Reports & Publications

Innovations out of Africa

The emergence, challenges and potential of the Kenyan Tech Ecosystem

A report by Julia Manske published by the Vodafone Institute for Society and Communications

TECH ECOSYSTEM | INNOVATION | KENYA | M-PESA | MOBILE ENTREPRENEURSHIP | START-UPS | BUSINESS

Vodafone Institute for Society and Communications

About this paper

"Innovations out of Africa. The emergence, challenges and potential of the Kenyan Tech Ecosystem." is a publication by the Vodafone Institute for Society and Communications (2014).

This paper takes Kenya as an example of current developments in the African technology and digital sector. In a first part it analyses the factors behind its origins and describes the potential of the digital ecosystem for Africa and the western world. In a second part it highlights current challenges and makes recommendations as to how Africa's digital innovation culture and its positive knock-on effects can be stabilised. This report is intended to provide impetus to representatives of development policy, technology companies, investors and those interested in Africa and entrepreneurship. It can only cover some of the current developments but is intended to encourage dialogue and further research.

The outcomes are based on a research trip to Kenya and South Africa, interviews with local experts from a range of sectors, ethnographic research and literature and discourse research.

We would like to thank the following discussion partners for their support and input:
- Maja Andjelkovic, Mobile Innovation Specialist at infoDev
- Chris Asego, Co-Founder and Director of Operations of Eneza Education
- Shikoh Gitau, Founder of Ummeli and Taasisi
- Evannah Hu, Founder and CEO of g.maarifa
- Michael Joseph, former CEO of Safaricom, Director Mobile Money at Vodafone
- John Kieti, CEO of m:labs, East Africa
- Derrick Kotze, Director of m:labs, Southern Africa
- Josiah Mugambi, CEO at iHub
- Martin Nielsen, Co-Founder and CEO of mdundo
- Reg Orton, Co-Founder and CTO of BRCK
- Brian Omwenga, Research Fellow at iHub Research
- Judith Owigar, Co-Founder and CEO of Akira Chix
- Fabian Owuor, Project Manager Praekelt Foundation and Entrepreneur
- Ugo Vallauri, Founder and CEO of Restart Project
- Participants of Akira Chix Training program

This paper does not necessarily reflect the opinions of each oft he persons named in all respects.
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GLOSSARY

Accelerators Facilities providing business development support over a period of a few months – through jobs, coaching, advice and networks. A share in the company's equity is often provided in return for support. However, it is difficult to clearly differentiate between incubators and accelerators since they are terms that are often used synonymously.

Business angels Generally wealthy private individuals or business owners who invest capital, time or professional expertise in young companies. The ultimate objective is a financial return on investment and the business angels participate in business development opportunities and risks.

Incubators Facilities that provide longer-term business support programmes to start-ups. The business incubator usually has shares in the start-ups' equity initially, then sells them at a later time.

Start-up A young company, often with low initial business capital, that has an innovative (generally high tech) business model.

Technological ecosystem The term technological ecosystem defines an interactive community which promotes digital and mobile innovations.

Tech(nological) entrepreneurship The use of digital and mobile information technologies to support business processes. Information, communication and transactions, the fundamental elements of the companies' business, are transmitted and processed via digital networks.

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Executive Summary

For a long time Africa was a continent with serious development challenges. However, a different picture has started to emerge. The continent is changing. Today Africa is generating innovations that are relevant to international markets. The introduction of a mobile payment system from Kenya, M-Pesa, in Romania clearly illustrates this paradigm shift. Both mobile services as a basic infrastructure and the continuous increase of fast and powerful Internet access capabilities have played an important part in this. In 2012 Africa's annual economic output rose by 4.7 percent – constant economic growth and increasing investments are anticipated in coming years.

Beyond the economic success stories, an aspirational technology scene has grown up on the continent. Kenya's capital Nairobi, the birthplace of M-Pesa, has established itself as the "tech centre" in Africa within seven years. The rise of M-Pesa is impressive: in 2007 the local mobile services provider Safaricom in partnership with its shareholder Vodafone launched a mobile-based money-transfer service as a non-profit project. Just six years later a third of Kenyans (17 million people) were using their mobile phone to transfer or save money.

The project's success and the national and international attention it attracted as a result are considered to be particular catalysts for the differentiation and professionalisation of the Kenyan tech scene. The interplay of "from above" (a mobile services company that drove innovations forward) and "from below" (individual actors interested in technology) facilitated a culture that was unique in Africa at that time. An economic and social climate emerged in which resources could be pooled and the key thinkers of the Kenyan tech and start-up scene cooperated to offer mobile services and use mobile technology as a distribution channel. The opportunities for developing innovative products in Africa are particularly wide-ranging: Successful apps such as the mobile learning software Eneza, m-Farm, a service for farmers, and the medical information service medAfrica illustrate the cross-sector potential.

Despite these impressive developments, the challenges remain substantial: Kenya's tech ecosystem is young and still unstable. The success story of M-Pesa has yet to repeat itself. The media-inspired nickname "Silicon Savannah" makes it difficult to discuss the potential of the Kenyan technology sector objectively. In fact, the framework conditions for entrepreneurship in Kenya are considerably less favourable than in the western world and setting up a profitable company entails enormous risks. Funding instruments from the western technology sector cannot be transferred one-to-one. In order for Kenya's technology ecosystem to establish itself in the long-run, the specific regional conditions must be foregrounded within the activities of innovation policy. This means:

1. Create access to funding capital

An omnipresent problem in the start-up world is the lack of funding opportunities. What is lacking in Kenya are low funding sums in the start-up phase that enable companies to cover their living or hardware costs. At the same time, few Kenyan

investors are taking stakes in tech innovations because the anticipated profits are still low and the risks high.

Development organisations and companies should commit themselves as investors or provide start-up grants as part of longer-term funding programmes. Equally, they can act as intermediate organisations for the distribution of micro-funding to reduce the transaction costs for investors. Incentives need to be created for investors and business angels for example by the government in order for micro investments to be made. Business angels should be specifically targeted due to their non-monetary support. Universities must promote funding concepts that correspond to the specific requirements of start-ups in developing countries.

2. Promote lasting structures

Investing in Africa means investing in future potential. Investors who enter the market expecting a short-term reward have little prospect of success and send the wrong signals to future company founders. Instead, investors should provide long-term incentives for entrepreneurs and enable sustainable business models. Specifically this means that, instead of high one-off monetary prizes, companies and institutions should offer long-term support and targeted monitoring at start-up competitions. The creation of mentor networks should be promoted at local level from the government side and at international level by development organisations taking the diaspora into account.

3. Establish competences

Kenya's population is comparatively young and has an enormous willingness to operate entrepreneurially. Kenyans are increasingly acquiring programming skills. However, very few have the relevant management knowledge to successfully realise business ideas. In the long term African universities need to anchor management competence in their teaching. In the short term institutions that promote start-ups or convey tech skills should combine this with training in commercial management. Development organisations and IT companies can use grants and internship programmes to promote entrepreneurial and management talents.

Technological innovations are based on good ideas – and hardware. However, the African tech scene faces huge obstacles when it comes to procuring the necessary components. This is to do first with restrictive framework conditions for obtaining materials (lack of logistical infrastructure, high customs levies) and second to a shortage of training opportunities for hardware engineering. Governments need to substantially improve the import and export conditions for hardware as the basis of a technology-based economy. Development organisations should promote programmes for expanding competence in the area of hardware production.

4. Set up stable real and virtual networks

In countries where entrepreneurs suffer from severe financial restrictions, the creation of technology meeting places (co-working spaces, incubators and accelerators) is particularly relevant. They enable access to hardware equipment, infrastructure, affordable premises and potential business contacts. Governments, companies and development organisations should support the spread of such places in a targeted manner. Similarly, locations for the international transfer of knowledge should be created. Development organisations and universities should offer exchange programmes between western and African start-ups and award travel grants for international conferences. Additionally, special entry and visa terms for African interns and students from the technology sector should be developed in cooperation with the African governments.

01 | Africa reloaded

The paradigm shift

In parallel to largely crisis-focused media reports about the USA and Europe, recent years have seen a rise in positive articles about Africa. These increasingly report on an up-and-coming continent.[1]

The old mantra of the "flourishing North" and the "suffering South" appears to be gradually dissolving. Whilst the West is currently fixated on the economic and political crises and fears for its future viability in the face of shifting geopolitical and economic power relationships, Africa's regions are reinventing themselves. A wind of innovation is blowing through Africa. Hotbeds of technology-driven entrepreneurship are being established in many of the continent's big cities. This development is assisted by the increasing spread of the Internet and mobile technologies. Africa is regularly the point of origin of forward-looking inventions with global relevance and is thus a market participant on level pegging. The premise that states that innovations happen in the West, then to be consumed by Africa will challenged this year at the latest: in March 2014 the mobile communications group Vodafone introduced the Kenyan-developed M-Pesa payment service in Romania. A "made in Africa" innovation has arrived in Europe and Kenya has thus carved out a place in the international perception as a location for tech innovations.

"Our innovation is a solution that is born out of Africa under the specific situation here. It doesn't use anything new from a technological perspective. It is just rearranging components in a more useful way which is maybe something that somebody outside of the continent would not have figured out." Reg Orton, CTO at BRCK

Rapid development, but problems remain

In 2012 the total GDP of Africa rose by 4.7 percent year-on-year – excluding South Africa this figure rises to 5.8 percent. The total GDP of the African continent is already higher than that of India. Many African nations have found their way onto the list of countries with the highest economic growth over recent years.[2] With the exception of the tourism sector, the region has remained largely unaffected by the economic and financial crisis in 2008. Africa's population will soon be the youngest on the planet. Already 50 percent of Africa's population are under 25; in Europe this figure is 16 percent. Thanks to improvements in healthcare and a reformed and expanded education system in many places, young Africans are already much better educated than their parents. Today these make up a large part of the African middle class, of which 70 percent is under 40.[3] Unlike previous generations, they no longer live with the memory of colonialism.[4]

However, despite encouraging developments, significant challenges remain. Many people on the African continent still suffer from extreme poverty and political instability. Enduring conflicts and civil wars such as most recently in South Sudan or in the Central African Republic, as well as terrorist activities such as in Somalia and most recently Kenya's capital Nairobi, have dampened the euphoria. There is no doubt that it will take further decades of growth and political stability until the majority of people in Africa have left the "bottom of the pyramid".[5] That said, the outlook is positive. According to analyses by the World Bank, by 2025 most sub-Saharan countries will be classed as "middle income" countries.[6] For instance, the economist Charles Robertson, author of the well-received book "The Fastest Billion", points out the parallels with the Chinese development curve and, like his colleagues, expects a comparable boom in Africa.[7]

The impact of mobile technology

"When I look at the revolutions in Africa over the last two centuries: Perhaps the invention of the steam engine, perhaps the bringing of the motor car, then the mobile phone and then M-Pesa – those four inventions changed Africa dramatically."

Michael Joseph, former CEO of Safaricom

The spread of mobile technologies has without a doubt played an important role in the current changes in Africa. A range of studies have demonstrated the positive effect of the increasing spread of mobile phones on economic and socio-political developments.[8] According to a calculation by GSMA in 2012, to date the "mobile ecosystem" has contributed up to 6 percent of the GDP of sub-Saharan Africa.[9] Although many people in Africa remain without access to basic infrastructure such as transport, banking, education or a functioning health system, the majority have what is termed a basic mobile phone.[10]

As a study of the Vodafone Institute shows, the diffusion of mobile technology has had a positive effect on political participation, education and the empowerment of women.[11] Mobile phones reduce the costs of obtaining information and thereby facilitate the emancipation of farmers and traders; they give students access to learning and private individuals access to the banking system. Mobile technologies become platforms that transform the lives of individuals. They transcend all social classes and also reach the very poorest.[12]

Africa's mobile revolution has skipped key developmental steps on its path to the modern digital age. This is termed "leap-frogging": instead of expanding expensive fixed network lines, which are now becoming less significant in other parts of the world, investments went directly into expanding mobile networks, which saved huge costs and set the course for innovations able to connect with the wider world. In Africa mobile services replace much more than just fixed-line telephony – for many countries it represents the first functioning infrastructure.

Mobile technologies offer clear benefits as they are more adaptable and flexible. More specifically, this means that modifications on the supply side can be made much more easily as the software can be updated independently of the hardware. The effort required to perform modifications or modernisations is thereby comparatively low, whilst in the western world creating new technological infrastructures involves high costs, and "log-in effects" render the shift difficult.

Global networking is changing the rules of the game

The Internet and global networking are changing the rules of the game on the global market. The increasing diffusion of digital media is enabling more and more people around the world to be heard and to establish networks across continents. Never before have the conditions for Africa competing in the global economic system been so favourable. This is because individual countries can leap-frog earlier phases of industrialisation using digital technologies and develop straight into knowledge economies, at least to a partial extent – the barriers are lower than ever before.

The following traces the key development steps in the course of more recent technological success stories of Kenya. This success story is a particularly good illustration of the influence of mobile and digital technologies as drivers of innovation. In the first instance the specific conditions for the origin of the Kenyan innovative climate are shown and obstacles and issues are also highlighted. In a second step the discussion turns to how such an innovation-friendly climate can not only be created, but also maintained in the long run.

Paradigm shift: IT and networking are turning Africa into an innovator and producer

Although there are still significant problems, mobile technologies have vasty accelerated the development in Africa.

02 | Once upon a time in Kenya

"I was somewhere in Europe a couple of weeks ago and had to buy a train ticket for the following morning. Now, the ticket shop at the station opens at 6:30 a.m. and I wanted to take the fast train at 6:15 a.m., at the machine you can only buy it with coins and I didn't have coins. I had to go there the day before to buy the ticket. If I had M-Pesa I could have bought it at the time I was planning the trip."

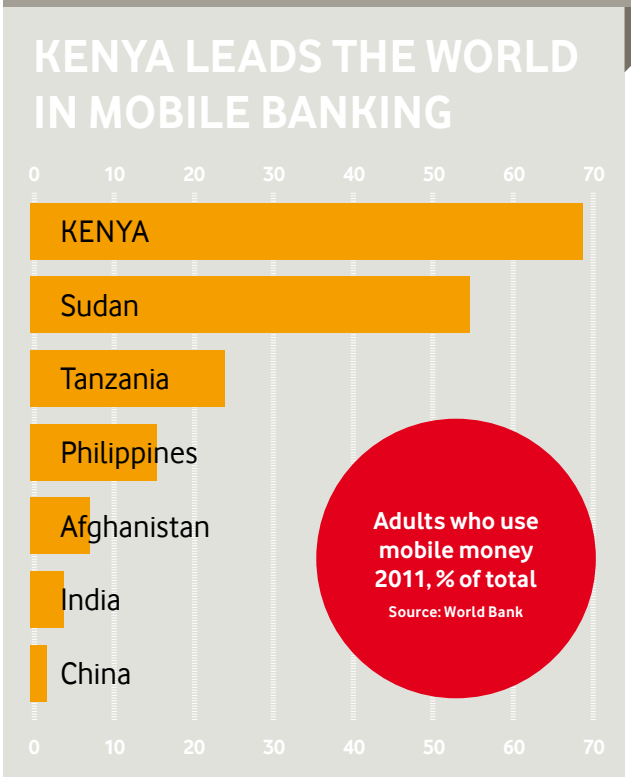
John Kieti, Director mLab East Africa

In the beginning was M-Pesa

The beginning of international reporting about Africa as a location of technological innovations can be dated to 2007. At that time the Kenyan mobile operator Safaricom introduced the M-Pesa (mobile money) service in a partnership with Vodafone. Originally planned as a micro-credit service, M-Pesa was supposed to be used by micro-credit institutions to transfer money to clients via their mobile-phone credit. However, with its market launch the users started to use the service to send each other money. M-Pesa became a national infrastructure for financial transactions. Just one month after its launch the service had 20,000 active users.

In March 2013 – six years later – this figure had risen to 17 million, meaning that more than a third of the Kenyan population had access to a money-transfer system in the form of M-Pesa.[13] At $249 million M-Pesa made up 18 percent of Safaricom's turnover in 2013.[14] Further, nationally 66,000 M-Pesa agents are paid commission for paying M-Pesa balances in cash to customers. The green M-Pesa signs affixed outside their shops and kiosks are standard features of the town- and villagescapes. They can be found in the most remote parts of the country. M-Pesa is omnipresent in Kenya and has rewritten the history of the country.

USAGE OF MOBILE MONEY



"M-Pesa as a product is not like any other product in the world. If you as a customer have M-Pesa you will never leave that company because you have an emotional bond with the product. I don't stay with the company because it gives me a free phone every year, but I stay with the company because it has brought me this fantastic product. And from a personal point of view as a manger it is the product that gives you the most satisfaction because of how it has changed the country. It has changed peoples life dramatically"

Michael Joseph, former CEO of Safaricom

M-Pesa – a catalyst

M-Pesa became a catalyst for development in Kenya, both economically and socially. Numerous studies, reports and papers have been dedicated to this phenomenon.[15]
The spread of the M-Pesa service has had positive effects at both micro and macro level. In a country in which the majority of inhabitants have no access to the banking system, M-Pesa replaces traditional banking services. As with other banking and transaction services, M-Pesa enables the exchange of money for goods and services without the actors having to be physically in the same place. For example, whereas customers of electricity suppliers used to have to go to the supplier to pay them, the bill can now be paid from home by mobile phone. Family members who work in the city can transfer money to their relatives in remote villages. In Kenya, where people often need to travel large distances on foot, or where heavy traffic has to be negotiated, this service saves many people a lot of time and effort.

At the same time the service reduces the risk of being mugged or burgled. Taxi drivers can work without storing cash in the car; schoolchildren no longer need to carry large amounts of cash on them for school fees. The money and security factor has improved the living circumstances of the inhabitants of rural regions in particular. For salary transfers M-Pesa increases the transparency between employee and employer and minimises the risk of employees being defrauded. It reduces the opportunities for corruption and makes money transfer more efficient for employers. M-Pesa also makes it easier to save money and to be better prepared for times of financial uncertainty.
On a macro level it can be seen that M-Pesa also has a substantial influence on employment figures as entry barriers are lifted and the foundation of micro-businesses is enabled.

Factors for M-Pesa's success

"There are M-Pesa agents everywhere. That is the secret of M-Pesa's success. Not just their presence but that you see them; the branding. That is what we wanted to create. Now, that costs a lot of money. That was a big risk to take. Would I have got permission for this if I had asked? I am not sure."

Michael Joseph, former CEO of Safaricom

In the relevant literature M-Pesa is today considered as a case study for disruptive innovations. The success of M-Pesa is down to a number of factors. On the one hand there was a strong demand for an infrastructure for transferring money because most Kenyans are unable to open a bank account, as is also the case in many other countries with a low per-capita income. Conversely, mobile phone use was widespread, accepted and part of cultural practice – not only for making phone calls, but also writing text messages. However, the role of Safaricom as financer and initiator was crucial: in 2007 the company, which is 60 percent state-owned and 40 percent owned by Vodafone, was the most profitable company in East Africa and had a market share of 70 percent. The company enjoyed great popularity amongst the population. This was also due to the fact that they specifically targeted their marketing at the "bottom of the pyramid" and offered products for the very poorest.

M-Pesa was originally conceived as a welfare project that was only intended to break even – a direct return on investment was not anticipated. As well as the social effect, the project objective was more to reinforce the brand and boost customer loyalty. The creation of the infrastructure that was necessary for M-Pesa was costly and time-consuming: to reach the actual target group – i.e. the very poor – it was necessary to ensure that the service is accessible everywhere in the country. There needed to be at least a kiosk in every village at which M-Pesa credits could be paid to and from the mobile phone. The agents needed to be recruited and trained; and this was done before there was any indication of whether the service would be

accepted. The introduction of M-Pesa thus harboured substantial risks and could therefore only be introduced by a market player with access to capital. A further reason given by Michael Joseph, the then CEO of Safaricom, is the lack of a need to justify the project and little monitoring by third parties.

M-Pesa came about under unique conditions that can only partially be transferred to other circumstances. The success story of this service and its knock-on effects once again show that disruptive innovations are rarely systematic or plannable. At the same time it makes sense to examine the positive developments such an innovation gives rise to and how a success story can be continued by means of targeted funding. The case of Kenya therefore also shows how political and economic actors can exert influence by intervening and can impact the innovative climate at a place.

"If you came to Kenya around 2007 – before M-Pesa took of – you would have said that there was nothing, yet the innovation had been under development for some time prior to 2007. The thing that you cannot take out of the story of innovation and tech in Kenya is M-Pesa. That has set the bar high – it is a success story that was driven by a local operator. People believe it is a Kenyan born innovation. Now, people expect more from Kenya."

John Kieti, Director mLab East Africa

M-Pesa was a disruptive innovation for Kenya whose success can be expressed in figures and that has had a lasting positive impact on the life of broad sections of the population.

The creation of M-Pesa entailed substantial costs and risks. Little regulation and monitoring and a strong market power of the innovator facilitated success – meaning that it is repeatable only to a limited extent.

FACTORS FOR THE SUCCESS OF M-PESA

Large demand for a transaction system as most of the population do not have access to a bank account.

Widespread use of mobile telephony.

As the market leader Safaricom enjoyed a high level of trust among the population and was able to make high-risk, capital-intensive investments.

Profit was not the main driver, huge social effects and long-term profitability were not planned.

"Anarchic structure"/little regulation and need to justify the project to shareholders

03 | The rise of a techno-logical ecosystem

"To understand the tech and innovation ecosystem in Kenya you will have to first take into consideration the factor of time. Until 2010, around the time when iHub was becoming a reality there wasn't much to say about the local tech ecosystem. It is a fairly nascent ecosystem compared to advanced settings such as Silicon Valley, Tel Aviv, London, etc"

John Kieti, Director at mLab East Africa

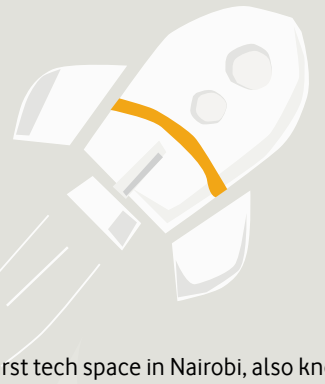
With the success of M-Pesa Kenya advanced to the position of a global pioneer and international point of reference for mobile payment systems. For the first time Kenya was associated with technology-driven innovation. International media and large companies took notice of the African country. This had an effect on the Kenyans' self-image. M-Pesa's success became an identity-forming narrative; the idea that an innovation can come out of Kenya crystallised in the collective memory of the younger generation in particular.

Similar to the butterfly effect,[16] M-Pesa became the trigger and driver of a new ecosystem of mobile technological innovations. It created a mood in which resources were pooled and key thinkers from the Kenyan tech and start-up scene got together. This development was accelerated by the foundation of the Ushahidi platform that was set up at the start of 2008 following the uprisings in the context of the Kenyan presidential elections. As a reaction to the violence, an ad hoc team of developers and bloggers came together to collect witness statements via SMS and plot them on a Google map, thereby initiating what is termed "activist mapping". The free open source service is now used by bloggers and activists across the world, for example for the earthquake at Christchurch or the Gaza war in 2008. The company that came out of this process enjoys high levels of familiarity in Kenya and its founders have become leading digital opinion makers.

One of the Ushahidi founders, the blogger Erik Hersman, was struck by the absence of places to exchange ideas in Kenya and so in 2010 he set up the iHub, one of the first co-working spaces for companies from the tech scene in Africa.
This was followed by a whole host of further technology spaces, incubators and accelerators. The Bishop Magua Centre, the fourth floor of which is occupied by the iHub, is also home to the spin-offs iHub Research, the iHub UX Lab, the start-ups Ushahidi, mFarm, Frontline SMS, mLab, the accelerator Nailab, Preakelt and the office of GSMA. The Who's Who of the Kenyan tech scene is housed in a single building. Other actors such as the accelerators 88mph and The Growth Hub have set up shop in the immediate vicinity. Large multinational companies such as Google, Microsoft, GSMA, Nokia and IBM have opened branches and research centres. This development is facilitated by a liberal economic system with a dynamic and strong private sector that promotes efficiency, competition and overseas investments. Within seven years Nairobi has developed into an African centre of technological innovations – journalists dub it "Silicon Savannah".

The success story of Kenya also radiated to other African countries. Technology experts, developers and designers started cooperating and by doing so gave rise to the technological ecosystem that they had been missing until that point. Especially Ghana, Nigeria, Rwanda, Ethiopia and South Africa saw similar developments as in Kenya. Large development organisations, such as InfoDev which is associated with the World Bank, set up co-working spaces and accelerators. Microsoft, Google and individual investors financed the expansion of a range of start-up centres in the African metropolises. Spread across the continent there are now over 35 locations for tech innovations in 13 African countries – of which many are members of the AfriLabs [www.afrilabs.com] alliance.[17] These generate new inventions and mobile and digital business ideas every year.

WHERE INNOVATION IS HAPPENING



iHub	Coworking space Founded in 2010 Main sponsors: Hivos, Omidyar Network, Google, Intel, Microsoft, Samsung, Nokia	The first tech space in Nairobi, also known as the unofficial base of the Kenyan tech movement. Numerous events such as hack-a-thons and training courses. In addition to m:lab, iHub has founded iHub Research, Consulting, Cluster, Gear Box and UX Lab (user experience).
m:lab	Incubator Founded in 2011 Main sponsors: World Bank, Samsung	iHub's spin-off and part of the infoDev initiative. Minimum 3-month programme for start-up teams, sometimes with start-up financing. Also coding training courses for external participants.
NaiLab	Accelerator Founded in 2011 Main sponsors: 1%Club, Microsoft	Start-ups take part in a six-month programme. Recently got 1.6 million dollars from the Kenyan ICT Authority to promote technological innovations beyond Nairobi in Kenya.
iLab/ iBiz	Tech research and incubator Founded in 2011 Main Sponsors: Safaricom, Ericsson, Samsung	@iLab and @iBiz at Strathmore University are Kenya's only university-affiliated tech hubs. The research results generated in iLab can be transferred to start-ups in iBiz.
88mph	Accelerator Founded in 2011 Main sponsors: Microsoft, Google for Entrepreneurs, Samsung	88mph, founded by Danish investor Kersten Bruch. Similar to US accelerators, promoting internet-based concepts in a three-month programme, including start-up capital of around USD 20 thousand.
PAWA254	Coworking space Founded in 2012	Not strictly a tech hub, but a creative space. Promotes social entrepreneurship by bringing creative people together (photographers, journalists, graphic artists and musicians), who can also get mentoring. Extra programme for young people.
Safaricom	Founded in 1997 Mobile Network Operator	As an industry example, Safaricom is also still regularly launching market innovations, including M-Shwari (micro loans), Okoa Jahazi (airtime on credit), Flashback 130 (free text message saying "Please call me"), Kipokezi service (e-mail and chat with SMS-capable mobile phone), M-Kesho (savings account)

"There are so many cases of hardware that has not been developed in the West because it has not been required in the West. But maybe it is required here. The BRCK is a good example. (...) Now, with the huge curve that Africa is going through, we are seeing that there is a real demand of new devices in that space (...) People are developing devices according to their own situation. BRCK came out of our pain."

Reg Orton, CTO at BRCK

The success of M-Pesa is anchored in the Kenyan consciousness and has reinforced the feeling of collective self-efficacy.

In Kenya and beyond a considerable system for technology-driven innovations has developed over the course of seven years.

The potential – a perfect ground for innovation

The expansion of the technology scene in Africa is not only promising in terms of socio-political and economical development but also in term of investment. These investments may also play a part in adressing pressing issues in the West.

The "bottom of the pyramid" concept, first published at the end of the 1990s by the Indian-American economist C.K. Prahalad, played a key role in the poor sections of the African population today being perceived and taken seriously today in their role as consumers. Products especially adapted for the needs of poor people can open up new business segments to multinational corporations. There is good reason why the large digital companies such as Facebook, Google and Intel are becoming increasingly active and preparing their commercial future in Africa. Developing countries already make up 65 percent of daily Internet users.[18]

Additionally, Africa is a cost-effective "breeding ground" for innovative solutions. Entrepreneurial independence has become a popular and widespread working and living model in Kenya over the course of the technological revolution. Officially 42 percent of the Kenyan population is currently unemployed, yet small, informal enterprises and innovative solutions for managing everyday problems are springing up everywhere. The combination of this optimistic attitude of the small businesspeople, known as Jua Kali (Jua Kali = under the hot sun), coupled with the competences of the developers and technology experts, harbours particular potential for creative business ideas. Mobile and digital technologies open up new ways of solving the numerous problems that still require a solution in Africa. A whole range of successful services have been established, in particular in the area of education, health and agriculture. As the example of M-Pesa shows, some of these may also be of interest to the west. The concept *reverse innovation* introduced by the innovation experts Vijay Govindarajan and Chris Trimble (2012) provides a systematic basis for this approach: conventional ideas are rendered obsolete as the direction of the innovations is reversed and inventions that are created under the specific conditions in developing countries are increasingly used in the West.

ANOTHER GREAT INNOVATION FROM AFRICA

There is another famous example of an innovation that was developed in Africa, in addition to M-Pesa and Ushaidi, which is used all over the globe. It's the Ubunto operating system. Initiated and predominantly financed by the foundation of South African multimillionaire, Mark Shuttleworth, Ubuntu was developed for open and free-of-charge Linux distribution. Ubuntu is the name of an African philosophy that is followed by the Zulu and Xhosa tribes (meaning humanity towards others). Ubuntu speaks particularly about the fact that you can't exist as a human being in isolation, and one of the key ideas behind this philosophy is "I am what I am because of who we all are". The operating system was developed according to this principle as an open access system that is easy to install and operate.

"Innovation in Africa is mostly necessity-driven. You see problems in front of you, every step you take, every new place that you go to, you see new problems and challenges. It could be purely social challenges or problems that have economic challenges as the root course. Hence, you see people motivated around addressing these challenges and this can turn out to be the start of good economic fortune."

John Kieti, Director at mLab East Africa

Mobile services as a dominant channel for innovations

The "mobile enterprise" business segment offers the biggest potential to many company founders, with the result that most innovations come about in this sector. With M-Pesa the understanding of the deployment potential of mobile phones has been substantially expanded and the idea spread to developers and consumers that mobile devices can be used for other services alongside voice and SMS transmission. According to the Communications Commission of Kenya, mobile penetration in Kenya was around 77 percent in 2013. Of those Kenyans who live on less than $2.50 a day, 60 percent have access to a mobile telephone (including common use of one device).[19] 16 million Kenyans have access to the Internet. 99 percent of Internet access is made via a mobile telephone.[20] The figures are increasing sharply and illustrate that mobile telephones are the fastest way of accessing the customer. With this "mobile first" strategy, Africa is ahead of the curve. Around the world, 46 percent of mobile phone users between 18 and 34 use their mobile phone as a "first screen" to obtain information, listen to music or watch videos.[21] For Africa this includes the opportunity to expand existing expertise in order to operate on other markets.

Curse and blessing – the development of mobile applications

Similarly, the low access barriers mean that the field of "mobile entrepreneurship" is particularly promising to many.[22] Numerous start-ups are emerging in this context. Information services via which subscribers obtain regular information on increasing productivity or efficiency of business processes are particularly successful. For example, the iCow service sends farmers reminders when their cows need to be vaccinated and milked and provides additional pointers on fertility cycles.

Many of the new digital service offerings build directly on M-Pesa: Safaricom itself already provides a whole portfolio of services, such as M-Kesho, a savings account on the mobile phone; or the M-Shwari micro-credit system. Additionally, beyond Safaricom successful innovations on the basis of M-Pesa are emerging: M-Farm [www.mfarm.co.ke] is a platform via which farmers can

THE OMNIPRESENCE OF SMS

SMS is omnipresent in Africa and it continues to be the dominant channel for obtaining information or communicating offers. Services that are people tend to use on the internet in the western world are predominantly received on SMS-demand in Africa.

Entertainment – Muthoni The Drummer Queen is a Kenyan musician who produces a combination of hip-hop and pop. In her current song "Nai Ni Ya Who" (Who does Nairobi belong to), she sings about the influence of the social media on everyday life in Kenya. She markets all her songs via SMS. People who want to buy the song send a text message to the number that is provided and the song is sent to their mobile phone.

Job seekers – Dumaworks connects job seekers to employers. The job seekers can register via SMS and are sent a job offer that matches their profile in an SMS notification with phone number.

Encyclopaedia – Since 2012, the Wikimedia Foundation has been promoting Wikipedia Zero, a reduced version of Wikipedia that can be used free of charge, i.e. without data service charges. Content can be requested by text message or USSD. The service is currently available to Airtel Africa customers in Kenya.

Education – Eneza Education aims to improve education for Kenyan children in rural regions. They can answer quiz questions relating to their curriculum via SMS. The teachers can monitor the children's performance on a platform, so they know which aspects of the curriculum they need additional help with. Over 12 thousand schoolchildren use Eneza. There are even registered users in Dadaab, the refugee camp in the north-eastern part of the country.

for example buy products collectively at better prices using M-Pesa. M-Kopa-Solar [www.m-kopa.com] provides Kenyans with electricity via solar panels installed in the house if they transfer a small sum via M-Pesa. Instead of a large, one-off investment that many cannot make, they pay "on demand".

Further, there are highly successful companies that have developed improvements to M-Pesa or, in more general terms, of mobile banking systems. Kopo Kopo is an organisational and administration tool for traders who use mobile banking systems. The MoVas Group credit scores customers using data analyses. Both companies now operate internationally.

Barriers to the spread of mobile services

Still today SMS and voice transmission are the dominant communication channels for reaching a large number of potential customers in in Kenya. In order to optimally distribute a product or a service, this needs to be done via the mobile end device. However, the providers of mobile services are often only economically profitable in partnerships with the mobile service providers where the latter provide for instance a high quota of free SMSs or customer data. However, to date only 11 percent of start-ups in Kenya have entered into partnerships with mobile services companies.[23]

There is often a lack of social capital for even making contact with the companies. In countries in which a small number of providers dominate the market, these can not only afford costly initial investments and introduce ideas to the market (see M-Pesa), but they are also gatekeepers for innovations by smaller companies. For innovative strength, diversity, competition and interaction between multiple actors is more beneficial in the long term than the dominance of a single provider.

To get around the problem many African start-ups are developing smartphone or web apps. The barriers to bringing these to market are considerably lower as the services can be distributed via freely accessible online stores. However, one issue is the fact that currently only a very small section of the population can currently make use of these apps as they either have no access to the Internet or no fully Internet-enabled smartphone. Further, the willingness – and the opportunity –

to pay for online services is very low. End customers at the bottom of the pyramid are forced to select by relevance. Only one service that promises direct, especially financial, added value (e.g. saving money through the use of an online service), can and will be used by this customer group. Many of the currently available apps therefore appeal theoretically to the upper strata of society or foreign prospects. Beyond this user group, companies often lack knowledge or the necessary imagination as in conceiving their services they assume the needs of their own peer group. To that extent the products are not suitable for the target group within reach. This discrepancy between potential customers and the supply is one of the reasons why the potential for B2B products has to date not been exploited to the full.
It is expected that the landscape will change further with the increased spread of the Internet. As is the case elsewhere, the importance of SMS will diminish as costs for smartphones and feature phones fall, and that of data packages and web-based solutions will increase.

There is a high innovation density in the area of SMS-based services that are used on basic and feature phones.

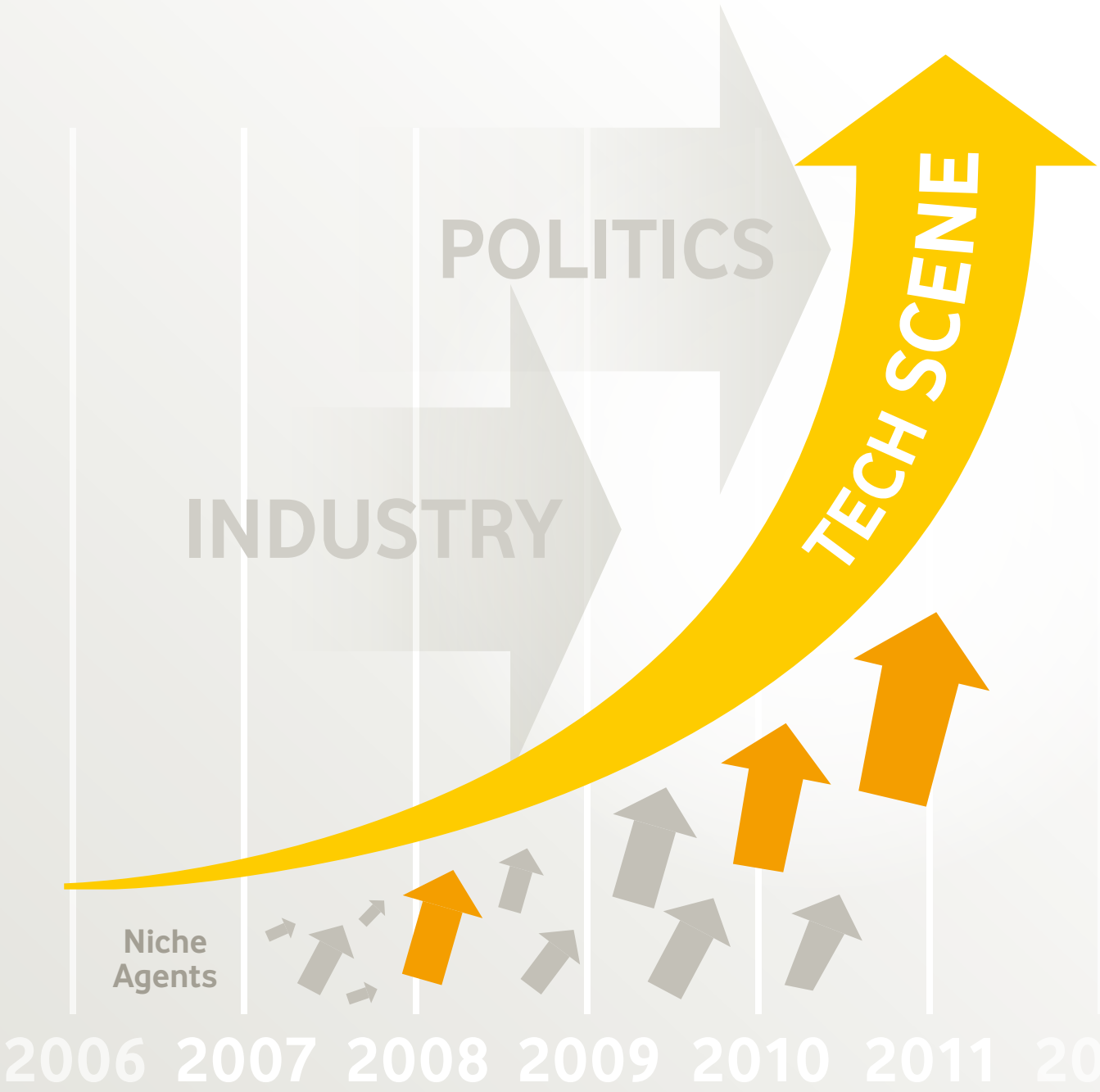
In order to operate a service, companies often need to cooperate with mobile services providers in order to be profitable. Large companies thus become gatekeepers.

As a result, many developers are starting to concentrate on smartphone and web-based apps. However, the products do not often meet the needs of the majority of potential customers.

The increasing spread of the Internet will reshape the market and alter the landscape of digital service offerings.

The interaction of the powers "from above" (one mobile services company that drove innovations) and "from below" (individual actors interested in technology who met physically and networked virtually) fostered the emergence of a culture of innovation that was unique to Africa at the time.
The technological ecosystem that has arisen from the particular circumstances of the recent past has the potential to have a positive impact on the future of Kenya – and over time that of the whole of Africa – and generating economic growth through the increase of entrepreneurship as defined by Schumpeter.[24]

Kenya's history as a technological location is still young and is currently at a turning point. Path dependency and limiting structures harbour the risk that the potential will disperse. Local companies and the international public are impatiently expecting the "next M-Pesa". Although innovations are springing up like mushrooms in Kenya, only a small number are scalable. In order for the trend to continue successfully and for a "breathing ecosystem" to arise that empowers individual actors to engage in lucrative entrepreneurship, the specific challenges facing Kenya as an innovative location in this decisive transitional phase need to be addressed. Private companies, development organisations and investors are requested to make their contribution and need to target their efforts at the right place.



THE RISE OF KENYA'S TECH SCENE

04 | Four fields of action to secure lasting success

"In Kenya we are mastering the practice of perception engineering. We have learned to make perception of reality to be what we want. Hence, you may see a lot more buzz than substance in some things. Some of us believe the buzz should go ahead of the substance. Many people will get impatient that the substance is coming too slowly behind the buzz. Of course substance around innovation and entrepreneurship is the ultimate success, especially when it is scalable and sustainable. This will take one, two or many more years to be realised. Innovation is not a button that you press and it just happens."

John Kieti, Director mLab East Africa

I. Early access to money

Create access to early-phase financing

As in many other innovation ecosystems, the lack of access to funds is a problem in Kenya. 60 percent of start-ups in Kenya are funded by equity and 20 percent are supported by the family. Whilst venture capital in Kenya only makes up 8.6 percent of start-up capital, in Silicon Valley this is 64 percent.[25] Local funders have been hesitant thus far – they prefer investments in real estate or transport and infrastructure that promise high growth margins and rapid returns.

So far, there are some foreign investors that target the promotion of start-ups and few local unions that have been established recently.[26] Some of those investors complain that whilst there is a substantial number of start-ups that could be funded, they are not profitable or scalable. This indicates a gulf between the requirements of investors and companies, which the latest GSMA report confirms:[27] While most investors on the ground want to provide scalable capital (i.e. after company set-up), many entrepreneurs are reliant on seedfunding and micro-seedfunding (i.e. in the first stages of the business idea). Although the ongoing expansion of the tech-ecosystem has already lowered barriers to start an enterprise many entrepreneurs lack the funds to pay the rent or buy the hardware they need and the capacity to financially concentrate on one business idea.

In this respect the different demands on start-ups in Africa as compared to the West become clear: early funding through small sums is especially important in a country where many entrepreneurs live in financially precarious circumstances. However, the funding structures pioneered by Silicon Valley neglect the issue of micro-capital. Because of the transaction costs (e.g. for due diligence audits), many investors feel it is hardly worth investing small sums. Therefore, new funding models need to be developed that also give investors the incentive to invest minimal sums. For example, development organisations can act as intermediate organisations for the coordination and distribution of micro-funding to reduce the transaction costs for investors. Alternatively, banks should promote the issue of micro-credit extensively and in a targeted manner. Governments should also create incentives for business angels who support companies at an early stage. This may be for example in the form of pro rata investment subsidies from state institutions or credit banks; or also funds matching (which doubles the contribution) by development organisations.

"More important than huge amounts of Venture Capital those entrepreneurs need small amounts of funding to buy proper hardware and pay their rent."

Derrick Kotze, Director mLab Southern Africa

Exploiting the potential of crowdfunding

The Internet expands the opportunities for supporting start-ups in unconventional ways: crowdfunding platforms can be used to collect money for product or business ideas. For its BRCK project, Ushahidi used the Kickstarter platform to collect a total of $172,000 in just 30 days. One benefit of crowdsourcing is that it both serves as a marketing tool and high levels

of awareness can be achieved via social-media channels, even before product launch. In the ideal case, the system also acts as a natural sieving mechanism for unmarketable business ideas. Donors and prospects from around the world can get involved in a product and – in the case of crowdinvesting – use this as an investment opportunity. It is expected that in future the young and technology-savvy African middle class will also be more willing to make individual investments in technology products.

"There is a growing middle class and some that want to make some investments. We need to understand how to tap into that money, how we can make somebody consider to seed their money for innovation driven entrepreneurship instead of taking it to the traditional stock markets or real estate?" John Kieti, Director mLab East Africa

Global networking also enables large international investors and business angels to hear about innovations in Africa. Platforms such as Start-upvalley.com and seedups.com bring international start-ups and investors together. Governmental and development agencies should assess the extent to which existing platforms are being used broadly to promote start-ups locally and internationally. With platforms such as this the African diaspora (see page 30) can be addressed and be part of the expansion of the start-up scene.

Most start-ups are established using equity capital.

Local investors have shown little interest to date in the tech market; rising international interest on the African market could change this.

There is substantial need for financial support or share capital in the very early stages of the company (micro- and seed funding).

The Internet can open up access to start-up financing: crowdsourcing and crowdinvesting; virtual networks with overseas investors.

POTENTIAL FORMS OF SUPPORTING THE TECH SCENE

Safaricom:
In addition to funding the iLabs and iBiz at Strathmore University, Safaricom established the Safaricom Academy which offers a Master in Telecommunication Innovations. The Academy has an incubator where companies can start businesses with the products of their R&D projects. Safaricom also provides an online lab via Vodafone's Betavine platform where innovations can be developed, tested and presented to a global audience. The Appstar Challenge is an annual Challenge that Safaricom run's in partnership with Vodafone which allows participants from various countries within Emerging Markets to participate. Safaricom also runs the Appwiz Challenge to identify, develop and support early stage mobile technology companies using mobile technology as an enabler.

Microsoft:
Microsoft has been supporting the development of the tech entrepreneur scene in Africa with the 4Africa initiative since February 2013. It mainly supports the 88mph accelerator in Nairobi and Cape Town but also gives grants to start-ups. People all over the world can learn tech skills at the Microsoft IT Academy. BizSpark provides resources to start-ups.

Google:
In the Google for Entrepreneurs Programme, Google works with tech hubs throughout Africa. It provides these tech hubs with technical content, business tools and infrastructure upgrades that satisfy the increasingly high requirements of developers and start-ups.

InfoDev - World Bank:
The World Bank's infoDev programme established a network of five mobile application labs (mLabs) and eight social networking hubs (mHubs) in collaboration with the Finnish government and Nokia. They are located in Armenia, Azerbaijan, Georgia, Moldova, Kenya, Tanzania, South Africa, Uganda, Nepal, Pakistan and Vietnam. The goal in setting up the network was to support the needs-oriented innovations of young entrepreneurs. Courses, workshops and network events are provided in addition to equipment and tech hardware.

II. Promote lasting structures

Nairobi is not Silicon Valley

"Many ask for success stories. But it is a bit early for solid solutions. The bar for success is raised (...) So hopefully, at some point we will have one of those world-known and ground-breaking success stories. So far there are some good solutions but maybe they are not know outside of this city."

Josiah Mugambi, Executive Director at iHub

Media and publications are constantly trying to compare Nairobi to Silicon Valley. This may be helpful to draw the world's attention to the continent. However, under scrutiny it is misleading and arouses false expectations: it is unlikely that Nairobi will establish itself as a "new Silicon Valley" (this also applies to all other cities not only in Africa, but also Europe).
The unique innovation cosmos of Silicon Valley has grown up over 80 years; established universities such as MIT and Stanford and also successful entrepreneurs "made in Silicon Valley" perpetuate its continuation. Conversely, Nairobi's tech scene is just seven years old. The latest positive developments should therefore be viewed with the requisite patience.

Given the sudden prominence of Kenya as an African tech centre and its rapid development over recent years, many – both Kenyan start-up entrepreneurs and investors in equal measure – are waiting for a new, ground-breaking innovation that can match the success of M-Pesa. However, it usually takes a few years for an idea to become a profitable business; in a system like Kenya where the conditions are considerably more difficult than in other regions of the world, it may take even longer. Investors looking for rapid returns are therefore not advised to invest in Kenya right now and are by doing so also send the wrong signals to future entrepreneurs.

THE NEXT REVERSE INNOVATION?

The BRCK, an innovation by Ushahidi, is an "emergency power generator" for internet access. It is a modem resembling a brick which is intended to provide unlimited mobile internet connectivity. It was developed in response to the needs of the African tech crowd and the knowledge that current hardware only reflects western standards.
Weak Wi-Fi connections, power cuts and mobile devices without Wi-Fi function are restricting internet access in Africa. The BRCK modem works like a smartphone and has a SIM card. It can provide Wi-Fi to a range of different devices and bridge power cuts. It also has a robust, dirt, heat and splash-resistant design. At re:publica 2013, Erik Hersman launched the BRCK crowd funding campaign. Within 30 days, a total of USD 172,107 had been raised. Now the first BRCKs are being supplied to customers.
It is assumed that customers far beyond the borders of Kenya will be interested in a BRCK. Hersman is the man who said, "If it works in Africa, it will work anywhere."

"THE BRCK"

Create a long-term orientation through mentoring and regular cash distributions

"Most people have a side business. On this continent there is a feeling that you need to have a safety net. You might not have your job the day after and therefore you need to have a backup plan."

Josiah Mugambi, Executive Director at iHub

There is a risk that short-term access to huge amounts of funding will put a hamper, or even prevent, the long-term orientation of an enterprise. Many entrepreneurs in Kenya start a business because they could not find formal employment and act out of existential need. Two thirds of entrepreneurs consider themselves "necessity driven"[28]. Short time financial support might fill the financial gap but distract from the business idea as soon as there is another opportunity to make money. In fact, out of concern that plans will go wrong, or a start-up is not successful, many Kenyan start-up employees have other irons in the fire to guarantee a secure income. On the one hand this indicates a decidedly entrepreneurial culture, yet at the same time this daily "hustle and struggle", also harbours the risk that long-term commitment and energy for one specific start-up project will be lacking. For the promoters of entrepreneurship this means that they should focus particularly on the right incentives to foster long-term orientations towards a business idea. In concrete terms this would entail for example funding measures that do not constitute large sums, but instead relate to the provision of workspaces, equipment and a monthly basic salary. Also, it is useful to link the distributions of funds to agreed target.

A crucial element to support long-term orientation is mentoring. According to a report by *Startup Genome,* the chances of success for start-ups that are given mentoring support rise sevenfold.[29] Ideally, funding should always be linked to intensive support and supervision. Mentoring programmes should therefore be implemented in a targeted manner. However, it is essential to identify mentors who know and understand the specific requirements of the Kenyan/African innovation scene (e.g. representatives of the diaspora).

For that reason, too, increased incentives should be put in place for business angels as they not only contribute money, but also their expertise.

Further, investments in African start-ups should not be misunderstood as welfare projects. Development agencies and NGOs should base the conception of their funding measures on the rationale of investors. More specifically, this means that funding programmes should be for a fixed term and include strict stipulations. Otherwise entrepreneurs who would not be able to operate on the market in the long term without support are funded for an unnecessary period and take away opportunities for others.

Reflect the added value of competitions

"Some people think they can take shortcuts to entrepreneurial success. Such people want to rely on innovation or business competitions for prize money without really achieving business growth from real revenues that are sustainable"

John Kieti, Director at mLab East Africa

Across the world the numbers of competitions and awards for start-ups is increasing – including in Africa. They are an important element in the funding structure, and one of the few instruments for providing support at an early stage. Additionally, they are a good way for start-ups to get themselves known to start with and to be noticed by other investors.

The organisers of the competitions are often furthering their own interests: frequently the purpose of awards is to position the organiser's own brand; ensuring a sustainable business model is secondary. Having handed over the prize money many organisers do not check how the money is actually being spent. Consequently, attractive project ideas at competitions often win over well thought-out business cases. In order for competitions to support the technological ecosystem in the long term, benefits that foster the long-term development of an idea –

such as mentoring and training models – are a considerably better instrument than awarding substantial prize money only.

The talk of the "Silicon Savannah" is misguided and produces exaggerated expectations. Kenya is still a young and unstable tech ecosystem.

Investors should aim for long-term success instead of hoping for short-term returns.

The specific living circumstances of the entrepreneurs must be taken into account when drawing up the promotional measures (scarcity, "back-up" culture).

Funding programmes and competitions should always consider the sustainable expansion of a business as an objective. Non-monetary support through mentoring, training and access to social capital are at least as important as monetary funding.

III. Promote relevant competences

"Kenya's innovation culture is necessity-driven. Because many of the young people have so much free time that they ask themselves; okay I have all these skills but I can't use them because I am not employed, can I use them somewhere?"

John Kieti, Director at mLab East Africa

The educational aspirations and the will to advance professionally among young Africans are pronounced. A survey of the Global Entrepreneurship Monitor showed that 60 percent of young people in sub-Saharan Africa believe that there are adequate opportunities for setting up a company. Only 25 percent of respondents stated that the fear of failure was an obstacle in operating as an entrepreneur (by way of comparison, this was 49.2 percent of respondents in Europe).[30]

Foster programming skills

Digital entrepreneurship represents an important point of contact for entrepreneurial spirit and drive to shape the future of young Africans. To this end the promotion of programming knowledge needs to be further expanded. The potential is particularly large as fundamental coding and hacking skills can be improved by concrete application – *learning by doing*. Certification courses that provide the necessary skills within a short period can be an important instrument here. They convey to participants the necessary basic skills so that they can acquire the relevant capabilities under their own steam. Such certification courses could for example be offered in school for anyone interested. Online courses, i.e. MOOCs or YouTube tutorials, are a useful extension of this. Their use is on the rise around the word and democratises the learning of skills. Self-managed learning with digital formats has been very well-received in Kenya. However, such courses require stable and fast Internet connections. Self-teaching centres that offer the necessary infrastructure would be useful to support this trend.

"You know, all my coders are self-taught; they have done something else before and now they work for my platform and from my perspective they are all doing a brilliant job."

Shikoh Gitau, Entrepreneur, Founder of Taasisi

Build up business skills

Individual initiatives are already carrying this trend forward – in particular the number of certification courses is growing; specifically, the new opportunities afforded by online tools could hold huge potential.

However, this harbours the risk that young people become entrepreneurially active in a comparatively unmanaged and necessity-driven way. Many cannot find a job and instead use their skills to develop an app. At the same time, without entrepreneurial knowledge many entrepreneurs will fail soon after start-up: programming knowledge alone is not enough to be a successful entrepreneur. However, the communication of entrepreneurial skills has long been neglected in education. This can be at least partly explained through the role and the self-image of the universities. The aim of the first generation of African universities was to educate post-colonial civil servants. The colonial masters who were in the process of leaving the country only had a marginal interest in educating Africans to become agents of an economic recovery.[31] Higher-education institutions are therefore strongly theory-driven and do not see themselves as purveyors of practical skills. In the long term universities need to adapt their curriculums and be more practice-orientated if Africa is to build up a competitive technology market.

Obviously, until the combination of programming skills and management experience is anchored in teaching, high-quality incubator programmes and management courses take on an important function. Development organisations, companies and investors should therefore support the creation of additional high-quality accelerator and incubator programmes.

BEST PRACTICE AT AKIRA CHIX

Initially an informal network of women, the Kenyan Akira Chix initiative hopes to increase the number of women involved in the tech scene and provides a network platform for female geeks. The name is a combination of the Japanese word "Akira", which means energy and intelligence, and "Chix", an alternative spelling of chicks. The Akira Chix provide a virtual network and organise information events about technology careers for women, as well as hack-a-thons for women. They also mentor women with an interest in technology and provide a training programme for women who want to work in technological professions.
The one-year programme teaches young women from poorer regions and Nairobi slums how to programme software. It covers the main programming languages, plus marketing and management, providing the girls with relevant knowledge that could help them to start-up their own business with the support of the older Akira Chix and the network.

"AKIRA CHIX"

"It is a learning from the past, we are now focussing on talent and not on projects."

Derrick Kotze, Director mLab Southern Africa

As well as that they should support not only ideas, but also entrepreneurial and management talents in a targeted manner. This applies both to the award of grants for incubators and also for the targeted promotion of development of young people who have the potential to develop into entrepreneurs, e.g. through scholarships, one-to-one mentoring or visiting programmes such as the American Venture for America programme [www.ventureforamerica.org] for university graduates.

Improving conditions for building hardware

In the hardware sector in particular, the potential for innovations from Africa has barley been touched. The example of BRCK shows this clearly: with "The BRCK" the makers of Ushahidi developed a modem especially for the African market. The modems available to that point were based on the needs of the western market and did not meet the specific requirements of users in Africa.
However, the path to the development of a bespoke hardware product was difficult: only a few universities currently offer engineering courses in the ICT sector. Expertise and production locations are thin on the ground in Africa. This means that start-ups are almost entirely dependent on imports. This is often difficult due to political, regulatory or infrastructural framework conditions and is also expensive. It is even difficult to exchange goods and raw materials within Africa.

In order to make sure the great potential for innovative solutions does not remain untapped, in future further spaces should be created in which prototypes can be developed and tested. Additionally, increasing investment should be made in the training of hardware experts. Alongside traditional educational support, the political and regulatory framework conditions for the import of hardware must be improved to facilitate development of the location. This comprises in particular reducing levies, some of which are 100 percent, and, added to the delivery costs, high in themselves, unnecessarily increase the final price of hardware products.

"Unfortunately, the logistics are difficult (...) There is a lot of infrastructure required that does not exist here. For example, prototyping facilities – if you go to the West those things are pretty easy to come across, you can get 3-D printing over night for cheap prices. We own now one of very few 3-D printers across East Africa that only arrived some month ago. Those things have been in Europe and the US for almost a decade."

Reg Orton, CTO at BRCK

Young Africans have high educational aspirations and exude entrepreneurial spirit.

Certificate and online courses for enhancing programming skills should be promoted.

Business skills need to be anchored in the education. Institutions should connect the teaching of coding skills with business skills.

Investments in the competence of hardware development and improved conditions for the import of hardware components can unlock further innovative potential.

IV. Setting up stable networks

Create meeting places

"There was a yearning for a space or a location where people could go to and meet and interact without worrying about the question of who is going to pay the bill for the drink. (...) Easy internet access, allowing people to connect and to interact with one another and hopefully to solve many problems that we have on the continent."

Josiah Mugambi, Executive Director at iHub

The success of the iHub and other co-working spaces illustrates that places of exchange and networking are of fundamental importance to promote technological innovations. Here a comparative look at Silicon Valley is certainly worthwhile: there, too, the proximity of institutions with similar interests, the concentration of expertise and the pronounced culture of recommendation and networking play a part as important factors for success in consolidating innovations. Also, because lack of social capital makes entry difficult for many young Africans, networking is even more important. Additionally, these places have a particular relevance, especially in countries where the Internet is difficult or expensive to access, as they lower the entry barriers to entrepreneurs. Setting up further co-working spaces, incubators and accelerators by companies, government and development organisations is important to that extent.

Additionally, intra-continental and international conferences can be important locations for communication, although only a small number of young Africans can afford to take part in such events. Initiatives such as the meeting of all managers of the AfriLab members at the re:publica in Berlin, funded by GIZ, or the Global Entrepreneurship Congress in Moscow offer places for discussions and learning from one another and should be continued. The award of travel grants for international conferences would be beneficial.

THE MAKER MOVEMENT

A hacker or maker space is a place where people meet to create physical products. They are part of the do-it-yourself movement. The most famous maker spaces are the FabLabs that were initiated by MIT and there are now 35 of these labs around the world. They generally use 3D printers and other tools to make prototypes. In Africa, the maker movement is still quite rudimentary.
One maker, Faire Africa, promotes maker spaces by hosting events. In Kenya there is a maker space in the iLab, and a hacker space called "Gearbox" has been in the iHub since October 2013.
There still aren't very many maker spaces in Africa because equipment such as 3D printers, though inexpensive in Europe and the USA (USD 200+), are difficult to get hold of in Africa and very expensive. This will change over time. For example, 33 year-old Togoer Kodjo Afate Gnikou developed a 3D printer from recycled parts for 100 dollars, which won him an award from NASA.

"A 3D-PRINTER FOR $100"

Use global networks and international transfer of knowledge

Another reason why a place like Nairobi provides such favourable conditions for innovations is that international organisations have settled here over a long period and the infrastructure conditions are favourable compared to many other African cities. Additionally, there is a large ex-pat community in Nairobi that exerts a substantial influence over the local technology scene. In the city's co-working spaces and accelerators, a disproportionate number of non-Africans can be found. Most European and American experts initially plan a short stay. During their stay they encounter problems to which they start to devise solutions based on the knowledge from their home countries, so some therefore decide to stay longer. They set up companies or join existing teams. Multi-cultural experience in the team also boosts creativity.[32] Benefiting from the combination of the ex-pats' management skills and the Kenyans' local knowledge and understanding of the market these teams are highly successfull. Ex-pats not only foster the transfer of knowledge towards Africa, they also themselves bring important insights and potentially also business ideas back to their home countries.[33]

(Virtual) mentoring and exchange programmes, for example based on the *Enpact programme* [www.enpact.org], help young entrepreneurs to network and learn from one another. International exchange and study programmes with the USA and Europe[34] are promising for the promotion of entrepreneurial skills in Africa (and also for the exchange countries) and should continue to be promoted. This could also include joint university programmes between Western and African universities. To further exploit the potential of international meetings, it would be advisable to consider special entry and visa provisions for African interns and students from the technology sector in partnership with the African governments.

The constant networking with the African Diaspora – in 2010 this was 30.6 million people[35] – can play an important role in expanding the technology industry, as the example of India and Israel have shown. The successful overseas Africans are also very important as investors because they usually have a better understanding of the market and can better evaluate risks. Even if many of the diaspora Africans do not return to their home country, the constant contact due to the Internet and new direct flight links promotes the exchange of knowledge and provides innovative impetus to the continent. Embassies and other institutions should work to secure the integration of the diaspora into the innovation culture by involving the diaspora in expanding a mentoring network as already discussed.

Connect the global entrepreneurship scene

Virtual networking, too, can reinforce an innovation ecosystem: the Internet gives young people around the world a better idea of other places (for innovation), such as Silicon Valley or Tel Aviv. Based on the studies by the ethnologist Arjun Appadurai, who described the introduction of new media as an extension of the "imagination", today digitally communicated accounts of life and work in other countries become real opportunities for people to shape their own life. The recipients are given new ideas about themselves as a person.[36] Young people hear about trends and activities via social-media channels and blogs – without having to leave their country. This can have a motivating effect for young people. Additionally, people can communicate virtually with other entrepreneurs and exchange experiences. The "Global Entrepreneurship Week" initiative promotes this spirit of global community like almost no other event: each year in November entrepreneurs come together in their city for the period of a week in order to celebrate entrepreneurship and to exchange knowledge. They network with their colleagues around the world via video calls and Twitter chats. Institutions can foster this dialogue between start-ups in various countries, for example by setting up virtual conferences or expert chats.

Places for communicating virtually and in person are particularly relevant in Africa, where there are entry barriers for financial and social reasons.

International exchange and networking by ex-pats and diaspora fuels innovations and transfer of knowledge.

Virtual networking opens up horizons and and the self-conception of belonging to a global community.

A look at the digital future

"Having seen peoples' life change in front of my eyes because they got to access the Internet, I am a big proponent for the Internet. I literally saw how lives changed. I have this evidence so I can't run away from the power of the Internet. And if you give people value or reason enough to access the Internet they will access the Internet."

Shikoh Gitau, Entrepreneur, Founder of Taasisi

The ongoing diffusion of the Internet will change Africa and, as mobile telephony did recently, further drive wealth and growth. Based on Alexander Gerschenkron's theory of the "advantages of backwardness"[37] the African continent could skip the traditional industrialisation phase in favour of the creation of a knowledge economy. This would have an impact beyond the African continent: African countries become global economic actors on an equal footing as knowledge societies.

The transformation has already started. Large corporations who are involved in expanding the Internet in Africa are not doing so for philanthropic reasons only; they know that their economic future lies in Africa.[38] To an extent mobile services companies making more stable profits in the emerging markets than in Europe and North America. At the same time the democratisation of innovations by the Internet is lowering the barriers to operate as entrepreneurs. Social and economic selection mechanisms are rendered irrelevant by the Internet. Products can be sold and knowledge acquired via the net. African developers thereby become potential employees for virtual jobs with western employers as well as drivers of ideas for innovations in their home countries.

Concepts such as *frugal and reverse innovation* raise the issue of the potential that these innovations could also have for the West. There are enormous investment opportunities in particular in the area of mobile enterprise.

To date the African tech scene has been a microcosm. Only 15.6 percent of the African population currently have access to the Internet and smartphone penetration is still 12 percent. It will be all the more important for the recently emerged tech ecosystems to be able to establish themselves permanently and expand. This clearly requires the correct political framework conditions: political reforms and favourable tax and funding packages for entrepreneurs and investors are equally essential in promoting a culture of innovation and entrepreneurship in the long term. Only does a systemic anchoring hold out the prospect that African countries can become independent of what is termed the "resource curse".[39] As current developments in Kenya show, the African tech scene does not passively wait for political signals.

Until political actors get on board, international companies, investors, development organisations and NGOs can play all the more important a role to support the movement "from below". In the scope of the 4Africa programme Microsoft is already supporting the entrepreneur scene in Africa. InfoDev, a spin-off of the world bank, has diverse set up a range of innovation hubs in Africa. The Rockefeller Foundation dedicates itself to the link between ICT and job creation. SIDA, the Swedish organisation for development cooperation, is supporting the establishment of mobile entrepreneurship with a range of programmes. These are important initial signals. Subsequent actors should push for the establishment of long-term funding structures. This comprises mentoring programmes, adequate funding models, the communication of management and hardware competences, exchange programmes and the funding of co-working spaces, incubators and accelerators.

The original goals of development policy – reduction of poverty and economic empowerment – are closer than ever.
The agenda for development policy must also reflect the transformation of Africa. Of course many countries still need mechanisms to fight poverty and for political stabilisation. At the same time, however, instruments need to be introduced that support the current trend. In the consolidation of technology-driven innovations there is a huge potential for self-determined development of African countries. Actors in development partnerships should see themselves as intermediaries, enablers and investors in this context who are smoothing the way for young entrepreneurs into the community of global entrepreneurs.

Supporting this shift is not a one-way street. An exchange on equal terms also means involving African tech entrepreneurs in the development of future strategies, showing willingness to learn from one another and taking the expertise of the young tech entrepreneurs seriously – after all, digital technologies provide the necessary instruments for this exchange.

DIVING DEEPER INTO AFRICA'S TECH SCENE

Selection of platforms:

- LIONS@Africa
- http://www.siliconafrica.com
- https://vc4africa.biz
- http://www.howwemadeitinafrica.com

Selection of tech blogs:

- http://timbuktuchronicles.blogspot.de
- www.afrigadget.com
- http://whiteafrican.com
- http://timbuktuchronicles.blogspot.de
- http://matthewbuckland.com

Endnotes

1 Dubbed the "Hopeless Continent" by The Economist ten years ago, the magazine has over recent years dedicated itself to the new Africa: "Africa rising. A hopeful continent." http://www.economist.com/news/special-report/21572377-african-lives-have-already-greatly-improved-over-past-decade-says-oliver-august

2 The World Bank (2013): Annual Report https://openknowledge.worldbank.org/bitstream/handle/10986/16091/9780821399378.pdf?sequence=1

3 http://www.washingtonpost.com/blogs/worldviews/wp/2013/07/16/the-amazing-surprising-africa-driven-demographic-future-of-the-earth-in-9-charts/

4 Mahajan, Vijah (2009): Africa rising. How 900 Million African Consumers offer more than you think. New Jersey.

5 The term "bottom of the pyramid" (or also base of the pyramid) coined by C.K. Prahalad describes the lower tier in the global income pyramid. People in the lowest tier of the income scale live on less than $2.50 a day. There are estimated to be 4 billion such people around the world. Prahalad, C.K.; Hall, S.T. (2002): The Fortune at the Bottom of the Pyramid. http://www.cs.berkeley.edu/~brewer/ict4b/Fortune-BoP.pdf

6 In this calculation the term "middle class" does not refer to the European standard, but instead to an average income of $1,460 to $7,300 per year.

7 http://www.ted.com/talks/charles_robertson_africa_s_next_boom; see also an interview with economist Christopher Barrett http://mediarelations.cornell.edu/2014/01/22/trade-and-investment-is-africa-the-new- asia/ as well as forecasts by the African Development Bank http://www.afdb.org/en/news-and- events/article/afdb-president-commends-au-during-50th-anniversary-celebrations-11823/ and McKinsey http://www.mckinsey.com/insights/africa/lions_on_the_move and Goldman Sachs http://www.securitasglobal.com/2012/06/04/goldman-sachs-equity-research-africas-turn/

8 E.g. Jensen, R., 2007. The Digital Provide, Quarterly Journal of Economics 122, 879- 924.; Aker, J.C.; Mbiti, I. (2010): Mobile Phones and Economic Development in Africa. Journal of Economic Perspectives, 24(3): 207-32.; Vodafone Institute (2013): The Digital Fabric of our lives http://www.vodafone-institut.de/economic-participation/17/study-mobile-technologies-the-digital-fabric-of-our-lives.html

9 GSMA (2013): Sub-Saharan Africa Mobile Economy 2013 http://www.gsmamobileeconomyafrica.com/Sub-Saharan%20Africa_ME_ExecSummary_English_2013.pdf

10 Basic mobile phones are mobile phones of the first generation in the lowest price segment. They have no data connection and often just have basic functions such as telephony and SMS. Feature phones are low-end versions of smartphones. They have a data connection and enhanced functions, but not usually the same computing power. As technological developments advance, the boundaries between smartphones and featurephones become blurred.

11 Vodafone Institute (2013): The Digital Fabrics of our lives: http://www.vodafone-institut.de/economic-participation/17/study-mobile-technologies-the-digital-fabric-of-our-lives.html

12 Adolga, E.C. (2006): Mobile Telecommunications In Africa: Past, Present and Future of A Continent-Wide Technological Phenomenon http://www.kiwanja.net/database/document/document_mobile_comms_africa.pdf

13 http://www.safaricom.co.ke/mpesa_timeline/timeline.html

14 Safricom (2013) Annual Report: http://www.safaricom.co.ke/images/Downloads/Resources_Downloads/Annual_Report.pdf

15 e.g. Jack, William and Tavneet Suri (2011) "Mobile Money: The Economics of M-Pesa" NBER Working Paper 16721; Morawczynski, Olga and Mark Pickens. 2009." "Poor People Using Mobile Financial Services: Observations on Customer Usage and Impact from M-PESA" CGAP Brief Online

http://www.cgap.org/publications/poor-people-using-mobile-financial-services, Isaac Mbiti & David N. Weil, 2011. "Mobile Banking: The Impact of M-Pesa in Kenya," NBER Working Papers 17129, National Bureau of Economic Research, Inc.

16 The butterfly effect describes the sensitivity that complex, non-linear, dynamic systems can have to small changes in the starting conditions. Small deviations can therefore change an entire system in the long term.

17 Mutua, Will; Alliy, Mbwana (2012): Innovation Africa. The New Face of Africa. Essays on the rise of Africa's innovation Age. Edited by Nanjira Sambuli.

18 ITU (2013): Measuring the Information Society https://www.itu.int/en/ITU- D/Statistics/Pages/publications/mis2013.aspx

19 The World Bank (2012): Mobile Usage at the Base of the Pyramid in Kenya. http://www.infodev.org/articles/mobile-usage-base-pyramid-kenya.

20 GSMA (2014): Digital Entrepreneurship in Kenya http://www.gsmaentrepreneurshipkenya.com/GSMA_KENYA-AR2014-060214-WEB-SINGLE-PGS.pdf

21 http://weve.com/mobile-eclipsing-tv-as-the-first-screen-for-consumers

22 Andjelkovic, M.; Imaizumi, S. (2012): Mobile Entrepreneurship and Employment. http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/IC4D-2012-Report.pdf

23 GSMA (2014): Digital Entrepreneurship in Kenya, ibd.

24 Schumpeter, J.A. (1934), The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle.

25 GSMA (2014): Digital Entrepreneurship in Kenya, ibd.

26 International corporations such as IBM, Google, Microsoft and Nokia are setting important signals with their Africa-wide funding activities. As pan-African networks the Angel-Investment network "Angel Africa List" and the Silicon Savannah Fund should be positively highlighted.

27 GSMA (2014): Digital Entrepreneurship in Kenya, ibd.

28 Youth Business International and Global Entrepreneurship Monitor (2013): Generation Entrepreneurship? The state of Global Youth Entrepreneurship. http://www.youthbusiness.org/wp-content/uploads/2013/09/GenerationEntrepreneur.pdf

29 http://cdn2.blog.digital.telephoneica.com.s3.amazonaws.com/wp-content/uploads/2012/11/Startup-Ecosystem-Report-2012.pdf

30 Youth Business International and Global Entrepreneurship Monitor (2013): Generation Entrepreneurship? The state of Global Youth Entrepreneurship. ibd.

31 Juma, C. (2011): Africa's New Engine. Africa looks to its middle-class consumers to drive prosperity. https://www.imf.org/external/pubs/ft/fandd/2011/12/juma.htm

32 Ka-yee Leung, A.; Maddux, W.W.; Galinsky, A.D.; Chiu, C. (2008): Multicultural Experience Enhances Creativity http://people.ucsc.edu/~cnreyes/teaching/multicultural-Creative.pdf

33 As an example: The Italian entrepreneur Ugo Vallauri lived in Kenya for five years and researched mobile technology in agriculture. Back in Europe he set up the "Restart" project. A repair workshop for technology, as done previously by Jua Kali in Nairobi.

34 Examples worthy of mention are the tempus programme by the EU and the Erasmus Mundus programme (now Erasmus+).

35 Loose definition: "Foreign-born population" in World Bank (2011): Migration and Remittances Factbook 2011 (Washington, 2nd ed.) http://siteresources.worldbank.org/INTLAC/Resources/Factbook2011-Ebook.pdf

36 Appadurai, Arjun. 2002. TransUrbanism. The Right to Participate in the Work of Imagination. http://www.appadurai.com/pdf/transurbanism.pdf

37 Gerschenkron, A. (1962): Economic Backwardness in Historical Perspective, Cambridge: Belknap Press.

38 See e.g. McKinsey http://www.mckinsey.com/insights/africa/lions_on_the_move and Goldman Sachs http://www.securitasglobal.com/2012/06/04/goldman-sachs-equity-research-africas-turn/

39 The "resource curse" describes the dilemma that the potential advantages to a country from a high availability of resources can have long-term negative effects on a country's development. The focus is on the export of raw materials and little attention is paid to establishing other economic structures. This one-dimensional dependence one one economic sector is fatal as raw material prices are subject to fluctuations on the world market. In fact, experts fear that this phenomenon could become a problem for Kenya. The recent discovery of oil reserves in the north west of the country could create a situation in which the government concentrates on funding that and not expanding ICT structures.

Published by
Vodafone Institute for Society and Communications GmbH
Ferdinand-Braun-Platz 1
40549 Düsseldorf
Germany
www.vodafone-institut.de

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Georg Milz, Interview support

Layout/Design
Andreas Mayer, Stuttgart

Special Thanks to Brian Omwenga

Photos
Cover: Flickr/iHubNairobi; p. 6: Flickr/Ushahidi; p. 9: Flickr/Andrew Currie
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