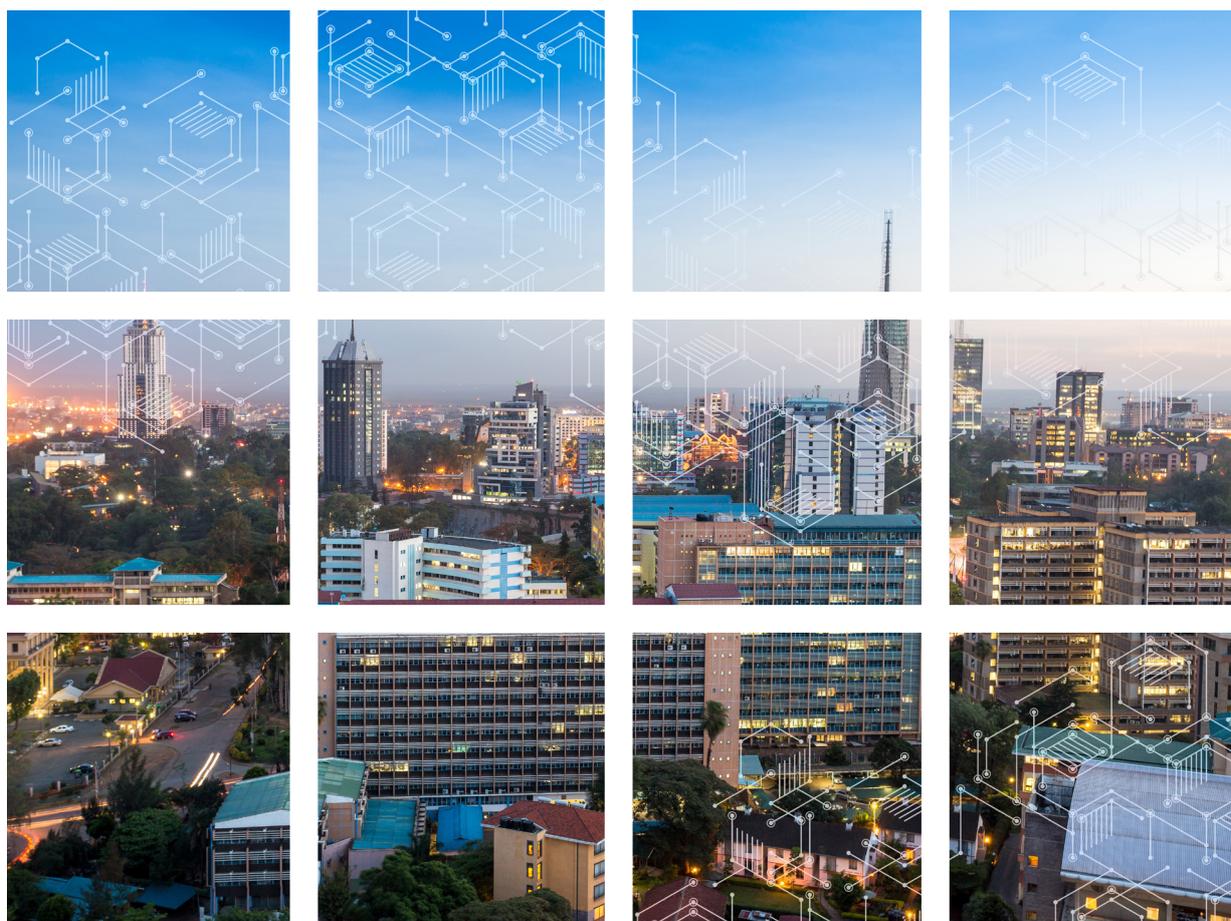


ICT centric Innovation Ecosystem

Kenya: Country Review



ICT centric Innovation Ecosystem: Kenya

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In developing the ICT-centric innovation country review series, ITU engages key stakeholders from government, the corporate sector, the financial community, academia, entrepreneurs, and innovation support networks. Their invaluable contribution ensures that the analysis in these reports always accurately reflects the conditions and needs of each country. Each report offers an in-depth overview of a country's digital transformation strategies and innovation policies aimed at fostering ICT-centric innovation. This series seeks to provide constructive guidance to ITU membership in developing comprehensive recommendations, roadmaps, and initiatives designed to strengthen digital transformation capacity.



Doreen Bogdan-Martin
Director, Telecommunication Development Bureau, ITU

Foreword from the Cabinet Secretary

Kenya's Government economic development blueprint, *Vision 2030*, recognizes the role of science, technology (including ICTs), and innovation (STI) in a modern economy. Knowledge is positioned to a central role in wealth creation, social welfare and international competitiveness through effective exploitation of knowledge, an effective innovation system and flourishing entrepreneurship, among others. Furthermore, Innovation in ICTs is key in the achievement of the Sustainable Development Goals (SDGs) and the Government priorities in the next five years, '*Big 4 Agenda*' which encompasses food security, universal health, affordable housing and manufacturing.



This report analyses the dynamics of the ICT centric innovation ecosystem in Kenya with a view to strengthening Kenya's ability to integrate ICT innovation in its national development agenda and leveraging on opportunities provided by innovative technologies. Through this report, we aim to help stakeholders in the innovation eco-system understand and identify the challenges within the ecosystem, needs and arising opportunities in order to develop coherent approaches to transition Kenya to an innovation-driven economy.

The model used to describe the ICT centric ecosystem in the report encompasses the following pillars: Vision and Strategy; Infrastructure and Programmes; Talent and Champions; Capital and Resources; Market and Networks; Culture and Communities; Policy and Regulation; and Central Pillar. Through this report, we draw from past successes and failures in order to improve Kenya's ICT centric innovation system, support the digital entrepreneurship, nurture talent, strengthen engagement platforms, reinforce Intellectual Property (IP) frameworks, and institutional frameworks that can make the ICT ecosystem thrive among others.

I am optimistic that with the renewed vigour and the infusion of new thinking in the eco-system, ICT innovations will play a more significant role in transforming Kenya into a knowledge-based economy.

Hon. Joe Mucheru, EGH
Cabinet Secretary, Ministry of Information, Communications and Technology

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Who is targeted

This report examines the dynamics of the ICT centric innovation ecosystem in Kenya, and makes recommendations to strengthen Kenya's ability to integrate ICT innovation in its national development agenda, and how to leverage economic and social opportunities provided by innovative technologies. The primary objective of this report is to work cooperatively with ecosystem stakeholders, policy leaders and experts to identify opportunities and challenges the ecosystem is faced with, in order to develop strategic approaches specifically designed to transition Kenya towards an innovation driven economy.

Kenya has been making considerable strides towards establishing a more innovation driven economy, particular since 2008. In the realm of the Kenya Vision 2030 strategic plan, investments made in infrastructure, as well as private sector initiatives have been able to steer the country in the right direction. This course is now reinforced through the Big Four agenda¹, a five year action plan that puts strategic importance on ICT as key enabler to realize immediate priorities (food security, universal healthcare, housing, enhancing manufacturing) and aims to utilize and reap benefits of the digital revolution to achieve socio-economic development and long-term goals of Kenya Vision 2030. In regard to the adoption of mobile technology and mobile money in particular, Kenya's efforts have made the country a global success story. As a result, the ecosystem in Kenya has grown over the past few years, however gaps remain. Despite these successes there are still a variety of issues that need to be addressed. The ICT centric innovation ecosystem is currently in a stagnating phase, with missing linkages and not adequately guided innovation dynamics to enable enough entrepreneurs to create high growth innovative businesses. This indicates a need for further action to build up factors like private investment, last mile connectivity, ICT skills, and entrepreneurial support networks in particular. If these issues can be addressed, the country is well positioned to become a regional and global leader in several key areas within the ICT sector.

This report will provide an analysis of the current situation, make recommendations for programmes and policies supporting digital entrepreneurship and innovation, and present flagship projects to help unleash the potential of Kenya's ICT centric innovation ecosystem. This report is intended for policy makers, ICT entrepreneurs, academia, research institutions, financial stakeholders, private sector firms, and entrepreneurial support organizations.

The mandate

The International Telecommunication Union (ITU), especially the Telecommunication Development Bureau (BDT), has been actively fostering ICT led development for numerous years. In 2014, at the ITU World Telecommunication Development Conference in Dubai (United Arab Emirates), its membership approved a strategic and operational plan for the BDT that includes output 2.3 calling for the strengthening of ITU Member State capacity to integrate ICT innovation in national development agenda. This priority can also be found in the new Sustainable Development Goals, namely Goal 9: *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*.

In this context, ITU has worked together with other international organizations, global experts, and key national stakeholders to elaborate this report on ICT centric innovation ecosystem for sustainable development. This report is furthermore part of a series of reports, defining and shaping an international

¹ The Big Four agenda was initiated in December 2017, and presents a five year plan for national development goals (2018-2022) with immediate priorities being: food security, universal healthcare, housing, enhancing manufacturing). The terms *Big Four agenda* and the *Big Four* will be used in reference to this action plan and related key sectors throughout the report.

knowledge base and series good practices intended to strengthen the innovation capacity not just of Kenya, but of all ITU Member States.

Addressing challenges in Kenya

In recent years, Kenya has made significant progress in fostering socio-economic development. Strong programmes and international investment has led to improvements in regard to many of the Millennium Development Goals (MDGs), such as education and health, gender equality, and leveraging information and communication technologies. But socio-economic inclusion and poverty eradication remain challenges. Overall, the country has seen a stable but stagnant economic growth rate of about 5.8 per cent² over the past six years, yet economic forecasts issued by the World Bank, predict a drop of economic growth to 4.876 per cent in 2017, yet a gradual recovery to around 5.86 per cent in 2019.

Kenya GDP growth rate (2005 to 2016)



Source: World Bank Data (current, 2017).

Despite this socio-economic progress, significant issues still remain to be addressed. The GNI per capita is USD 3 130 as of 2016³, with agriculture, forestry, tourism and manufacturing being key sectors. Kenya has the biggest economy in central and east Africa, and is part of the lower-middle income group of countries. Kenya is regarded as a moderate country for the World Bank ease of doing business report, consistently rising in the ranks over the past few years.

Under the Kenya Vision 2030⁴, Kenya has undertaken many reforms which have seeded an opportunity for economic transformation. However, Kenya economy is at a cross road, and it is facing several barriers that significantly affect its medium and long-term competitiveness. According to the 2016 World Bank economic memorandum,⁵ the unemployment rate among Kenya's youth is 17.3 per cent – nearly one in five young people of working age. There is a growing challenge for Kenya to create jobs and

² <http://data.worldbank.org>

³ GNI per capita, see <http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD?locations=KE>

⁴ www.vision2030.go.ke/

⁵ www.businessdailyafrica.com/news/Kenya-tops-East-Africa-s-list-of-youth-joblessness/539546-3108514-13vpaib/index.html – World Bank Kenya Country Economic Memorandum (2016). See: <http://documents.worldbank.org/curated/en/763771468197384854/pdf/103822-WP-Kenya-Country-Economic-Memorandum-PUBLIC.pdf>

provide new economic opportunities. Accelerating digital transformation presents an opportunity for Kenya to meet its ambitious goal under Kenya Vision 2030, but Kenya needs to strengthen its digital innovation ecosystem, which is facing several issues.

Current state

This section provides a summarized view on the current positions of the key stakeholders vis-à-vis their interaction with the essential pillars of an ICT centric innovation ecosystem.

The ICT centric ecosystem covers seven pillars: Vision and Strategy, Infrastructure and Programmes, Talent and Champions, Capital and Resources, Market and Networks, Culture and Communities, and Policy and Regulation. Policy, is a pillar with particularly important connections to all others and vision sets the direction the ecosystem is moving. Definitions of the pillars that support the ICT-centric innovation ecosystem canvas are outlined in the table below.

Definition of ecosystem canvas pillars

1. Vision and Strategy	Awareness of, support of, and adherence to a clear national strategy; sense of the situation and direction of the ecosystem and perceived consensus around major issues.
2. Infrastructure and Programmes	State of "hard" infrastructure (ICT connectivity, electricity, transportation); "soft" infrastructure (skills training, knowledge sharing and support platforms) and clusters to share resources.
3. Talent and Champions	Skills readiness, human capacity development, and champions taking on leadership roles in the ecosystem.
4. Capital and Resources	Investment available for start-ups and R&D; presence of foreign direct investment (FDI), technology transfer and licensed production, and funding available for projects to support innovation.
5. Networks and Markets	Business associations or formal networks in the ecosystem, access to domestic and international markets, and public procurement.
6. Culture and Communities	Activities to gather and support the innovation ecosystem, the presence of entrepreneurial culture in society, event and opportunity to participate in innovation activities.
7. Policy and Regulation	Public sector awareness of their role and connection to other stakeholders, views on specific policies regarding research and development (R&D), Intellectual Property (IP), trade, finance and other areas.
Central Space	The "central space" of the ICT-centric innovation ecosystem canvas includes the components of each other pillar which are densely interlinked to support innovation as opposed to supporting the overall economy.

Source: ITU

Vision and strategy

Kenya has strong vision, and most stakeholders are working towards improving the state of the economy towards the overarching goals of Kenya Vision 2030 and the priorities identified for the period of 2018-2022 under the government Big Four agenda. While there is a common vision, the roadmap to achieve these ambitious goals seems to be disconnected. Many strategies and policies specific to engaging the ICT innovation ecosystem are not yet in place. Stakeholders in the digital innovation ecosystem are working in silos, and are not adequately engaged with each other in either communication or implementation. This is fuelled by the lack of common agenda, robust implementation process, and coordinating anchors for activities within the ICT innovation ecosystem. Many efforts

are underway, but they can be more effective with a comprehensive framework addressing all the needs of the ecosystem.

Ecosystem stakeholder: "Digital innovation has no defined steps. So everyone is trying to do their own thing."

Infrastructure and programmes

Hard infrastructure has seen tremendous growth in Kenya, particularly with respect to mobile phone penetration and broadband. Coverage and availability of broadband have been improving due to public and private investments. However, quality hard infrastructure is concentrated within urban areas, and last-mile remains an issue. The development of soft infrastructure and related programmes is perceived to have been slower in comparison, and again, limited primarily to urban centres. Several known digital clusters are loosely forming, but they lack guidance and support to grow. Thus, innovators in these nascent clusters are struggling to develop appropriate solutions. Additionally, significant improvements will be necessary in regard to soft infrastructure in order to foster inclusive innovation capacity throughout the country.

Ecosystem stakeholder: "There has been quite a bit of improvement in the quality of hard infrastructure lately. But what's the point of having an infrastructure that you are not leveraging well? Soft infrastructure has just begun to be available but there's a long way to go. There is no unified vision actually. We're only at a 10 per cent capacity at the moment."

Talent and champions

At this point, the talent in Kenya does not meet the demand of the ecosystem; improvement in terms of skill level and availability is necessary to develop a suitable skilled workforce to address current and future needs of industry and the ecosystem. There are some gaps in technical skills especially advanced skills, and there is a need for broader soft skills development. The primary focus of government efforts to upgrade skills is targeted towards digital literacy in primary schools, retooling curriculums, the expansion of broadband access in secondary schools through the Education Broadband Connectivity Project and creating centres of excellences in the higher education system. Among notable initiatives of the government to develop the talent pool is also the presidential digital talent programme which aims to build ICT capacity and leadership skills through internship programs in collaboration between the public and private sectors. However, the persisting skills gap is preventing talent from moving to research, entrepreneurship and innovation. Graduates predominantly prefer safer corporate jobs. To fill the short fall, many barriers exist for attracting and retaining much needed foreign talent in the ecosystem. There are many champions with programmes addressing both soft skills and technical skills; but, they operate in silos and do not have adequate support. Without guidance and renewed efforts to upgrade the skills of talent, the innovation ecosystem will continue to struggle in creating success stories.

Ecosystem stakeholder: "They are expertise needed for product design, market research, and governance. Those things need to be guided. Who should guide that?"

Capital and resources

Access to capital is very limited in Kenya, and more notably in the digital innovation ecosystem. The few existing public sector funds are perceived as insufficient, ineffective and non-transparent for access. There are many efforts to encourage foreign direct investment (FDI), including various new instruments such as the special economic zones. However, these instruments are at an early phase of development and are not adequate to attract resources, especially in ICT ecosystem. Research funding is still insufficient and directed at technical knowledge generation rather than commercialization of research. A sizeable amount of funding for development of innovations and capacity building is sourced from development partners, however this does not qualify as a sustainable resource, and does not contribute to the development of a viable, self-sufficient ecosystem. At the moment, attracting risk capital in Kenya is difficult due to the perceived market and investor risks. A few venture capital firms are present, but their efforts appear to focus regionally rather than domestically. Without appropriate risk capital, funding entrepreneurs and their ideas is limiting opportunities in the Kenya digital ecosystem. Some entrepreneurs are trying to create innovative solutions solving financing gaps, but they need support to make an impact. Without funding, start-up formation and SME growth is stalled, consequently, the ecosystem is stagnating.

Ecosystem stakeholder: "There is lack of bootstrapping opportunities for entrepreneurs. This prevents small companies from surviving for long, or from failing, learning and improving their skills."¹

¹ *Bootstrapping* refers to how an entrepreneur starts a company with little capital, for example from their own money.

Market and networks

Though there is sufficient domestic market size to get started, access for innovators was seen as limited due to challenges around transparency, fairness in procurement, and bias against local, or Kenya-made innovations. Additionally, regional and international markets offer increased opportunities, but their access remain limited due to inefficient networks and linkages in the ecosystem. Both formal and informal networks that foster markets access exist in the ecosystem, but they are not tailored to fully support the dynamic needs of the ICT centric ecosystem. Without direct access to demand, entrepreneurs and start-ups cannot transform their ideas into opportunities. They may be able to access their first customers to prove their ideas, but the market demand remains the barrier to make their business sustainable. There is need to foster and nurture innovation, to develop networks, and to facilitate global export.

Ecosystem stakeholder: "When government doesn't buy, innovators don't get references, don't get to make mistakes, and don't get access to the export market. ... Key networks and associations are not structures for start-ups. In the innovation world, we are more social."

Culture and communities

Entrepreneurial business culture in Kenya is seen as developing, but at an early stage. This is partly due to the lack of jobs in the economy, leading many young people towards entrepreneurship. Many operate in the informal sector, and business ecosystems (such business-to-business (B2B), business-to-government (B2G), and business-to-consumer (B2C) are needed to help migrate them to the formal economy. This is an opportunity for digital entrepreneurs and should be nurtured vigorously by all stakeholders, especially the private sector. Failure is not perceived well, though support

networks and academia have been playing key roles in changing mind-sets. Support networks are active in fostering appropriate business culture through events and projects in the ecosystem, but their efforts are limited and not inclusive. Many counties and rural communities lack representation. There is also a need for strengthening community building with aim to increase trust, networking and engagement in the ecosystem.

Ecosystem stakeholder: "Society: If you fail once, you are a failure. A good number of entrepreneurs get up and move on. But a good number of them wallow in pity. ... Though events are creating awareness but only around Nairobi and Mombasa. Many of the events are just social events and marketing gimmicks."

Policy and regulation

Many regulatory and policy changes under the Kenya Vision 2030 led to the growth of the economy and the development of the ICT ecosystem. However, many policies are not seen as comprehensive, nor engaging the digital innovation ecosystem. Some policies are outdated or pending legislative or cabinet approvals, and this process should be accelerated. Though the public sector is aware of its role on innovation, it is clear from the scope of the existing policies and programmes that more is needed to stimulate funding, incentivise investment, nurture entrepreneurship and innovation, as well as strengthen the Intellectual Property (IP) framework. Due to the lack of comprehensive mechanisms for engagement of innovators, public sector is unable to nurture an enabling environment that will lead to private sector leadership in the ecosystem. This is fuelled by the low level of trust between stakeholders and limited common understanding of the major issues and opportunities. Stakeholders also noted specific programmes, funds or flagship projects as uncoordinated, non-transparent and ineffective.

Ecosystem stakeholder: "I know lots of research funded by us but they get IP somewhere else. Somebody is happy to get some fees for research, while someone else get the big picture."

Central space

Some programmes are creating bridges and enabling digital innovators to address opportunities in Kenya, but they are limited and seen as fragmented. They are often not well capitalized as they lack resources and operate in silos. Many communities are built around their champions' interest, but there is a need to bring them together more often to create trust and solidify the ecosystem. Resources are also needed for community mapping, events, and to help entrepreneur bootstrap and access markets. Champions with good practices do not receive adequate support from the public sector. This may be related to a misalignment with national priorities. There is a lack of leadership by both public and private sectors in supporting the ecosystem. Overall, the central space is lacking dialogue and collaborative initiatives among the various stakeholder groups.

Overarching themes

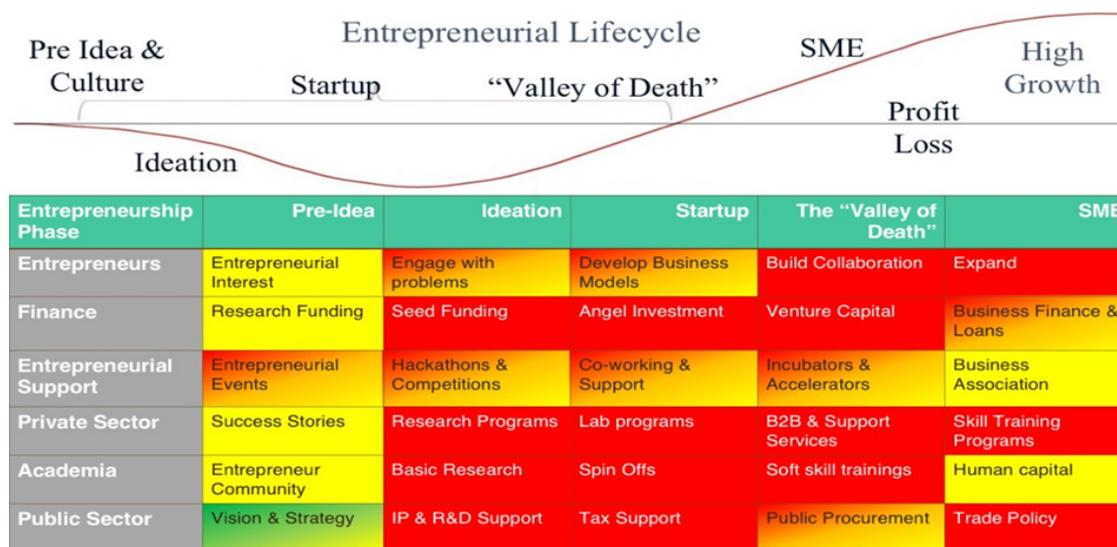
Government ambitions for a digital economy and the Kenya Vision 2030 strategic plan are not yet anchored by its potential. However the public sector is aware of its role, and taking significant steps in the right direction. These steps require better guidance, access to a continuum of resources, new enabling policies, and a clear roadmap of initiatives and programmes. Furthermore, a change of mind-set and focus on strategic sectors is necessary. The overall impression is that ICT is regarded as a mere tool, and not seen as a strategic enabler as called for by Kenya Vision 2030. Therefore the ICT sector, as a key strategic sector, should have its policy adjusted accordingly. There is a strong passion

for entrepreneurship in Kenya. However, a lot of this excitement is short lived due a lack of guidance, mentorship and support structures for entrepreneurs. The Kenya digital innovation ecosystem has grown in the last few years, but factors noted in this report are impacting the early-stage innovation and growth. This has resulted in a phase of stagnation that leaves the ecosystem in a vulnerable state.

Holistic overview

This section discusses the "job to be done"⁶ to strengthen the digital innovation framework of Kenya. The ITU stakeholder interface canvas tool is used to analyse the job and provide an overview of the key activities necessary to take innovations from pre-ideation to high growth firms. The figure below (Completed stakeholder interface canvas for Kenya) describes the different roles each stakeholder group can take up to support entrepreneurs and innovators at each stage of the entrepreneurial lifecycle. It is colour coded to show areas that are well supported (*green*), insufficient (*yellow*), and missing (*red*).

Completed stakeholder interface canvas for Kenya



Source: ITU

The following is a summary of the stakeholder interface canvass for Kenya:

- In Kenya, there is a strong entrepreneurial interest, but risk aversion, lack of needed skills, and limited resources in the ecosystem are preventing entrepreneurs from engaging with problems and developing appropriate business models.
- Research funding is limited and not focused on commercialization, which leads to research and knowledge leaking to more competitive ecosystems. There are limited opportunities for entrepreneurs to bootstrap and risk capital is hard to come by.
- Private sector is not doing enough to assume innovation leadership through specific initiatives including building laboratory programmes, research programmes, skills training and business ecosystems.
- Talent is not moving to research and innovation, and much work is needed to foster a broad set of technical and soft skills.
- The entrepreneurial support networks are leading the ecosystem, but they do not have adequate support to create critical mass. As a result, an entrepreneurial community is slowly developing with very few success stories.

⁶ <https://www.christenseninstitute.org/key-concepts/jobs-to-be-done/>

- Public sector has a strong vision with ambitious targets, but many policies and programmes are missing including adequate procurement support, incentives and trade facilitation. Additionally, the work of the ecosystem is fragmented and lacking guidance.
- Taken together with the other elements of the analysis, the stakeholder interface canvas reflects Kenya as an early stage ecosystem. There are many activities, which are underdeveloped or not present yet at this point in time.

Major implications

For innovation policies to work better for Kenya, a new implementation framework is needed to guide activities in the innovation ecosystem. Previous policies have helped the ICT sector, predominantly through government efforts in developing infrastructure and public service. The start-up community has benefited from various public and private sector initiatives. Good infrastructure, together with the establishment of the first hubs fuelled initial growth of the ICT centric innovation ecosystem. However, there are still considerable steps that need to be taken in order to create critical mass in the ecosystem.

One considerable challenge concerns the lack of dialogue and common agenda between stakeholders. A higher degree of guidance and structured collaboration between the public sector and other stakeholders within the ecosystem is needed. The public sector should take an active role in continuously assessing needs within the ecosystem and should develop policies to nurture innovation. The private sector should adopt an ecosystem leadership role to ensure long term sustainability. This can be accelerated if entrepreneurs can engage with problems and create high growth business models to solve real needs.

For many of the key gaps in the ecosystem, good practice and success stories are available both within Kenya and internationally, and a central component of any effort to improve policy will be to amplify, duplicate, and learn from such practice and success stories.

Priority objectives

With the goal to gather support for more comprehensive policy actions – outlined in the recommendations below – and to ensure the programme overall has a high-profile impact, the following priority objectives have been identified to support the Kenya Vision 2030 long-term national planning strategy:

- To position Kenya as a regional ICT hub and a globally competitive digital economy.
- To accelerate public sector transformation.
- To promote inclusion and socio-economic development throughout Kenya.
- To accelerate digital transformation for the Big Four.

To position Kenya as a regional ICT hub and globally competitive digital economy

Kenya is a regional market leader and benefits from a number of advantages in talent, labour efficiency, geographical endowment, and policies. It has developed hard infrastructure, facilitated business, and developed a number of sectors including agriculture, tourism, forestry, and manufacturing. Kenya is already considered an entry point to the regional market for many international companies. Kenya has an opportunity to develop ICT as a strong enabler and a key strategic sector that will make the use of ICTs ubiquitous in all other sectors boosting its regional and global competitiveness.

Leveraging these factors to build up the country reputation as a regional competitive ICT hub will require a number of actions, starting from reviewing and revising the policy framework for IP, start-ups, and SMEs. In addition, resources for entrepreneurial support must be amplified to improve distribution of- and access to- appropriate talents and soft infrastructure. This will require the creation of a dedicated digital innovation institution and development of a continuum of resources for equitable access and support of the ecosystem.

This priority objective supports the Kenya Vision 2030 economic goals in particular, but it is also a cross-cutting enabler for the political and the social goals.

To accelerate public sector transformation

A major barrier to developing a strong ICT centric innovation ecosystem concerns the public sector vision of a digitally enabled future without fully committing to systemic transformations. While the public sector is engaged in multiple initiatives to foster citizen services on digital platforms, these efforts are not enough to create a comprehensive system of e-governance.

The efforts launched in Kenya to digitalize government services have generated some momentum; though the process can be accelerated through stronger support, projects and collaboration between the ecosystem and public sector. Kenya needs to actively engage the ecosystem in developing business-to-government (B2G) and government-to-citizen (G2C) services. Building open data sandboxes⁷ with support, developing ecosystem engagement frameworks, and strengthening infrastructure and access to appropriate technology throughout Kenya will significantly contribute to achieve the desired outcome.

This priority objective supports the Kenya Vision 2030 political goals in particular, but it is also a cross-cutting enabler for the economic and the social goals.

To promote inclusion and socio-economic development throughout Kenya

There has been a significant improvement in ICT infrastructure over the past two decades. While mobile penetration has been largely even and consistent across the country, Internet penetration is still limited, available to less than half of the Kenya population. A large portion of resources – targeting education, mentorship, funding, infrastructure, and other – is reaching predominantly urban populations. Thus, there is a considerable need for inclusion of all stakeholders throughout Kenya, in order to achieve socio-economic development and ICT-driven inclusion.

Kenya can achieve inclusion by developing innovation leadership in the private sector through greater collaboration, incentives and programmes to build up specific clusters. It will also require new incentives to foster a business ecosystem offering B2B services to the ecosystem. Together, these can have the transformational impact of creating sustainable business models, and bringing informal sectors into the regular economy. Guiding digital cluster formation, fostering FDI and B2B ecosystem with private sector leadership, enhancing platforms for collaboration between academia and private sector, together with the availability of a continuum of resources to the ecosystem, will provide the critical mass needed to create economic inclusion.

This priority objective supports the Kenya Vision 2030 social goals in particular, but it is also a cross-cutting enabler for the economic and the political goals.

To accelerate digital transformation for the Big Four

While the country has implemented significant efforts to build foundations for achieving Kenya Vision 2030 – a large amount of people in Kenya find themselves in vulnerable position in respect to housing, health care, food and job security. The Big Four agenda lays out specific targets to be reached by 2022, to ensure food security, affordable housing, enhancement of manufacturing, and access to healthcare for all. While ICT centric innovation, and the adoption of new technological trends have been identified as strategic enablers for the agenda, projects and frameworks to realize these goals have yet to be developed, and require a strategic approach and the creation of new mechanisms and enablers.

Kenya can achieve and accelerate the delivery of the Big Four agenda priority items, by overcoming existing crosscutting barriers – such as strengthening missing linkages, collaboration, building innovation capacity and leadership in guiding innovation dynamics – and by creating specific projects and

⁷ Open data sandbox: A collection of tools and resources, combined with a collection of open datasets intended to allow experimentation in finding uses for those datasets.

programs that actively facilitate digital transformation in key sectors and cluster formation around priority issues of the Big Four agenda, as well as facilitating ecosystem and private sector engagement to develop technology-enabled, sustainable solutions for smart agriculture, smart housing, smart manufacturing, and smart healthcare.

This priority objective supports the Kenya Vision 2030 cross-cutting enabler for the economic and the social goals, as well as the immediate priorities for national development of the Big Four agenda.

Recommendations

The key recommendations developed in this report concern:

- policy framework revision;
- talent nurturing;
- support for ecosystem development;
- transparency and effectiveness of government;
- B2B engagement platforms;
- IP framework;
- integrating digital innovation in key sectors.

In order to **revise the policy framework** to support digital entrepreneurship, a strong dedicated institution for digital innovation, charged with guiding all innovation activities in the ecosystem, should be established by the government. The ecosystem is facing issues in engagement and collaboration between the public sector and other stakeholders; barriers from various laws, policies and incentives; and lack a common agenda. This institution should ensure that a continuum of resources are accessible and distributed equitably to nurture start-ups, SMEs, and clusters. Additionally, a revision of policies to simplify and streamline talent migration laws would be beneficial, as well as policies facilitating sandboxes for entrepreneurs. Furthermore, policies related to incentives should be adjusted to better promote FDI and B2B ecosystems; and measures such as tax holidays for entrepreneurs can go a long way in encouraging and sustaining entrepreneurship. This agency can operate with flexibility through Public Private Partnerships (PPP) models and open innovation networking platforms.

To **nurture talent**, Kenya should strengthen human capital in regard to: access, quality and appropriateness for critical sectors of the economy. For Kenya to develop a more effective human capital and encourage ICT entrepreneurship and careers, a number of opportunities present themselves. Some universities should update curriculums to include more courses in product management, IP management, marketing, entrepreneurship, and creativity among other things. In addition, nurturing talent through professional mentorship programmes at the university level together with champions of the ecosystem and industry experts will also foster innovation and entrepreneurship. Integrating specific programmes leveraging the Kenya diaspora can accelerate this process. Universities, in collaboration with the private sector, should explore the option of provisioning more embedded skills training, internships, and technology labs to students at an early stage. Additionally, improved digital curricula, early career development and use of educational mechanisms, such as new EdTech solutions can be embedded in the education system.

To **develop support for the ecosystem**, there should be a continuum of resources available to improve entrepreneurial distribution and quality. These resources should include labs, accelerators, incubators, and investors at all stages. Closing the gaps in seed funding for early stage start-ups, and fostering the development of a training and mentorship business ecosystem, will catalyse a critical mass of innovators focused on challenges in Kenya. Additionally, Kenya needs an increase in innovation spaces where entrepreneurs can engage in creating services that address local concerns. A good understanding of existing digital innovation capacity through ecosystem mapping is needed. One outcome could be to transform existing infrastructure such as telecentres and pasha centres into innovation spaces.

Additional support and scale-up of local good practice can also improve distribution and accelerate availability of innovation capacity in the ecosystem. Stronger collaboration between the government and the private sector should provide guided support to more mature start-ups and SMEs, and increase their orientation in key sectors. All these actions together will enhance ecosystem competitiveness.

To **improve transparency and effectiveness of government**, the public sector can continue to strengthen infrastructure and access to appropriate technology across Kenya. It should encourage development of networks for engagement between stakeholders, and continuously analyse global good practices to learn and validate in the local context. One mechanism should be to ensure that government institutions have an open innovation framework engaging the ecosystem in solving their sectors issues. Though open data initiatives exist in Kenya, much of these initiatives are uncoordinated and lack specific outcome and process framework to achieve impact. Developing coordinated and strong open data sandbox frameworks, including support services, will help Kenya build competitive industries in key social sectors such as AgriTech, FinTech, HealthTech, and EdTech. Accelerating public service transformation requires focusing and supporting the innovation ecosystem on the problems facing government.

To **strengthen B2B engagement platforms**, the government should engage in fostering FDI and B2B services with private sector leadership. To do so, further incentives are needed through ICT sector specific *activity-based* incentives in addition to *area-based* incentives like the flagship Technology Park Konza Technopolis and the special economic zones. These efforts should be coupled with targeted campaigns promoting the sector and technology innovation in Kenya. Efforts should increase for technology transfer, licensed production, reducing cost of technical resources, promoting SMEs, and increasing attractiveness for foreign talent in Kenya. Leading domestic private sector companies should be encouraged to have critical roles in the development of new digital services fostering development of a B2B service ecosystem especially serving the needs of SMEs. This will encourage collaboration between larger and smaller firms, and bring productivity and efficiency of ICT innovation to non-ICT sectors as well as the informal sectors of the economy.

To **strengthen the IP framework**, existing policies need be revised to remain relevant and navigate the fast pace of development and the changing technology landscape, and enactment of a national IP policy is recommended. Protection of intellectual property should be supported by a strong and agile institutional framework, and include the strengthening of technology transfer offices (TTOs) that have become a requirement in universities, in order to better connect to both entrepreneurs and researchers, which would benefit from increased capacity building. Academia, private sector, and the public sector must work together on the issues facing the ecosystem, and create a cadre of IP experts across the country. Barriers to IP creation should be lowered. This can be achieved by creating an ecosystem of ancillary services that includes IP awareness-raising and training, technological information services, as well as database searches, customized IP management advisory services, and financial assistance.

To **integrate digital innovation in key sectors**, foster cluster formation and their alignment towards developing 'smart' sustainable solutions for Big Four agenda priorities, the government needs to reduce existing barriers through the creation of specific programmes and targeted incentives that will lead to an uptake in adoption of new technology platforms in key sectors, an increased ecosystem engagement with Big Four agenda items, and cluster formation around smart agriculture, smart housing, smart healthcare and smart manufacturing focused solutions. For this, the government needs to create, or adapt existing projects and programmes, and combine them with efforts and new mechanisms in the realm of guiding innovation dynamics and ecosystem activities, as well as building innovation capacity to generate a particular focus on Big Four agenda gaining priority status in terms of ecosystem engagement and key sector development. A quick way to identify suitable projects and achieve this goal, is a detailed key sector mapping to develop digital transformation roadmaps, which include corresponding flagship projects for each key sector, in collaboration with ITU innovation experts.

To implement and develop these recommendations, specific flagship projects worth about USD 50 million over four years have been suggested. This will require investment from the public sector, private sector and international organizations with vested interest in the common regional agenda. Initially,

the public sector will ensure the majority of this investment, but the private sector is expected to take over leadership and sustain the investment over time as the ecosystem matures.

Kenya is in need of catalytic action to reenergize the growth of its *Silicon Savannah*. Without urgent action, the Kenya ecosystem will lose competitiveness and continue to leak its resources and innovation to better performing global ecosystems. These suggestions offer by no means definitive budgets or project plans, but are meant to give a good example of what it will take to start changing the direction of digital innovation in Kenya.

Structure of the report

The introductory and methodology sections discuss the work undertaken, gives an overview of the methodology used, and lays out the basic background information. These sections introduce common language on innovation and ICT. The impact of ICT centric innovation on business models, processes, organizational methods, services, and ultimately jobs and growth are discussed. It also introduces the stakeholder groups concerned and their respective roles. The new framework is introduced as the basis of measuring performance of an ecosystem and its seven pillars serve as a basis for qualitative assessment.

The section on the current situation reviews the findings for Kenya based on the suggested framework. The current situation is primarily derived from inputs gathered during workshops, and one-on-one interviews with stakeholders, supported where possible with desk research and available statistics. A qualitative approach has been favoured over a quantitative one in order to understand scope and innovation dynamics at play. Key findings are reported for each pillar inferring key points about strengths and gaps, as well as giving a review of available analyses and documentation for each pillar.

The holistic review section provides an overall analysis of the ecosystem stakeholder views based on data from interviews. The section introduces a tool, the *Stakeholder Interface Canvas*, that can analyse the activities of stakeholders in an ICT innovation ecosystem. The entrepreneurial lifecycle is the underpinning for this framework, showing some key supports needed from each stakeholder group during each phase of the lifecycle. This new tool will serve as a basis for identifying best practices of an ecosystem as well as showing any gaps.

The priority objectives section provides a set of high profile political goals that will help to promote more specific policy efforts, as well as providing highly visible successes in the context of the ICT centric innovation ecosystem. The background of each is discussed, in terms of how it relates to the various political goals on the ground. Then ties are explicitly made between that goal and a later recommendation. Finally, overall benefits are outlined.

The recommendations section focusses on the building blocks that foster the ecosystem. Each recommendation works on the simple principle of removing barriers where they exist, and amplifying the working best practices in Kenya. Many good practices exists outside Kenya for solutions to gaps found in the ecosystem, these will be explored so that they can leveraged to fill gaps in Kenya. Overall, there is a focus on new thinking on growth and policy experimentation, where all stakeholders can be engaged to foster a vibrant innovation ecosystem.

Conclusion

This report details what needs to be done in order to accelerate digital transformation in Kenya. It offers an overall review of the Kenya ICT innovation ecosystem, through the critical lenses of stakeholders, it captures a snapshot of the challenges and opportunities that stakeholders are facing, and it is intended to serve as a reference tool to help nurture the digital innovation ecosystem in Kenya.

Kenya has been undergoing rapid development, and a number of fundamental shifts have positioned the ecosystem for success in several key ways. Although Kenya's digital innovation ecosystem is experiencing stagnation, flagship projects have been suggested that will help restart growth, increase competitiveness, and foster the creation of new services and new jobs.

Successful policy experimentation will require that stakeholders think critically about their roles, their opportunities, and their commitments. Much work remains to convert this report into tangible programmes and results. The tools, recommendations and frameworks provided in this report will empower stakeholders to accelerate their journey towards transforming Kenya into an innovation-driven economy. The implementation and any final decisions about priorities and which recommendations to consider as important for further engagement remain the right of all stakeholders in Kenya.

1 Introduction

Recognizing the importance of innovation, the International Telecommunication Union membership adopted innovation and partnership as an ITU-wide goal at the Plenipotentiary Conference 2014 in Busan.

ITU strives to enhance telecommunication development by offering, organizing, facilitating and coordinating delivery of technical assistance, as well as the implementation of projects. To that end, and having been given a strengthened mandate for innovation by World Telecommunication Development Conference in 2017 (WTDC-17), BDT has been assisting Member States to develop their ICT-centric innovation ecosystems and foster the uptake of digital entrepreneurship and the development ICT-enabled industries.

WTDC-17 also adopted the Regional Initiative on Building digital economies and fostering innovation in Africa. The objective of this new regional initiative is to assist Member States in the Africa region to reap the full benefits of the digital economy by addressing issues with growing digital economies, ICT-based innovations, and effective innovation policy interventions in all stages of innovation, as well as the growth of an ICT ecosystem inclusive of all.

ITU has been working closely with its partners and members, bringing together technology and innovation to create synergies which will take them further and faster towards achieving the SDGs, especially SDG 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation). The ITU-D innovation mandate aims to strengthen Member States capacity to integrate ICT innovation in national development agenda and to develop strategies that promote ICT innovations.

In this context, ITU joined forces with the United Nations Trade Conference on Trade and Development (UNCTAD), and the United Nations Industrial Development Organization (UNIDO) in order to elaborate ICT centric innovation ecosystems for sustainable development. This report is part of a series of reports ITU is undertaking, and it benefits from the previous multi-stakeholder collaboration of leading United Nations organizations in innovation matters, and lessons learned from other country reviews.

1.1 Purpose

The ICT policies are evolving fast from a focus on infrastructure requirements such as broadband, or spectrum to other enabling conditions based on innovation and entrepreneurship. Traditional innovation policies have not fully transformed or supported the ecosystem and in order to accelerate socio-economic transformation and promote inclusive development, new strategies and tactics are needed to enable ICT policies in-line with the changing telecommunication/ICT environment and the development landscape.

The main objective of this process is to carry out a comprehensive review and strengthen the ICT centric national innovation ecosystem and increase its impact on the broader economy. In addition, it is hoped that this report will support the development and implementation of the Kenya Vision 2030 strategic plan and the delivery of the Big Four plan. Working together with the Ministry of ICT of Kenya, the Communications Authority of Kenya, ITU and its partners have developed this report to provide the results of the review, and deepen the understanding of the dynamics of the ICT ecosystem in Kenya, its role in fostering socio-economic development, and to promote evidence based recommendations to improve the current direction of the ICT ecosystem. It is hoped that this report will bring new insights to policy makers, private sector actors, innovators, development actors, financial actors, entrepreneurs, and other ICT ecosystem stakeholders.

1.2 Current context in Kenya

In recent years, Kenya has made significant progress in fostering socio-economic development. Strong programmes and international investment have led to improvements in many targets of the

Millennium Development Goals (MDGs), such as education and health, gender equality, and leveraging information and communication technologies. However, socio-economic inclusion and poverty eradication remain challenges. Overall, the country has seen a stable with an economic growth rate of about 5.8 per cent¹ over the past six years. The country's GNI per capita is USD 3 130 as of 2016², with agriculture, forestry, tourism and manufacturing being key sectors. The country is the biggest economy in central and east Africa and is part of the lower-middle income group of countries.

The WEF Global Competitiveness Index³ ranked Kenya 99 out of 140 economies in 2016. In particular, it rated Kenya highly in the categories of business sophistication, innovation, financial market development, and labour market efficiency. However, institutions, infrastructure, macro-economic environment, health and primary education did not fare so well. Similarly, the Global Innovation Index⁴ reflected these institutional factors, along with the international investment and national strategy in giving Kenya a high rating in innovation linkages but low rating in human capital and research.

Kenya is regarded as a moderate country for ease of doing business⁵ by the World Bank, consistently rising in the ranks over the past few years. In the report, Kenya is ranked 92 out of 190 economies. From 2016 to 2017, Kenya has improved its rank in categories such as starting a business, getting electricity, protecting minority interest, and registering property. However, all these indexes are ranked worse than its overall ranking. Kenya's place in a number of free trade and other international associations, such as Kenya Trade National Agency, Common Market for Eastern and Southern Africa (COMESA), Smart Africa and the East Africa Trade is relevant to the country's economy. These connections help Kenya to integrate its markets into the regional economy, and align its institutions to international norms and standards. Overall, there are many positive aspects as well as many challenges to the Kenya economy.

Recent economic theory⁶ defines three stages each country can have in its economy: factor driven, efficiency driven, and innovation driven. The Global Competitiveness Index gives us an indication of where Kenya stands with respect to this competitive analysis. Kenya is identified as a factor driven economy, based on the reliance on subsistence farming and extractive industries, though the country has a rising industrial base and very good enablers to become an innovation driven economy.

Broadly, Kenya's economic transformation can be seen as a partially successful effort. The inputs, the institutional factors, the strategies, and the policies are aimed in the right direction and have been able to move Kenya from a lower income country to a lower-middle income country. However, the Kenya economy is still heavily factor driven, poverty remains high, and ICT usage is persistently low; but, these issues may be resolved by continued efforts to remove barriers and the ongoing development of positive factors in the economy.

1.3 Role of technology and innovation

The Organization for Economic Cooperation and Development (OECD), in the 'Oslo Manual' defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations". Innovation in this context can also be new to the world, new to the market, or new to a company.

Kenya Vision 2030 outlines a number of specific objectives regarding ICT centric innovation in Kenya. It focuses on key elements of the economy: economic, social, political, and enablers and macros. This national long-term development blue-print aims to transform Kenya into a newly industrializing,

¹ <http://data.worldbank.org/country/kenya>

² <http://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=KE>

³ <http://reports.weforum.org/global-competitiveness-report-2015-2016/economies/#economy=KEN>

⁴ GII 2017, WIPO

⁵ www.doingbusiness.org/data/exploreeconomies/Kenya

⁶ See The Competitive Advantage of Nations; Michael Porter, 1990

middle-income country providing a high quality of life to all its citizens by 2030. It aims to develop a knowledge-based and ICT-enabled economy for Kenya. To achieve its ambitious goal, Kenya needs to define what can be done through innovation and ICT to foster new products, new services, and new growth in many sectors of the economy, and a review of Kenya's ICT centric innovation ecosystem will help understand what is needed to reach its objectives.

1.4 Opportunities in the new industrial age

The first and second industrial revolutions, ushered in by new technologies and sources of energy such as mechanized industries, steam engines, coal and electricity, gave dramatic competitive advantage to some countries that set science, technology, and innovation (STI) policies with strategic priorities to leverage these opportunities.

In the past, countries had more policy options to achieve knowledge accumulation with use of multiple policy instruments such as export oriented strategies and R&D investment. The opportunity now is to establish competitive smart industries and markets without all the burden of the past (e.g., heavy R&D), nor its advantages (e.g., trade control). They need to establish vision and strategies aligned to their capabilities and potential, fostering ICT centric innovation as the core enabler for their economies.

Today, with the spread of ICTs, many countries are at the eve of a fourth industrial revolution with the convergence of technological and scientific progress rooted in the use of ICTs. Hierarchies, borders and organizational structures that were once the cornerstone of competitiveness are now hindering markets and opportunities. Thanks to ICTs, a new sharing economy is taking place changing the rules of innovation. Collaboration, co-creation and trust between networks of resources, people, and needs are the critical behaviour for success. New business models are blurring the gap between physical and virtual.

1.5 ICT centric economic development: The elusive scenarios

Vibrant ICT centric innovation ecosystems, responsible for the creation and diffusion of digital technologies transforming the world are the dreams of countries and communities worldwide. Creating the next Google or Airbnb, or becoming the next Steve Jobs is the dream of entrepreneurs everywhere, and Kenya is no different. Policy makers are actively looking for ways to establish the conditions necessary where ideas, entrepreneurs, and resources come together to unlock unique opportunities for their citizens and country.

Yet, creating the next Silicon Valley has been elusive and difficult. Following the traditional STI recommendation of investment in inputs such as R&D, infrastructure, and education does not guarantee the right results. Many cities worldwide with the traditional building blocks comparable to Silicon Valley have failed to become hot beds for ICT centric innovation. Kenya has worked hard to develop the enabling environment, the infrastructure, policies, and programmes that drive innovation. So far, those efforts have had an impact in Kenya, but their full promise remain somewhat elusive. ICT usage remains low, and entrepreneurship remains tenuous. As noted in the Global Innovation Index⁷ the inputs to the innovation ecosystem are strong, but the efficiency of the use of those inputs limits their impact.

1.6 Transforming Kenya through innovation

To understand the scope and the dynamics playing out in Kenya, with the aim to build a vibrant ecosystem that will help Kenya unleash its digital potential, this report takes a grassroots approach to diagnosing the issues that generate its recommendations. The methodology is based on the good

⁷ www.globalinnovationindex.org 2017

practices of fostering working elements, to remove barriers of the innovation ecosystem, and to promote organic systems that can reach critical momentum to unleash innovation.

The methodology offers new approaches to policy making in-line with empowering policy makers to undertake policy experimentation. The ultimate goal of this report is to empower the stakeholders to take advantage of the preparations that have laid the groundwork for success and to drive their own destiny in creating a vibrant ecosystem. By empowering these stakeholders, not only can Kenya become a regional leader in ICTs, with an innovative private sector and all of its associated economic benefits, but it can use innovation to transform the lives of people on the ground, through new technologies and services.

2 Methodology

The ITU-D country review methodology focuses on the interaction of two core components. The first is a process of desk research, data analysis and expert driven policy advisory, resembling processes used by many international organizations and consultancies. The second is a consultative process focused on working with the key stakeholders in the innovation ecosystem to gather information based on the views of grassroots actors.

In the interaction of these components, it is possible to develop a stronger understanding of the ecosystem, holistic and narrowly focused, top-down and bottom up, expert driven and user driven. It also leads to a mixture of outcomes and recommendations, some driven top down by the government, and others bottom up by direct actions of stakeholders, leading to more unified plans of action and grassroots engagement.

This working methodology came about from a series of global consultations with the ICT centric innovation ecosystems experts at various workshops, meetings, interviews, seminars, and through research. It is practical, with solid theoretical grounding in methodologies such as organizational management, lean thinking, human centred design, competitive strategies and STI.

The process is evolving and with every country review, this methodology will improve and enable new thinking on policy experimentation. A full description of the methodology can be found below, and is further detailed in the ITU toolkit, [Bridging the Digital Innovation Divide: strengthening ICT centric Innovation Ecosystems](#).

2.1 An innovation systems primer

The increasing importance of innovation systems particularly within policy cycles is noteworthy and is reflected by discussions as early as 2004 in academic circles on the number of specific Google hits on the concept of innovation "*...policy makers at the national level and experts in international organizations for economic cooperation such as OECD, UNCTAD, the World Bank and the EU-Commission have adopted the concept. This rate of diffusion is quite dramatic taking into account that 15 years ago only a handful of scholars had heard about the concept*"⁸.

The typology of innovation is dichotomous- linear or systems-oriented. The linear model of innovation emanates from supply side dynamics and supporting policies, in that "science leads to technology and technology satisfies market needs". This absence of feedback implies that the 'shortcomings and failures' which are an essential part of the learning process are ignored, not reflected upon and are therefore not available to the overall innovative process. The linear model of innovation assumes that more R&D in terms of capacity and capability (effort, expenditure, assets, skills, etc.) would generate

⁸ Lundvall 2004: www.druid.dk/conferences/Summer2005/Papers/Lundvall.pdf

discoveries leading to more innovation and that low R&D capacity and capability could explain low innovative output.

Lessons from the post Fordist era brought criticisms to the 'orthodox' linear model of innovation and led to the evolution of a more 'heterodox' approach, with empirical evidence indicating firstly that there is no directionality associated with the innovation process; and secondly that innovation may occur independently of scientific interaction. Rather different rates and intensities of feedback exist between upstream (technology related) and downstream (market related) phases of the innovation process.

However, from a systems perspective, concurrently Lundvall, in his description of user producer relationships, presented the concept of systems of innovation. In this seminal body of work Lundvall describes innovation systems as having the following key characteristics:

- Key institutions play a role in differing types of innovative activities and while the vertical division of labor between them is intractable or unclear, certain institution types predominantly undertake certain type of activity.
- Science is not the mainstay of universities. Private firms and public agencies also possess this competence. The research emanating from public and private firms is more applied because it is demand driven.
- Between universities and private bodies there are a multitude of specialized research organizations that are connected to either, and, as such, they react to incentives, to engage in basic research, applied research, or both.
- There are research units that are closely connected to production, which is associated with a level of dependency. Dependent units work within firms and public organizations, whereas independent units function as technological institutes. The main function of both organizational types is the conversion of scientific results into practical solutions rather than the stockpiling of scientific knowledge.
- Innovative activities are distributed and take place in many scientific units. The recognition of 'bottlenecks' in the production process is vital and the removal of blockages is facilitated by learning-by-doing and learning-by-using. Experience gained in production will act to stimulate new aspects of both applied and basic research these may not be accountable by science.

The discourse on innovation has been characterized by the movement away from a linear orthodox perspective to the systemic heterodox approach. This systemic approach views innovation as a 'stock' and 'flow' dynamism constituted by a complex network of feedback and interactive relations involving science, technology, learning, institutions, production, public policy, industrial supply and market demand factors.

The concept of systems of innovation provides extensive utility in the development of policy design as it enables an understanding of "... non-linear development of knowledge based on exchanges of information among interdependent actors"⁹. These interdependent actors are critical in building the framework for an innovation system to work. Key actors need to understand their roles, their relationships with other actors, and the process of innovation. Thus, an innovation system is driven by the working relationship of these actors, their behaviours and transactions to facilitate opportunities (needs) and resources.

⁹ Edquist and Hommen: 1999, page75

2.2 ICT centric innovation ecosystem

The ICT centric innovation ecosystem is a concept that draws and expands on systems of innovation theory. It recognizes that the ICT sector is one of the fastest evolving fields in the modern economy and lies at the centre of much of the innovation that is happening today. That innovation in the field of ICTs, as stated in systems of innovation theory, relies on an interconnected group of stakeholders who support potential innovators through a lifecycle. However, the benefits of innovation in the field of ICTs are not limited to ICT as a sector. The impact of ICTs is cross-cutting touching on almost every sector of the economy and almost every aspect of people's lives. Technology allows people to do things they always wanted to do, but better, faster, easier, and cheaper, for example:

- Farmers want to make better crops, they need to understand where to get the best seeds, know when the weather will change, plant the right seed at the right time, and sell to buyers who are willing to pay fair prices.
- Citizens want to know that their government is working for them, and that their taxes are being used for good causes, which requires transparency on spending, and accountability for public service.
- Businesses want to attract more customers, and to understand which products their customers want, want to use efficiency tools and systems to manage inventory, and to reach customers, etc.

Administrations, including policy makers and civil society, are always looking to be more efficient with public spending, to offer better services for citizens, to create more jobs and economic growth for their communities. The solutions, due to limited resources, need to have an exponential impact. Basic information problems, efficiency and scalability are easily addressed using information and communication technologies, for example, previously un-servable customers or resources (known as the long tail problem), can be easily reached through the mobile networks or the Internet, and businesses can become more efficient through ICTs increasing productivity and reducing costs, bringing higher profits and better return on investment.

Another major challenge is global competition. In the open economy, talent, resources and opportunities can come together to address emerging needs at a velocity unseen before, thanks to ICTs. From crowdfunding platforms like Kickstarter funding entrepreneurs, to massive open online courses (MOOC), providers enabling access to the best educational content, new business models are transforming society and personalized learning is now a reality.

And so, a range of sectors are caught up in an innovation ecosystem that centres on the ICT sector, but has benefits across the whole of the economy and of society, the ICT centric innovation ecosystem. ICT led innovation is significantly contributing to economic growth by bringing higher productivity factors, lower cost of goods and services, offering newer products and services, re-inventing traditional industries, and enabling new organizational and business models.

Systems of innovation reading list

The following resources are useful for readers who wish to continue research in systems of innovation:

Industrial Development Report 2016, UNIDO, 2016: https://www.unido.org/fileadmin/user_media_upgrade/Resources/Publications/EBOOK_IDR2016_FULLREPORT.pdf

The Innovation Process and Network Activities of Manufacturing Firms, Fischer, 1998: https://www.researchgate.net/profile/Manfred_Fischer/publication/251393792_The_Innovation_Process_and_Network_Activities_of_Manufacturing_Firms/links/02e7e53a7db001abb5000000.pdf

The Theoretical Basis and the Empirical Treatment of National Innovation Systems, Balzat, 2002: www.wiwi.uni-augsburg.de/vwl/institut/paper/232.pdf

An Evolutionary Theory of Economic Change, Nelson & Winter, 1982: http://inctpped.ie.ufrj.br/spiderweb/pdf_2/Dosi_1_An_evolutionary-theory-of_economic_change..pdf

Local Clusters, Innovation Systems and Sustained Competitiveness, Mytelka & Farinelli, 2000: www.intech.unu.edu/publications/discussion-papers/2000-5.pdf

Product Innovation and User-Producer Interaction, Lundvall, 1985: <http://vbn.aau.dk/ws/files/7556474/user-producer.pdf>

Innovation: The Five Disciplines for Creating What Customers Want, Carlson, 2007: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-5885.2007.00266.x/abstract>

2.3 Changing requirement of policy

Innovation policies rely on a range of factors to succeed that go beyond investment into traditional inputs such as R&D, infrastructure, education. Building an innovation framework that only invests in inputs or only fosters a favourable business environment is not sufficient. In the 2017 Global Innovation Index¹⁰ many countries have inefficiencies reflected in their innovation output to input ratios systems of innovation theory reasons that innovation institutions make significant contribution to innovation performance. Policies based on heavy intervention, or those based on a free market approach will only work in certain contexts. To become competitive and grow, countries need to develop new industrial policies based on highly skilled jobs, high-growth industries and global export.

One factor affecting results is the presence or absence of keystone institutions. If keystone institutions do not exist, the chances of success is dramatically reduced despite investment made by a country in innovation inputs. Previous OECD work considers that the failure of traditional top-down innovation policies are due to three critical risks: the lack of capabilities for successful policy making, the lack of information on the economy, and the power of the rent seekers in influencing policy.

The OECD report¹¹ also notes that novel institutions are needed to manage this search process. The search process executes three primary tasks: first "linking the better performing segments of private and public institutions, alleviate existing institutional constraints and help develop new solutions"; second reducing rent seeking because "these policies often start at the periphery of policy making";

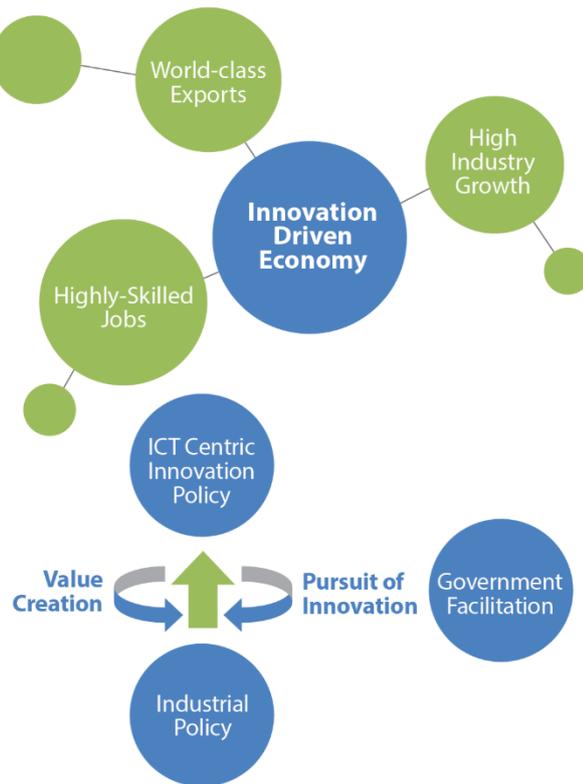
¹⁰ <https://www.globalinnovationindex.org/content/page/GII-Home>

¹¹ Making Innovation Policy Work: Learning from experimentation. OECD/WORLD BANK 2014

and third, "linking better performing segments of an existing institutional framework and searching for out-of-box solutions to familiar problems".

This implies a new model for government facilitation, one where the private sector has the lead, and government intervention is highly effective, timely and evidence based. One way to accelerate the move to innovation driven economies, therefor requires coordinating a traditional industrial policy with an ICT centric innovation policy. Figure 1 shows a modified graphic inspired by Goh's 2005 paper on new industrial policy that highlights this principle. This combination will mobilize existing potential in the ICT centric ecosystem to transform industries with sophisticated business models, to upskill the workforce and to enable access to global markets.

Figure 1: Policy driving innovation



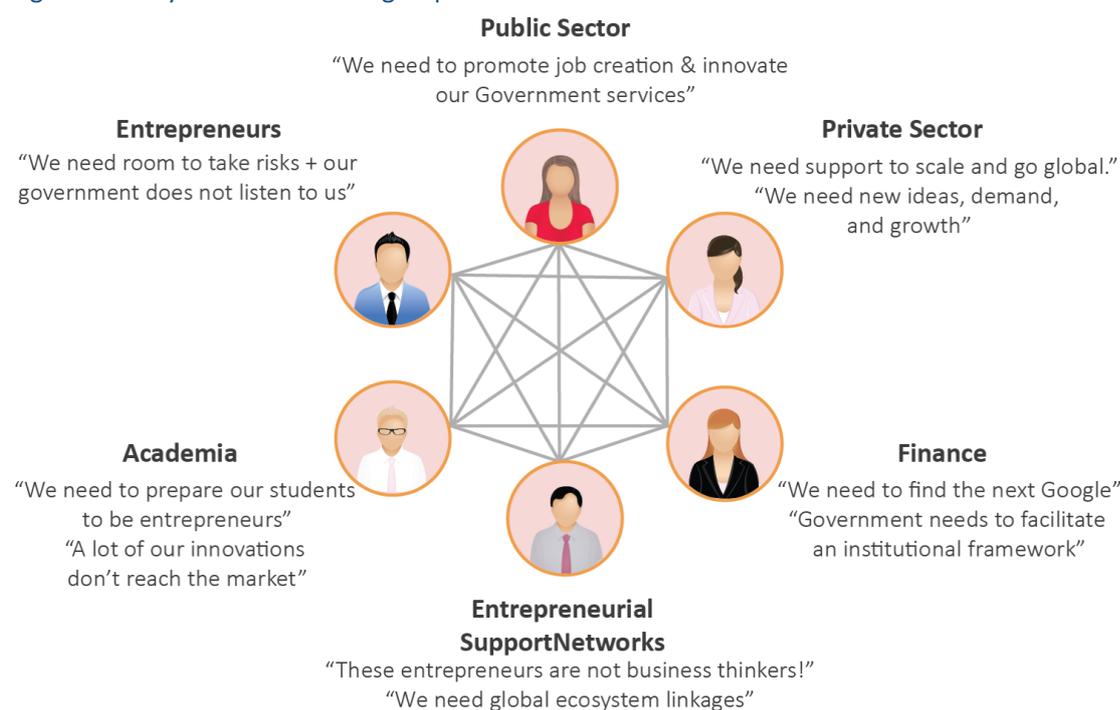
Source ITU – Telecommunication Development Bureau

To achieve this aim, an organic ecosystem approach to understanding the problems and drafting evidence-based policies are needed to spark vibrant, efficient, and sustainable ICT centric innovation systems.

2.4 Stakeholder groups

The interdependent actors defined by our methodology consist of six key stakeholder groups, essential to the good functioning of the ecosystem: entrepreneurs, public sector actors, financial actors, academics, private sector actors, and entrepreneurial support networks. These groups interact in many ways throughout the ecosystem, and each group works in many pillars (discussed below) and throughout the innovation lifecycle. Since much of the analysis and further discussion is based on these stakeholders, a brief introduction to each group is outlined in Figure 2.

Figure 2: Ecosystem stakeholder groups



Source: ITU

- **Public sector:** This group consists of public sector policymakers, regulators, programmes, and decision makers in entities connected to the ICT centric innovation ecosystem, directly or indirectly. Since innovation is a cross-cutting issue, this can incorporate a range of governance areas, including finance, trade, technology and communications, education, infrastructure and a range of others, even verticals such as energy or agriculture.
- **Entrepreneurs:** This group includes stakeholders who have decided to create their own firm with the aim to deliver new innovative solutions. They exist throughout the innovation lifecycle, starting from research and inspiration, through start-ups and SMEs and into more established firms. Much of their contribution to the ecosystem comes from their interactions with fellow entrepreneurs and their work to bring innovations to market.
- **Academia:** This group includes stakeholders from primary, secondary and tertiary education, research institutions and affiliated education and ICT centric innovation development centres. They contribute to innovation in terms of basic research work and the development of the ecosystem human capital, and to a lesser degree, foster the movement of innovation from research to start-up.
- **Support network:** This group incorporates stakeholders providing specialized services for entrepreneurship and innovation: incubators, accelerators, business associations, communities, gatherings, events, mentors, accountants, lawyers, etc. Their work facilitates the process of developing new businesses and innovations, and taking them through their lifecycle. There is some overlap between this and other groups as their work is often organized by actors from stakeholder groups.
- **Private sector:** This group represents established industry players and businesses engaged in internal innovation, business-to-business service provision, infrastructure development and support of outside innovators. They generally seek rent for their services or seek to integrate innovations into their existing organization. There is overlap between this group and entrepreneurs, especially in terms of SMEs. For our purposes, entrepreneurs are working as small firms and being supported, while private sector actors are working as part of larger firms and supporting the ecosystem.

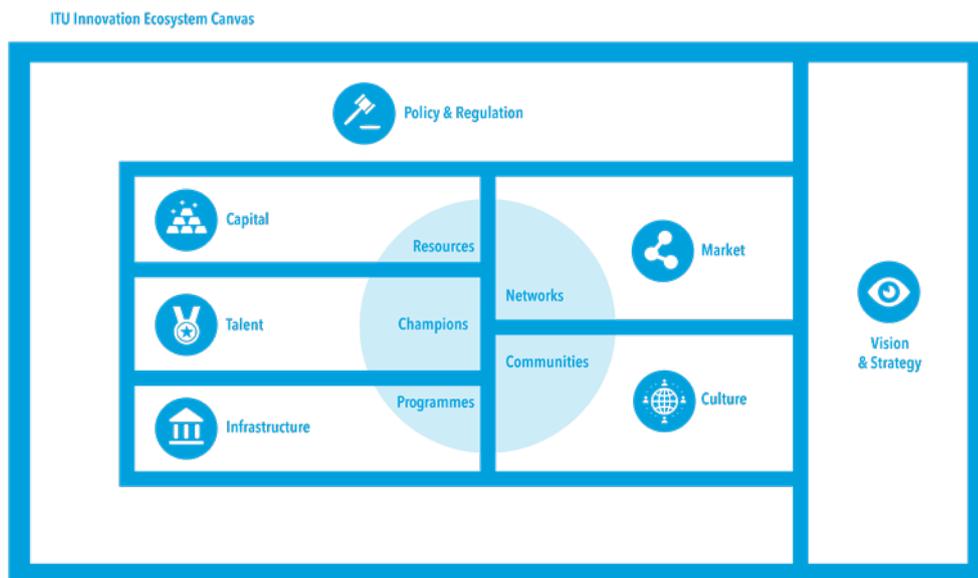
- Financial institutions:** This group includes banks, seed funds, investors, peer-to-peer and crowdfunding communities, and others who fund innovation in the ecosystem, from funding research to investment in start-ups and SMEs, to loans and IPOs for established businesses and organizations. This can also incorporate those who facilitate the process and build connections, as well as international actors interested in investing in the ecosystem.

2.5 Ecosystem canvas

A good innovation framework will have a clear understanding of the market needs (demand driven), foster good collaboration and coordination between various actors and create a structure within which innovation can be supported throughout its lifecycle, beginning with the underlying cultural and social factors, through basic research, into the development of innovations and firms, and through to where those become profitable and create the potential for social change.

To achieve these objective, the following ecosystem canvas was developed. It draws on traditional innovation input pillars as well as pillars to support building a sustainable innovation culture. It embraces a holistic view of the problem, and acts as an easy to use guide for diagnosing, changing, and monitoring an ICT centric ecosystem.

Figure 3: Innovation: Ecosystem canvas



Source ITU

The canvas covers seven pillars: vision and strategy, infrastructure and programmes, talents and champions, capital and resources, market and networks, culture and communities, and policy and regulation. Policy, being a pillar with particularly important connections to all of the others is shown wrapping around them. Vision is set as the direction the ecosystem moves toward. In the centre, the other pillars show the inputs and outputs of innovation activities.

2.5.1 Vision and strategy pillar

This pillar is the guiding map for the stakeholders of an ICT centric innovation ecosystem. Everyone in the ecosystem needs to have a clear understanding of the aim, the role of various actors, and how the initiative is connected to a common vision. It focuses the ecosystem on market needs.

Vision can be as wide as fostering an entrepreneurial society where citizens are empowering and empowered by innovation. It can be also as narrow as a specific sector. But a comprehensive, inclusive

vision is preferred at country level incorporating all major economic sectors and covering all major stakeholders. Different cities or communities can run their own strategies based on narrower visions to empower their local ecosystems.

2.5.2 Infrastructure and programmes pillar

Infrastructure and programmes represent the field on which the game of innovation is played. They encompass the core components (typical inputs) of general economic competitiveness; 'hard' infrastructure, such as power supply, connectivity, transportation, and so on; 'soft' or knowledge infrastructure, such as entrepreneurial support networks, co-working spaces, skills training and research institutions; and the accessibility, affordability and distribution of all of these core resources.

The programmes that make up much of the soft infrastructure of the country represent the infrastructure function for the central circle, specifically working to support innovation processes. They provide the spaces and resources needed to develop innovation and entrepreneurship, and share knowledge and skills in order to foster innovative technologies and businesses.

2.5.3 Talents and champions pillar

The notion of talents concerns the input side of people with skills, including technical skills such as IT training and engineering, and soft skills such as management and business planning. It incorporates training programmes and distribution, notably looking at whether appropriate talent is available and whether there are issues stemming from brain-drain or certain industries pulling talent away from areas of innovation.

Champions go a step beyond talent, taking on leadership and mentorship roles within the ecosystem. They serve as mentors and success stories to other stakeholders and create and guide the projects and initiatives that foster the ecosystem.

2.5.4 Capital and resources pillar

Capital represents the access of innovators and entrepreneurs to finance and investment. Various types of capital are required at the various stages of a project lifecycle. Investment in research is needed, followed by seed funding, angel investment, venture capital, investment rounds, and loans, as innovations develop. This pillar incorporates foreign direct investment and other forms of international trade flows, along with programmes such as government procurement and support programmes that provide funding to supplement private sector finance. To support all of these, the pillar also includes financial policy and efforts to facilitate the connection of investors and projects.

Resources are focused financing for programmes and communities that build up the ecosystem, primarily from the national government or international organizations, but also from various private sector actors. This financing is needed in order to run the activities that support the ecosystem.

2.5.5 Markets and networks pillar

Markets are an essential component of the innovation ecosystem, as the goal is ultimately not just to create innovations, but to develop innovations which can be profitably brought to market. The pillar examines whether the markets are present, whether businesses have access to foreign markets, the interest and purchasing power of local populations, and whether public procurement is providing appropriate demand without distorting markets.

Networks represent the need for different stakeholders to connect and the connections between them. It incorporates the formal and informal networks that foster ecosystem building activities, and the awareness of stakeholders of those networks, especially in the form of formal mapping exercises.

2.5.6 Culture and communities pillar

Innovation and entrepreneurship require a set of cultural values, especially putting a premium on creating rather than seeking jobs, an interest in doing novel research and innovation to create something new, and a comfort with risk and failure as part of entrepreneurship.

Communities foster this innovation culture, providing platforms and groups for knowledge sharing, and inspirational success stories are important building elements of this pillar that help build an entrepreneurial mind-set and bring together a group of passionate actors to create initiatives.

2.5.7 Policy and regulatory pillar

Policy and regulatory frameworks are essential to fostering a favourable innovation ecosystem. A wide range of policy areas are important for innovation, including finance, trade, ICT and education policies. Not only should all of these areas structure their actions in ways that foster innovation, but the regulators, policymakers and programmes should be aware of their roles in the ecosystem. Taxes for start-ups and established firms, regulatory support in established businesses, technology transfer policies, measures promoting high growth SME, funding for research, are all examples.

ICT environments are fast changing and require flexible support. Stakeholders driven policy management (co-created and co-manage with stakeholders), evidence base policy making, and demand drive policies are essential ingredient for success with this pillar.

2.5.8 Central pillar

As noted, the central pillar represents a series of key elements that function together to help build up the ecosystem. These elements, detailed above, are interconnected and interdependent, forming a tighter set of activities than the rest of the pillars, which can move forward more or less independently. They also represent activities that are broadly undertaken altruistically with an eye toward building up the ecosystem rather than personal gain, and which specifically benefit innovation, rather than the economy in more general terms. Taken together, these can be seen as the work of the core actors of the ecosystem, and represent active efforts to strengthen innovation, rather than more incidental actions that create beneficial conditions.

2.6 Process outline

A typical country review is carried out in five phases leading to common goals, diagnosis of the ecosystem, evidence based recommendations, an implementation framework, and monitoring and evaluation.

Figure 4: Process flow for country review



Source: ITU

- 1) **The common goal:** An initial workshop, between stakeholders is conducted to launch the process and ensure alignment with stakeholders. This bottom up process begins with a workshop, bringing together representatives of various stakeholder groups. Using a modified world-café format, the participants collaboratively identify key issues confronting the innovation ecosystem, and work to create an initial draft agenda and set of priorities for the stakeholders as a community. The outcome generates a community manifesto.
- 2) **The diagnosis phase:** There is a series of interviews with key stakeholders and a review of current information and available statistics. The interviews are analysed to provide a numeric score reflecting the respondent's perception of the strength of each pillar. Those scores are aggregated to provide data that can be broken out by pillar and by stakeholder group. The key points from the stakeholders are aggregated by pillar to provide overall analysis, identifying strengths, weaknesses and gaps. Using this analysis, a holistic view of the ecosystem is possible, identifying specific gaps regarding the resources available in the ecosystem, and identifying overarching issues and themes, strengths and weaknesses of the ecosystem. These key issues are further developed into collaborative grassroots building blocks to strengthen the ecosystem. Additional interviews are added to support some of the analysis where appropriate.
- 3) **Recommended action:** A critical review of all data allows for overarching needs to be identified, along with key areas of action. A workshop is then held to discuss the findings and collect further clarity from key stakeholders. Some proposals and recommendations require intervention and leadership by the public sector, and others can be better accomplished through a collaboration between ecosystem stakeholders. External partners can be brought on board during the recommendation planning to develop concrete projects whenever possible.
- 4) **Implementation:** Because innovation happens at the periphery of an ICT ecosystem, an implementation framework discussion is facilitated with key ecosystem leaders (champions). One critical aspect is to engage key champions in taking ownership of the steps forward. An informal working group is a critical enabler toward a formal institution. Institutions play a very important role in unlocking innovation potential for a country. Innovation should be facilitated by the government, but led by the private sector.
- 5) **Monitoring and evaluation:** This last phase is an engagement for the stakeholders to move recommendations forward and engage in real policy experimentation. ITU has many activities to continue supporting the country through dialogue, toolkits, and partnerships. Key stakeholders are encouraged to begin activities that require no resources, or follow through the recommendation especially the implementation framework that will determine success

factors. Government has a critical role to continue the discussion in trust building, and act on policy recommendations where they fit the national agenda. The recently released ITU toolkit, [Bridging the digital innovation divide: Strengthening ICT centric innovation ecosystems](#), should enable the stakeholders to quantitatively measure the progress of the ecosystem, as well as repeat this exercise to keep the country policies and programmes competitive.

2.7 Guiding principles

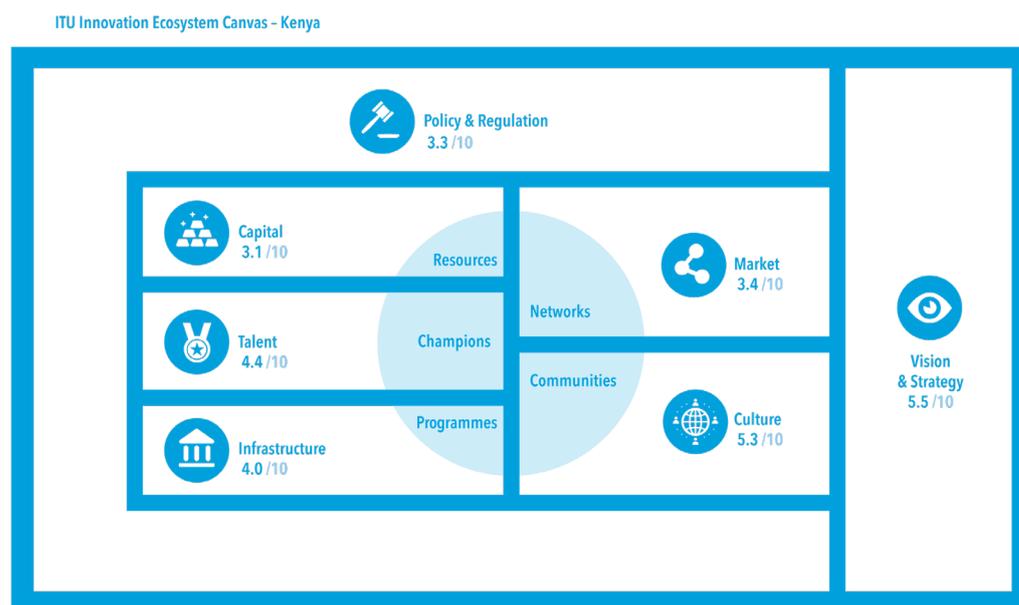
Throughout this report, there is a tacit focus on the idea of policy experimentation as a core principle. This concept focuses on developing policy in close partnership with the stakeholders it is meant to serve, which is based on best practices and existing activities whenever possible and which can be iterated based on rapid feedback loops. It bears close connection to contemporary design thinking, lean development and user centred design processes, and is an ideal fit for innovation policy because it represents the distributed knowledge bases and evolving nature of the issues. The key principles we focus on are as follows:

- user centred approach (e.g., demand driven);
- private sector led innovation;
- light and efficient resource utilization (e.g., find and invest in working good practices);
- replicable feedback loops to keep up with fast changing contexts;
- common language between all stakeholders (e.g., common understanding);
- everyone should have skin in the game (e.g., engaged);
- sustainable and predictable (including political stability), etc.

3 Current situation

Understanding the views of the stakeholders with respect to their environment presents the basis for the Kenya digital innovation analysis. The following section details the views and opinions of stakeholders about the critical pillars of the digital innovation ecosystem.

Figure 5: Innovation ecosystem canvas Kenya – Stakeholder views



This Ecosystem Canvas is an at-a-glance overview of the key components in the innovation ecosystem. Scores are based on combined target stakeholder interviews on a 0-10 scale.

Source: ITU

3.1 Vision and strategy

3.1.1 Literature review: Vision and strategy

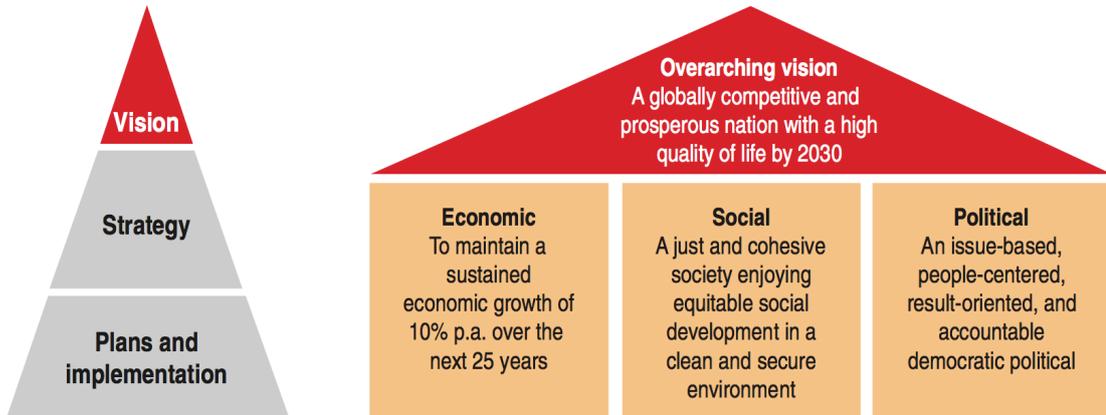
The key strategic documents regarding the development of the ICT sector and the innovation ecosystem in Kenya are the Economic Recovery Strategy for Wealth and Employment Creation (ERS)¹² and Kenya Vision 2030, and most recently the Big Four agenda. Active from 2003 to 2007, the ERS aimed at rejuvenating the Kenya economy after a period of economic stagnation from 1982 to 2002 and high unemployment. The ERS marks a paradigm shift in Kenya policy, indicating a move from poverty reduction to wealth creation through adopting a wide ranging macro-economic framework, public sector reforms and infrastructure. ICT was incorporated as a separate topic under the cross cutting themes, and was recognized as an enabler for creating economic wealth.

In the ERS, the ICT sector was seen as lacking awareness, priority, focus, coordination, resources and capacity. As a result, several measures were recommended such as a coordination mechanism to help mainstream ICT in the public sector, investment in adequate ICT education and training, revision of the tax regime and incentives for access to ICT equipment, review of the legal framework for e-commerce, and development of a masterplan for e-government. The ERS was narrow in scope, and neither recognized the role of the private sector nor that of relevant industry stakeholders to engage in wealth creation. Today, the focus areas identified under ERS are still current and remain issues.

With the five year ERS plan about to complete, in 2006, the Government of Kenya followed up with Kenya Vision 2030 as the new national long-term development policy to transform the country into a newly industrializing and middle-income country. The aim of Kenya Vision 2030 was to raise Kenya to a globally competitive and prosperous country with a high quality of life by 2030, and it is underpinned by three key pillars: economic, social and political.

¹² <http://siteresources.worldbank.org/KENYAEXTN/Resources/ERS.pdf>

Figure 6: Thematic overview of Kenya Vision 2030



Source: Kenya Vision 2030

Kenya Vision 2030 is more ambitious in scope targeting various sectors of the economy including agriculture, tourism, education, energy, and ICT business process outsourcing. The Kenya Vision 2030 strategy sets out infrastructure, energy, land reform, human resources security, public sector reforms, science technology and innovation as key enablers. Specifics goals were set to devote more resources to scientific research, technical capacity building, and raising the quality of teaching at various academic institutions. Kenya also recognized ICT as a sector to be developed with a flagship project fostering the development of business process outsourcing and public private partnerships.

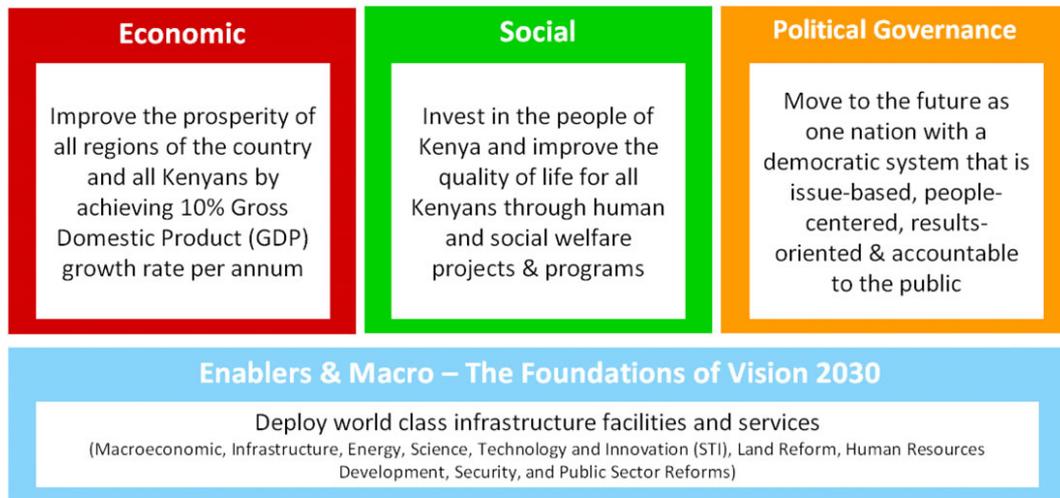
To achieve the Kenya Vision 2030 goals, a set of new institutions was created. These included the Ministry of Education, Science and Technology; the National Commission on Science, Technology and Innovation (NACOSTI); the Kenya National Innovation Agency (KENIA); and, the National Research Fund.

Figure 7: Kenya Vision 2030: Three pillars

Vision 2030: Three Key Pillars

Transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment

The vision is anchored on three key pillars:



Source: Kenya Vision 2030

Though it is too early to make clear assumptions about the ultimate outcome of the strategies laid forth in the Kenya Vision 2030, Kenya has made noticeable headway towards improving ICT infrastructure over the past few years. New institutions have been created and several identified flagship projects have been developed. Many stakeholders see Kenya Vision 2030 as a clear overarching vision for the country,

Most recently, in December 2017, the overarching Kenya Vision 2030 has been complemented with the strategic goals elaborated in the Big Four action plan – a five-year national development agenda for covering 2018-2022 – that focuses on key basic needs critical for increasing well-being and the standard of living of Kenyans on the path to becoming an upper middle-income country by 2030. The Big Four priority areas that are expected to bolster strong inclusive economic growth for socio-economic development are: (1) affordable and decent housing, (2) affordable and universal healthcare coverage, (3) food and nutritional security, and employment creation through (4) enhancing manufacturing. Each of the priority items comes with specific focus areas and goals (see section 5 below). Furthermore, the Big Four agenda reinforces the strategic importance of digital technology and ICT as key driver for development – as technological innovation and the global digital revolution underpin many crosscutting factors that will enable the expansion of the key sectors targeted.¹³

The Global Innovation Index¹⁴ has consistently highlighted Kenya over the past few years as an *'innovation performer'*¹⁵ and categorizes the country as one of the chief innovation achievers in the sub-Saharan Africa region. The Kenya overall ranking was 80th out of 127 economies surveyed. The report also identified Kenya as having an innovation efficiency ratio of 0.66 which translates into 50th position. The World Bank Doing Business Report¹⁶ ranked Kenya fifth in sub-Saharan Africa, and identified a range of reforms that have substantially improved the country's business environment. It also highlighted the country as making the most improvement in creating a conducive business environment.

However, the country is yet to implement a clear policy for the development of the ICT ecosystem, and the topic has received insufficient discussion in official strategic documents, although, efforts are underway to understand and engage various stakeholders to develop policies supporting the ICT innovation ecosystem.

3.1.2 Pillar strength: Vision and strategy

Based on the interviews, the scores reflected respondent views on the strength of vision and strategy in the ecosystem. Scores are indicated on a 0-10 scale, which is based on the results of stakeholder views – combining values of 0-2 per question – on whether respondents had a good overall view of the ecosystem, whether they felt there was a clear vision, general consensus, and whether they were working together with each other to run activities supporting this vision.

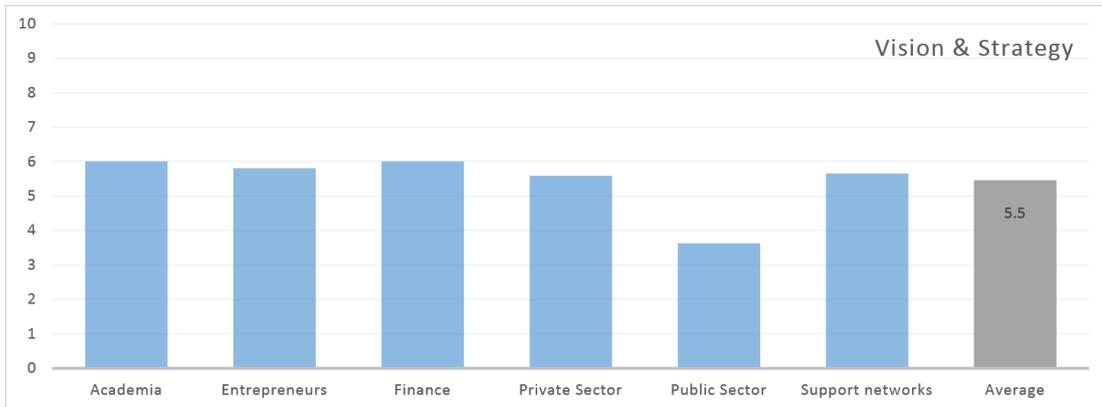
¹³ www.president.go.ke/
www.president.go.ke/2018/02/27/technology-will-be-major-driver-for-big-four-plan-president-kenyatta-says/
<http://kippra.or.ke/wp-content/uploads/2018/04/KIPPRA-Policy-Monitor-Issue-9-No.-3.pdf>

¹⁴ GII, see: <https://www.globalinnovationindex.org/>

¹⁵ Economies that perform at least 10 per cent higher than those in countries with similar levels of GDP are labelled 'innovation achievers'

¹⁶ www.doingbusiness.org/data/exploreeconomies/kenya

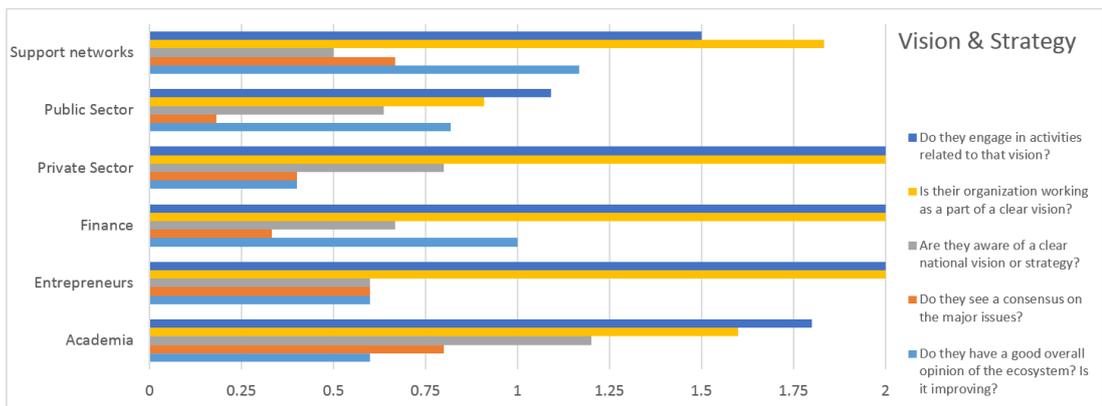
Figure 8: Pillar strength by stakeholders: Vision and strategy



Source: ITU.

The ratings for vision and strategy were broadly in alignment across stakeholder groups. Most stakeholders – other than the public sector – believe that they work towards a clear vision with supporting strategies of improving innovation in the ecosystem. However, almost all stakeholders feel that there is a lack of consensus on major issues plaguing the ecosystem. Further, despite the prominence of Kenya Vision 2030, they feel that the vision for catalysing innovation is lacking in the country.

Figure 9: Pillar strength by survey question: Vision and strategy



Source: ITU

3.1.3 Main points and themes: Vision and strategy

Strong vision with ambitious transformational targets for key sectors

Kenya Vision 2030 demonstrates a strong mandate put forward by the government of Kenya. Respondents noted that activities aimed at achieving this vision have helped foster the importance of the digital agenda. Several government agencies have been created to spearhead the vision and drive innovation in the country. To support the government ambition to develop the ICT sector, Konza City, a public private partnership (PPP) was created to foster innovation around four key areas: human capacity in science, technology, engineering, and mathematics. The initiative is focused on the creation of a Konza based Technology Park “Konza Technopolis.”

Stakeholders work towards one vision; efforts need coordination

The success of activities aimed at achieving the vision so far has been driven by the efforts of various government ministries and the private sector, but in silos and isolated from each other. Stakeholders

felt that not all ministries are speaking to the private sector in the same way. As a result, a lot of policies needed to support the vision are lacking, which is hampering growth of the sector. The implementation of coordinated strategic activities and the linkages between various stakeholders requires further debate. In the words of one stakeholder:

Ecosystem stakeholder: *“for example, we need data protection [...]. But there is no dialogue on that...”*

Lack of common agenda and robust implementation process

While there is a common vision, a common agenda is lacking within the various government ministries and departments, and the private sector. Innovation leadership being scattered between different ministries, the various actions are not seen as coordinated. For example digital innovation is with the Ministry of ICT, STI (science, technology, and innovation) is with the Ministry of Education, Science and Technology, and SME related innovation with the Ministry of Industrialisation. Though, in some areas there is a common understanding between stakeholders, it was noted that many projects with similar scope exist, but are uncoordinated. This lack of a common agenda and effective coordination leads to a fragmented implementation process.

No coordinating anchor for activities within the ICT innovation ecosystem

While there is the Kenya National Innovation Agency (KENIA), which envisions a globally competitive national innovation system for sustainable development, its mandate is too broad and its implementation seen as ineffective. Many stakeholders expressed challenges in finding resources such as skills trainings, and access to a wide range of information needed to succeed. KENIA was not seen as aware of their challenges or playing a role in fostering the needs of the ecosystem. NACOSTI, the other institution created to guide the STI framework is seen as devoting little focus on ICT innovation. In the absence of a strong national innovation agency or a coordinating entity with the competencies to guide the digital ecosystem, the ecosystem seems to be operating in an unfocused manner.

3.1.4 Gaps and strengths: Vision and strategy

Strengths

Most stakeholders feel that they have a clear vision and are working towards improving the state of innovation in the economy. Stakeholders regard Kenya Vision 2030 as source for this overarching focus, in which strategic goals and ambitions are detailed.

Gaps

While there is a common vision, the roadmap to achieve these goals seems to be disconnected. Kenya Vision 2030 was seen as lacking specifics, and does not provide for comprehensive policies and initiatives to support the transformation. Stakeholders in the digital innovation ecosystem are working in silos and rarely engage with each other – neither in communication nor in implementation.

Ecosystem stakeholder: *“There is no common understanding on ICT issues, and the government's current strategy under the ICT Master Plan lacks foundation. There is a big vision, but there is no execution plan.”*

Ecosystem stakeholder: *“The ecosystem is very fragmented. A lot of organizations are running initiatives to drive the ecosystem, but they're all working independently and not collectively.”*

3.2 Infrastructure and programmes

3.2.1 Literature review: Infrastructure and programmes

The literature review on infrastructures and programmes reveals that Kenya has undertaken deliberate steps to develop the hard infrastructure in support of Kenya Vision 2030. With broadband as a key enabler of infrastructure development, an ambitious plan to develop infrastructure to accelerate the transformation of various sectors such as healthcare, education, agriculture, government, business process outsourcing, etc. Several efforts¹⁷ has led to the development of international connectivity by incentivising investment and partnership, nurturing an enabling policy environment and promoting competition. The government investment in the global Internet backbone¹⁸ and the national optical fibre backbone have achieved results.

According to ICTA¹⁹, the National Optical Fibre Backbone (NOFBI) project aimed at ensuring access throughout Kenya. Phase I of the project laid 4 300 km OFC (Optical Fibre Connectivity), and NOFBI phase II, which aims to increase coverage by a further 6 000 km, has to date been successful in adding another 2 100 km.²⁰ Over 3 000 km of this network was utilized by the national government, and firms such as Telkom, Safaricom, Jamii Telecom Liquid Telecom and KENET (Kenyan Education Network), among others. Additionally, the Kenya County Connectivity Project²¹ aims at connecting county government offices to the Internet to facilitate public service delivery and promote e-government services. The shared access to the backbone, combined with the development of the global available international bandwidth, via multiple cable projects, helped to democratize broadband access in Kenya.

The ITU ICT development index (IDI)²² clearly outlines the strengths and challenges of the ICT infrastructure in Kenya. According to the 2016 IDI, Kenya was ranked 129 out of 175 countries in relation to overall ICT development, and retained its overall ranking from 2015. Since 2015, Kenya has seen increases in international Internet bandwidth, mobile cellular subscriptions, and active mobile broadband subscriptions. Kenya has made significant strides in improving Internet use in the country, rising from 14 per cent in 2010 to just over 45 per cent in 2016. Kenya stand out as one of the countries with the lowest mobile-cellular prices in PPP terms in the region. Kenya is known a mobile a first country. ITU IDI shows that only 19.6 per cent of household have Internet access and fixed broadband subscriptions is less than 1 per cent, while a report²³ by the Communication Authority of Kenya shows mobile penetration level at 90 per cent. Several factors contribute to the challenges facing ICT infrastructure in Kenya, including access to electricity, last miles broadband connectivity, and the high cost of essential hardware. Some of these factors were recognized in both ERS strategic plan and the Kenya Vision 2030, and efforts are underway to address them.

¹⁷ http://icta.go.ke/pdf/The_National_Broadband_Strategy.pdf

¹⁸ https://www.infodev.org/infodev-files/resource/InfodevDocuments_1108.pdf

¹⁹ <http://icta.go.ke/national-optic-fibre-backbone-nofbi/>

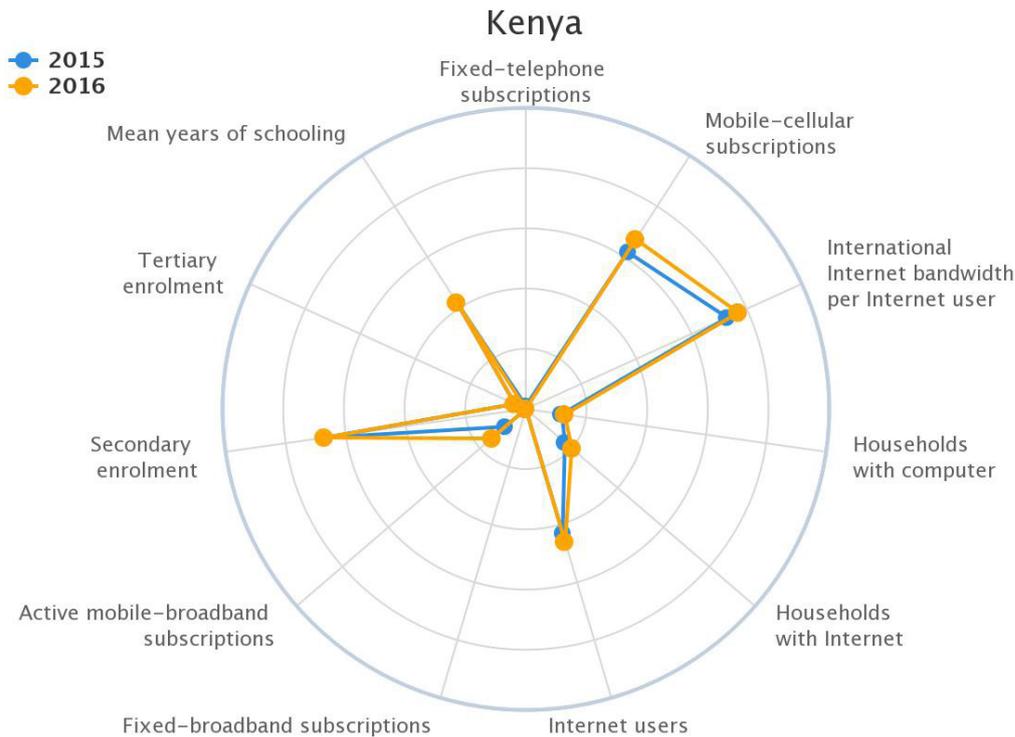
²⁰ <https://www.delivery.go.ke/flagship/nofbi>

²¹ <http://icta.go.ke/county-connectivity-project-ccp/>

²² www.itu.int/net4/ITU-D/idi/2016/#idi2016countrycard-tab&KEN

²³ <http://ca.go.ke/index.php/what-we-do/94-news/408-kenya-s-mobile-penetration-hits-90-per-cent-as-mvno-take-root>

Figure 10: ICT development index (IDI), Kenya



Source: ITU

The literature review on soft infrastructure reveals that its development, especially for technology hubs, has been largely driven by champions outside the public sector. Ushahidi²⁴, one of the pioneer in the soft infrastructure development, was founded after the 2008 election as a social enterprise to tackle election violence. It led to the creation of an entire ecosystem of soft infrastructure players including iHub²⁵, mLab²⁶, Gearbox²⁷, Akirachix²⁸, and also a successful start-up BRICK²⁹. One notable addition to the soft infrastructure ecosystem is Nailab³⁰, an incubator that offer entrepreneurship support to develop innovative solutions. These soft infrastructure players, located initially at Ngong road, came to symbolize Kenya as the *hot bed of the silicon Savannah*.

Other soft infrastructure players have since joined the ecosystem from both universities and the private sector. C4DLab³¹, from the University of Nairobi, is an R&D and incubation lab focused on acceleration of research to market. Similarly, iLabAfrica³² is a centre of excellence for ICT innovation and development based at Strathmore University, and an IBM Research Lab is based at Catholic University of East Africa. These universities affiliated labs provide valuable functions in talent development, industry collaboration, and innovation commercialization. On the private sector side, Safaricom innovation initiatives³³ have also played a key role in the expansion of soft infrastructure.

Infrastructure is facing some challenges that significantly affect the ecosystem medium and long-term competitiveness. Hard infrastructure is doing well, except for the last mile. The lack of innovation capacity is noticeable between urban and rural settings. Additionally, the development of the flagship

²⁴ <https://www.ushahidi.com/>

²⁵ <https://ihub.co.ke/>

²⁶ <http://mlab.co.ke/>

²⁷ www.gearbox.co.ke/

²⁸ <http://akirachix.com/>

²⁹ <https://www.brck.com/>

³⁰ <http://nailab.co.ke/>

³¹ www.c4dlab.ac.ke/

³² www.ilabafrika.ac.ke/index.php/ilabafrika/

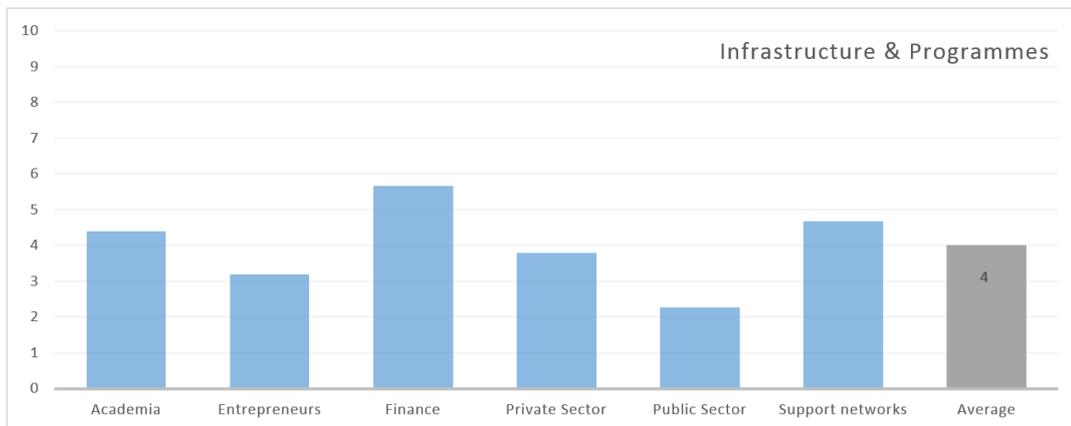
³³ www.safaricom.co.ke/about/innovation

project Konza Technopolis, a Konza City based Technology Park, has been completed and launched, however continues to face challenges and is yet to develop needed momentum to fully ‘take off’. Soft infrastructure needs broader development and strategic focus. Without the proper mix of innovation capacity and last mile access, the Kenya ecosystem is stagnating and limiting the scope of inclusion.

3.2.2 Pillar strength: Infrastructure and programmes

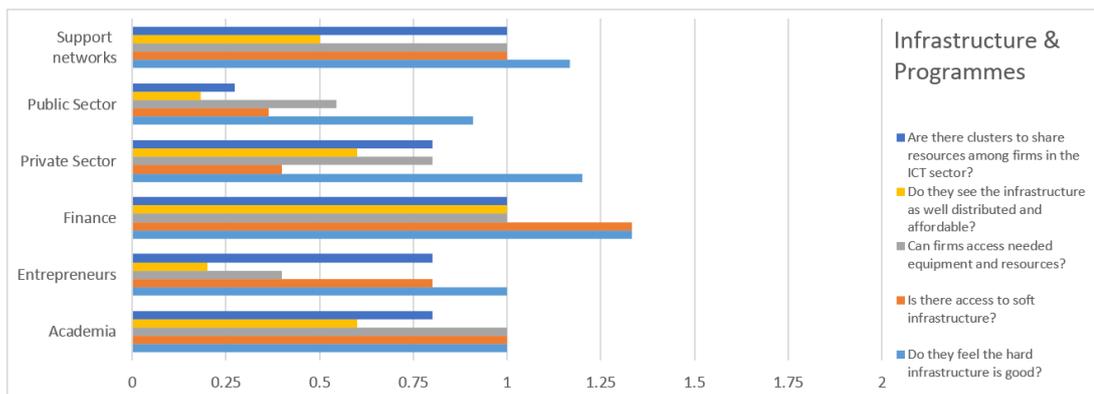
Scores shown in Figure 11 reflect respondent views on the strength of infrastructure in the ecosystem. Scores are indicated on a 0-10 scale, which is based on the results of stakeholder views – combining values of 0-2 per question – on whether respondents believe there to be sufficient hard and soft infrastructure and good access to it, and whether the country was economically competitive overall.

Figure 11: Pillar strength by stakeholder: Infrastructure and programmes



Source ITU

Figure 12: Pillar strength by survey question: Infrastructure and programmes



Source ITU.

Different stakeholder groups evaluated the pillars differently. Most groups regarded the country to be competitive, especially at a regional level. The quality of hard infrastructure is seen as good, but it remains concentrated in select urban towns – with last mile being a concern. Moreover, the public and private sectors feel there is not enough soft infrastructure. In terms of availability of resources for firms in the ICT sector, certain stakeholders believe that the resources exist, yet are too expensive.

3.2.3 Main points and themes: Infrastructure and programmes

Significant efforts to connect the country, but last mile remains a challenge.

Respondents are in agreement that the quality of infrastructure has improved significantly over the past five years. Government as well as private sectors investment have enabled Internet to reach most of the country. Kenya is seen as one of the leading countries in Africa in respect to embracing mobile phones and the Internet. Quality and availability of data-centres is limited. Entrepreneurs reported that Apps in Kenya are slow, which is based on the fact that they tend not to be hosted locally. The insufficient quality of service delivery and lack of sufficiently developed infrastructure is inhibiting the adoption and use of new modes of delivery for content – such as education. Cost of services is experienced as higher in rural areas, resulting in low content usage. Taken together, these factors make last mile a challenge in Kenya. The government has initiated various initiatives and policy reforms to address the issue. These include among other, the Economic Stimulus Programme (ESP), programmes developing infrastructure in schools for 290 constituencies in Kenya. More resources are needed and the adoption of new approaches is strongly suggested.

Need to develop and ensure access to soft infrastructure

Regarding soft infrastructure – including training, knowledge infrastructure, and mentoring programmes – some resources have been developed in the country, with notable initiatives at iHub and Nailab. However, these are not seen as sufficient to meet the needs of the ecosystem. Most soft infrastructure is concentrated in and around Nairobi. Efforts are therefore needed to develop further such programmes and to improve their efficacy and distribution. The lack of mentoring was expressed as a significant barrier by the support network group. Soft infrastructure located outside Nairobi was reported to have more acute issues, which can be deduced from the absence of other stakeholder groups in these regions.

FinTech, AgriTech, EduTech, HealthTech lack guidance

FinTech, AgriTech, EduTech and HealthTech are sectors that are foreseen as big potential based on the specifics of the economy in Kenya. However, these sectors are only beginning to exist in the ecosystem; and respondents expressed the view that they do not receive any guidance. Cluster formation, under existing government flagship projects, such as the economic zones, are known to stakeholders, but some feel that these projects are ideas only. Though some respondents from the entrepreneurial support group expressed the view that Konza Technopolis is beginning to take shape as a real estate project. According to other respondents, developing competitive digital clusters in key sectors needs support and increased availability of resources.

Lack of appropriate and structured programmes to support innovators

Entrepreneurs state that they lack specific resources and the support from the public sector, especially in the early stage of entrepreneurship. This lack of support is seen as actively limiting their opportunities to develop solutions for which there already exists a demand. Without access to a wide range of resources and infrastructure, many programmes become unsustainable. Respondents also reported that strategic plans, budgets and programmes lack government resources, projects or policies to ensure sustainability.

3.2.4 Gaps and strengths: Infrastructure and programmes

Strengths

Deliberate efforts to develop broadband and leverage ICT in key sectors, such as business process outsourcing (BPO)/IT Enabled Services (ITES), and the public sector, have accelerated the development of hard infrastructure. Kenya is known to have a very good broadband backbone and an active start-up community, as well as being known as a mobile first country. These positive factors enabled entrepreneurs to

develop unique solutions to address opportunities. As a result, Kenya has become a hot bed for financial inclusion with stakeholders offering world class innovative solutions via mobile platforms.

Gaps

The quality of hard infrastructure is good in urban setting but requires better distribution and maintenance throughout the rest of the country. Internet connectivity – both broadband and mobile – is still significantly low in the country, and needs much improvement in terms of quality and cost outside urban areas. Another gap concerns the lack of proactive measures by government to ensure the security, functionality and efficiency of existing infrastructure. Additional, significant improvement will be necessary in soft infrastructure in order to foster an inclusive innovation ecosystem in the country.

Ecosystem stakeholder: "As soon as you step 10 km outside Nairobi, connectivity and speed drops."

Ecosystem stakeholder: "Access and quality of hard infrastructure is growing but there's still a long way to go before we have enough soft infrastructure."

3.3 Talent and champions

3.3.1 Literature review: Talents and champions

The literature review on talent and champions, highlights a pronounced skills gap in both technical and soft skills, and insufficient reforms and implementation programmes to holistically address this deficit.

Although Kenya was ranked amongst the highest in regard to quality of education in the sub-Saharan region in a WEF survey³⁴, 30 per cent of employers perceive inadequate workforce skills as a major constraint. In a report by USAID³⁵, the root causes for delivering appropriate soft skills and technical skills, in the public education system are: information asymmetry, curriculum and teaching methods, focus on theoretical knowledge, ineffective applied learning opportunities, and over emphasis on testing. This leads to a lack of qualified talent with appropriate skills in the ecosystem such as high-level technical skills, entrepreneurial skills, and business skills.

Under Kenya Vision 2030, one of the main objectives is to create an information society and knowledge economy that foster wealth creation and jobs through leveraging ICT and STI. In the latest ICT Master Plan³⁶, as a pre-requisite to a viable ICT sector development, the government recognized the importance of quality ICT human capital and workforce development. Thus, ICT policies called for measures to address the talent retention in the ecosystem, bring needed high-level foreign skills, and address coordination issues between relevant policy and implementation institutions. Although the government commitment and its approach for addressing these challenges seem slow, several efforts are underway from both ICT and education policy makers to address the digital skills gaps.

To address the issue of talent in the ecosystem, the ICT authority in collaboration with other stakeholders including the Kenya Institute of Curriculum Development (KICD), has initiated the Digischool³⁷ programmes, to make sure pupils and teachers are prepared for the digital world. While this programme is about digital literacy, it doesn't address many of the components needed to develop 21st century

³⁴ WEF, The future of jobs and skills in Africa, Executive Briefing, March 2017, via www3.weforum.org/docs/WEF_EGW_FOJ_Africa.pdf

³⁵ www.usaid.gov/sites/default/files/documents/1865/Kenya_Youth_Assessment_Final_Report.pdf

³⁶ <http://icta.go.ke/national-ict-masterplan/>

³⁷ <http://icta.go.ke/digischool/>

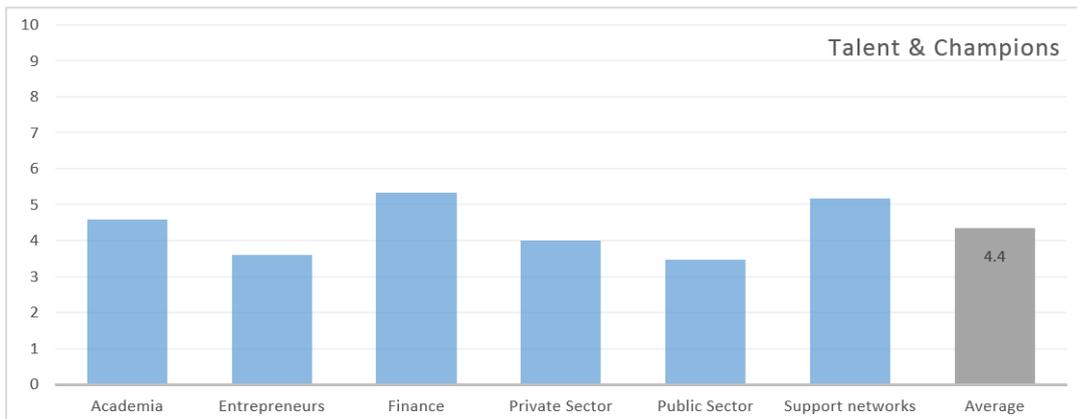
skills as defined by the WEF³⁸. However, the platform is useful development and can be leveraged to deliver additional content. Other initiatives, such as the Presidential Digital Talent Programme³⁹ and the CoEs initiatives were also developed to address the talent gap.

In addition, Kenya has many technical training schools and vocational training institutes targeting technical skills, soft skills, and entrepreneurial skills. But these institutions will need better guidance and new approaches as those from private sector firms such as Andela,⁴⁰ which focuses on both talent gap and talent placement. With fast changing technical skills and new learning methodologies, the education system is too slow to adapt, and therefore unable to produce talent with market appropriate skills to support innovation. While some educational initiatives, various champions and their programmes have yielded notable improvements in skills; more efforts are needed to improve educational approaches and quality of the graduates.

3.3.2 Pillar strength: Talent and champions

Based on the interviews, scores were assigned reflecting respondent views on the strength of the workforce and champions in the ecosystem. Scores are indicated on a 0-10 scale, which is based on the results of stakeholder views – combining values of 0-2 per question – on whether respondents saw sufficient technical and soft skills in the ecosystem, whether these were supporting innovation activities, how the education system is serving to provide human capital, and whether champions were present and active.

Figure 13: Pillar strength by stakeholder: Talent and champions



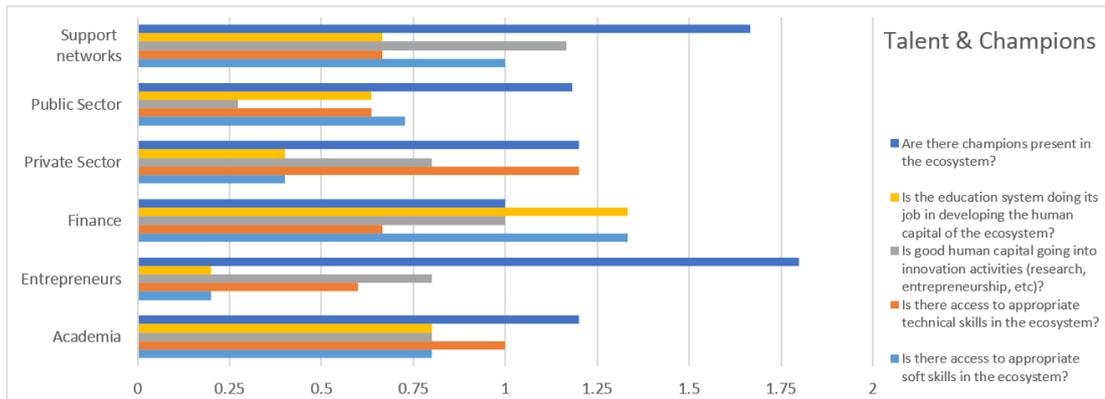
Source: ITU.

³⁸ <https://www.weforum.org/agenda/2016/03/21st-century-skills-future-jobs-students/>

³⁹ <http://icta.go.ke/digitalent/>

⁴⁰ <https://andela.com/about-us/>

Figure 14: Pillar strength by survey question: Talent and champions



Source: ITU

Opinions of stakeholders do not vary much in the talent and champions pillar. Most stakeholders, other than finance, think the education system has a lot of room for improvement. They feel technical skills are lacking but access to soft skills is improving, at least in select urban regions. Respondents also agree that there is a number of champions for every stakeholder group in the ecosystem. However, the number of individuals engaging in ICT-based entrepreneurship or research is still low.

3.3.3 Main points and themes: Talents and champions

Talent exists, but improvement in access, quality and appropriateness is necessary

Respondents believe that Kenya has done a very good job at training its talent in the past. This can be traced to post-independence initiatives when Kenya needed administrators. However, now Kenya is facing challenges with appropriateness of its talent. With the exception of a few programmes, the education system is failing to produce industry relevant skills. Respondents noted that the banking sector weakness can be attributed to shortfall of qualified skills in security. In the words of one stakeholder: "IT security is a modern-day market need, are we preparing our students for it? We may have a curriculum which is detached from the needs of the country in terms of security". Respondents also noted that the risk for the economy is increasing as businesses and government services are digitized.

According to the stakeholders in academia and the private sector, many issues contribute to the talent gap, such as outdated teaching environments, lack of qualified teachers, and retention of young teachers in the education system. Both public and private stakeholders have initiated efforts to address these issues. Notably, the Kenya Institute for Curriculum Design (KICD) is looking into redesigning curriculum. Another good effort is Andela, which aims to train 100 thousands developers by both technical and soft skills. Also, Moringa School, Braintree, and many private sector actors, including banks and support networks, are working to solve lack of appropriate digital talent.

Major gaps in soft and technical skills

Despite noted efforts by the education system to reform and upskill curriculums, much work remains. "We are hosting 400 university students", said one respondent from the public sector. "We are guided by Vision 2030", the respondent continues, "We are doing hackathon to expose them to design thinking and to technology that can advance. It is done at IBM research lab. The interns are spread around the country and they are helping government implement the digital leadership programme⁴¹". Some initiatives, such as the Presidential Digital Talent Program and the Education Broadband Connectivity Project for secondary schools, provide a good start but their efforts are not enough to close the existing gaps, especially considering the ever changing learning in new technology and platforms.

⁴¹ Note: The respondent refers to the Presidential Digital Talent Program.

Private sector respondents noted that they have to run extensive training programmes for most graduates, particularly in regard to advanced technical skills. They also felt that academia focuses on theoretical knowledge much more than practical knowledge. Thus, most universities are seen as following outdated curricula and teaching methods. Additionally, while access to soft skills is improving, its distribution is predominantly in major urban areas only.

Talent is predominantly moving to corporate jobs – not into research and innovation

Respondents noted that talents are captive to corporate jobs, and do not engage much in innovation and entrepreneurship. A respondent from the education sector noted, "*Our innovation culture is driven by unemployment and not by the idea of creating patents or solving problems*". One of the main reasons for this is considered to be risk aversion based on issues to secure immediate financial gains. Additionally, while innovation and entrepreneurship is receiving lots of attention, talent is not seen moving into research. This was noted as a major issue by academia, which expressed the view that critical research is missing and without it entrepreneurs cannot develop products and services that are competitive in the long term.

Another perceived reason is the lack of priority given to funding and supporting programmes around research activities, innovation, and entrepreneurship. The perception from stakeholders is that there are very few structural trainings after graduation from any level. Coming out of the higher education system, some respondents believe students have good basic skills but that these must be augmented with further trainings, for example, programmes are needed in mentorship, in creative thinking, in specialized technology such as IoT, etc. Some of these specialized courses aren't available in Kenya. As one respondent shared, "*I had to go to South Africa to get some specialization in my field.*" There is a need to develop a nurturing ecosystem for all kinds of skills in Kenya.

Issues with importing international talent to bridge gaps

Talent migration is an area where Kenya has been slow to make progress. Kenya is in need of high end skills such as engineers, data scientist, some technical skills, and talent with practical experience which can help mentor, support and develop competitive products and services. The short term solution can be found in attracting foreign talent to Kenya. However, migration laws and policies and procedures related to talent acquisition are seen as failing to encourage much needed global talent to migrate to the ecosystem. One respondent from the support network group shared his experience of going to Rwanda to obtain a work permit as an East African Community (EAC) resident, but practicing in Kenya because the process of obtaining such work permits in Rwanda is clear, transparent and cost effective.

To make matters worse, talent is moving out of Kenya to support projects and programmes in other ecosystems. The Kenya ecosystem is seen as regional leader, and its graduates are therefore seen favourably in other countries. Combined with the inability to bring in foreign talent, the ecosystem is in a very fragile position.

Champions exist in the ecosystem but they operate in silos and do not have enough support

While there are many noteworthy champions in the ecosystem, stakeholders feel that their numbers and activities are not sufficient to encourage talent to engage in innovation. Furthermore, many of these champions are working in silos, without engaging with upcoming entrepreneurs to share their journey, expertise and knowledge. The Presidential Digital Talent Programme (PDTP), MasterCard Lab, C4Dlab, iHub and Nailab, Strathmore University, Andela are all regarded as good programmes run by champions in the ecosystem.

3.3.4 Gaps and strengths: Talent and champions

Strengths

With almost 80 per cent of the Kenya population under the age of 35, Kenya has the opportunity to reshape the country landscape in growing qualified talent for the needs of the market. Past efforts by the government, have shown that Kenya can produce good talent and many regional neighbours have been looking to the Kenya talent pool to fill the needs of their respective ecosystems. There are champions within the Kenya ecosystem whose work can be further amplified.

Gaps

Even though everybody seems to embrace innovation, only a very small number is able to embrace entrepreneurship as it requires a large set of new skills. There are very noticeable gaps regarding high-end technical skills, and even more so in regard to soft skills. Very few are moving towards research careers, which would be critical to support ecosystem competitiveness. This unfavourable state is further intensified by the inability to attract qualified foreign talent or to retain high-performing, successful talent and champions in the ecosystem.

Ecosystem stakeholder: "Our techies have solutions but they are very clueless about how to monetize them."

Ecosystem stakeholder: "Young people have some talents, they have energy. But it burns out soon if that energy is not guided or supported to help build good companies."

Ecosystem stakeholder: "They are expertise needed for product design, market research, and governance. Those things need to be guided. Who should guide that?"

3.4 Capital and resources

3.4.1 Literature review: Capital and resources

In a 2015 survey by the Kenya National Bureau of Statistics⁴², respondents noted that foreign investors are attracted to the country due to perceived domestic and regional market growth potential, the legal framework and existing regulations, as well as other factors such as infrastructure. Access to capital and resources has been improving in Kenya over the last few years. The World Bank Ease of Doing Business Report⁴³ ranks Kenya 92 out of 190 in the world, and fifth in the sub-Saharan Africa region. While the country was ranked highly in the ease of doing business category, there are noticeable challenges in the access to finance pillar. Kenya has maintained a relatively high rank in the getting access to credit category, but lost 3 places between 2016 and 2017. Kenya is an underperformer relative to its overall position, ranked 125 in the paying taxes index. Improving access to credit, together with improving tax collection can provide resources for the various programmes that the government needs to fund.

The 2017 Global Innovation Index⁴⁴ shows that in the credit under market sophistication pillar Kenya ranked 22 out of 127 economies due to Kenya's strength in microfinance, however, the investment pillar, market capitalization, and venture capital funding, are seen as weaker. The 2017 Global

⁴² <https://www.knbs.or.ke/publications/#>

⁴³ World Bank Ease of Doing Business Report 2017, at: www.doingbusiness.org/reports/global-reports/doing-business-2017

⁴⁴ GII, at www.globalinnovationindex.org/

Entrepreneurship Index⁴⁵ places Kenya in the 107th position out of 137 countries. It identifies 'risk acceptance' and 'cultural support' as low scoring areas, but considers 'opportunity recognition' as a high scoring area. This indicator shows that entrepreneurs in Kenya face resource barriers, are risk averse, and struggle with cultural issues.

Kenya has addressed some of the resource issues with new programmes for special groups. Notably, new initiatives created the Women Enterprise Fund (WEF)⁴⁶, the Youth Enterprise Development Fund (YEDF)⁴⁷ and the Uwezo Fund⁴⁸. Most of this funding is targeted at *needs-based* entrepreneurship. According to a report on Kenya⁴⁹ by the Dutch Good Growth Fund, traditional SMEs are able to secure some start-up funds, but not subsequent growth funds. However, for high-tech start-up, there is an acute gap in start-up and growth fund. Unlike traditional SMEs, technology start-ups need funds based on the worth of their ideas. But this requires risk capital providers such as government programmes or venture capital. Some risk capital providers such as venture capital firms are known to operate, but they do not provide seed funding for start-ups without proven business models. Additionally, there are no official angel partners in Kenya, although some are known to operate. Without seed funds and venture capital funds, no critical mass of start-ups will exist and the ecosystem cannot attract investment, even from foreign sources as a result of the limited deal flow. Another challenge is exit opportunities for companies. The literature review has provided little evidence of high growth technology start-up success stories in Kenya, let alone their exit to a stock exchange. Without a continuum of funding mechanisms, from seed, to IPO and growth, start-ups will struggle.

Although they are efforts providing funds for organized research⁵⁰, innovation infrastructure⁵¹, and support formation of new firms⁵²; they fall short in meeting capital requirement for the needs of high growth firms. Resources are needed for the research, commercialization, building business support, creating competitive clusters and enhancing programmes for intellectual property rights, standards, and trade.

3.4.2 Pillar strength: Capital and resources

Based on interviews, scores were assigned reflecting respondent views on the strength of talent and champions in the ecosystem. Scores are indicated on a 0-10 scale, which is based on the results of stakeholder views – combining values of 0-2 per question – on whether respondents saw investment in innovation, research, and entrepreneurship being available, whether investment from abroad was possible, and whether capital markets were well developed.

⁴⁵ Global Entrepreneurship Index, at <https://thegedi.org/global-entrepreneurship-and-development-index/>

⁴⁶ www.wef.co.ke/

⁴⁷ www.youthfund.go.ke

⁴⁸ www.uwezo.go.ke/

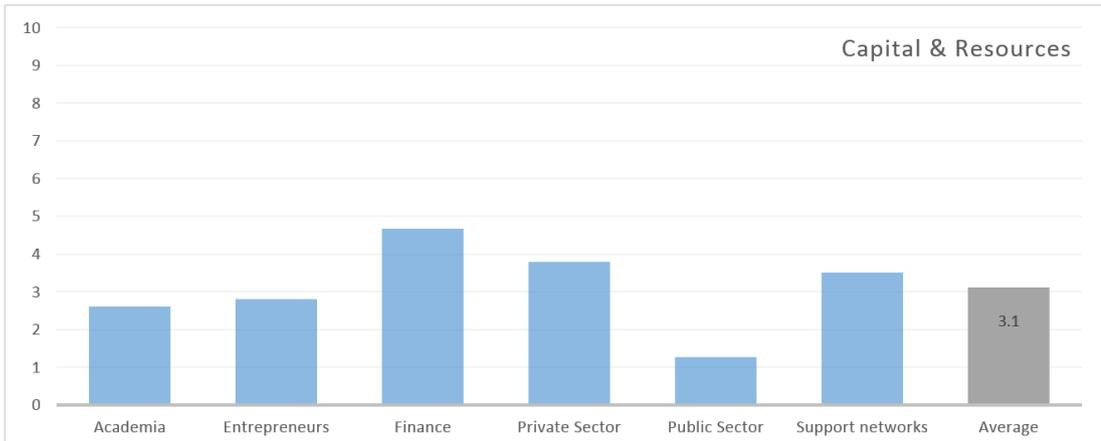
⁴⁹ <http://english.dggf.nl/file/download/40174772>

⁵⁰ www.researchfund.go.ke/

⁵¹ www.mygov.go.ke/kenya-partners-with-south-korea-to-fund-research-university-at-konza/

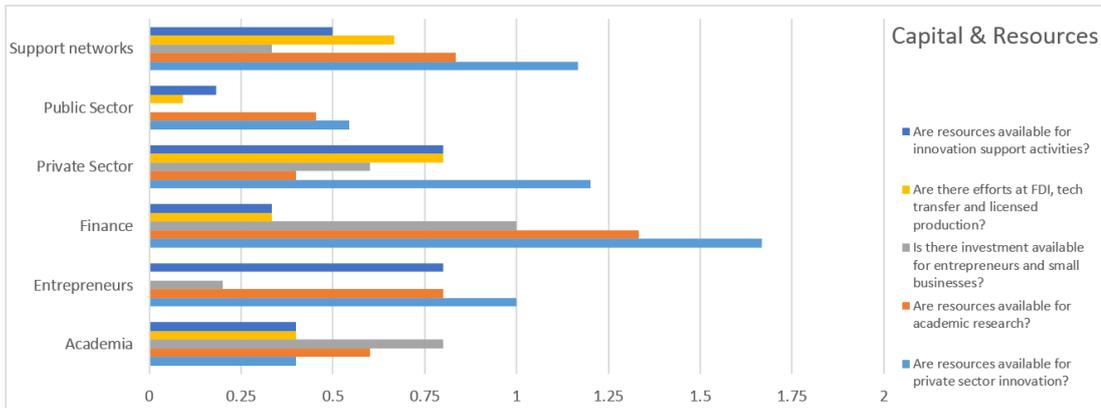
⁵² Youth, Uwezo, and various Funds

Figure 15: Pillar strength by stakeholder group: Capital and resources



Source: ITU.

Figure 16: Pillar strength by survey question: Capital and resources



Source: ITU

The capital and resources pillar is weak due to a lack of resources for innovators and a lack of targeted efforts at attracting foreign direct investment (FDI) and engaging in technology transfer. Stakeholders also identified a lack of resources for both academic and commercial initiatives as a weakness. While a number of resources can be found in the ecosystem, these efforts are largely private sector driven, and they are insufficient for fostering innovation and entrepreneurship at a large scale.

3.4.3 Main points and themes: Capital and resources

Need for strategic funds to support key sectors

Though there are several funds to support SMEs, their purpose and access to funds to support the digital ecosystem is seen as inadequate. The government has recently made notable efforts to explore new funding mechanisms, such as public private partnership in the development of Konza Technopolis. However, such isolated initiatives are not enough to address the widespread resource issues in the ecosystem. Respondents from the private sector noted that no strategic funds are available for core sectors such as green energy, agriculture, or ICT. With respect to the existing funds provided by various entities, entrepreneurs have a low perception and many complained about their transparency and restricted access. Namely the youth fund, the disability fund and the women fund were seen complex and ineffective for the digital ecosystem development.

Concerning international funds, respondents from the support networks believe that start-ups do not know how to structure themselves to access them. They suggested that the government could help start-ups with transaction advice to ease the cost burden. Some domestic funds with international funding source, such as the County Innovation Fund⁵³, received mixed reviews in the ecosystem. The main issue raised is that these type of funds have international goals and they operate in silos.

Resources for research are not translating into innovation

Public universities generate most of the research output in Kenya. Academia reported that they are engaging in basic research, but the majority of research outcome is limited to technical publications. One key reason cited is the fact that the performance contracts used are not incentivizing commercialization of research outcome, but rather promoting technical journals. The lack of research culture is seen as inhibiting innovation. In the words of one respondent from the academia group: "*there is no research happening in Kenya ... People want to make a living; and not sit down and study*". Furthermore, Academia expressed the view that a large portion of the research knowledge developed in Kenya is not used in the country.

With an increasing research agenda driven from abroad, the perception from stakeholders is that the international funding source of some research has an outside commercialization agenda. Domestic research funding with a 2 per cent target of GDP is seen as sufficient if the research agenda can be focused on domestic problems. However, other respondents believe operationalizing this funding through the National Research Fund has been ineffective. Some universities have created initiatives to close the gap in domestic research commercialization. At the University of Nairobi, the C4Dlab stands out for its good practice in pushing commercialization of research.

Efforts to attract foreign direct investment and technology transfer are mostly limited

While there are several efforts in place to encourage foreign direct investment, most of them are perceived as targeting the manufacturing sector and not ICT. The planned ICT sector development has been slow, such as with the infrastructure readiness for the technology park Konza Technopolis. Although the Special Economic Zones have potential, private sector stakeholders noted that there is much room for improvement. Respondents noted that attracting FDI in technology requires a structured approach, and efforts in Kenya were not seen as effective.

Some stakeholders in Academia believe that there are very few beneficial technology transfers in Kenya. Ecosystem readiness for technology transfer is a concern as processes and systems are not in place to conduct beneficial arrangements, and universities are vulnerable due to the lack of resources. Respondents also reported misguided barriers during the technology transfer. These barriers include control of ownership and control of capital. The private sector is leading technology transfer initiatives according to entrepreneurial support groups, but more can be done in the ICT sector. Obtaining work permits, providing investor protection, and simplifying the terms of technology transfer can improve availability of appropriate technology in the ecosystem.

Limited opportunities for entrepreneurs to bootstrap sustainably

Entrepreneurs in Kenya have very limited funding and resources to get started. They reported that they have to rely on winning competitions, or receiving grant money from international organizations, the donor community, or local companies. According to entrepreneurs, traditional finance stakeholders such as banks were perceived as out of touch with their needs. In the word of a respondent from the entrepreneurs group: "if I go to the finance sector and talk about my innovation, they will throw me out of the door with my idea. They will ask me for a piece of land or some asset before they can fund my idea". Other respondents in the entrepreneurial support group believe that some banks are supporting SMEs, but didn't see any viable funding for start-ups except from the three Fs – friends, family, and fools.

⁵³ www.mnhcicf.org/

While competitions and grants play a role in early bootstrapping opportunities, there is a huge perceived gap in funding up to USD 500 000, where some respondents believe venture capital may come in. Although there is some venture capital available in the ecosystem, the entrepreneurial support group recognises that trust with entrepreneurs as often inexistent. The more successful start-ups relied on securing their funding externally. Only very few angel investors are present, and these are not organized or well-known within the ecosystem. One responded noted that "Kenya needs deliverable steps to make people who have money invest in risk capital."

There is noted absence of viable domestic crowdfunding models that work for start-ups. Although international platforms are available for those who can mobilize their network to fund their ideas. BRCK is known to have used such platform to get started. Moreover, many of the resources that enter the ecosystem are driven by an outside agenda, such as international partners. The entrepreneurial support networks struggle with sustainability as soon as the funding from these sources are exhausted.

Domestic funding and investment is not appropriately incentivized

Both domestic and international investment lacks proper incentives. Respondents expressed the view that not enough efforts are made to attract or retain domestic investors. Often domestic investors are perceived to prefer investing in other ecosystems like Rwanda – partly because the environment is more transparent, partly because those countries actively seek out FDI from Kenya. Some of these domestic investors maintain venture capital funds with a regional approach – such as the Savannah fund. Overreliance on foreign funding is seen as taking priority away from domestic investment. In the word of one stakeholder: "*Charity must begin at home. If we are providing incentives to foreign investors, then why aren't we giving incentives to domestic investors?*"

The existing domestic crowdfunding platforms, such as those build around Mpesa, are only effective in supporting limited funds, amounts generally suitable for social businesses. A few success stories are starting to make the case to financial institutions that there is a market opportunity by partnering with start-ups. Notably, one start-up has partnered with microfinance providers to develop new solutions offering credit to farmers.

3.4.4 Gaps and strengths: Capital and resources

Strengths

There is a lot of excitement about the "Silicon Savannah" Kenya is known for, and many start-ups are looking to make Kenya their hub. There are many efforts to encourage international investment with special economic zones. A few venture capital firms are present in Kenya and their efforts appear to be broader, covering several countries. Their networks have a potential to support regional competitiveness for the ecosystem. Some start-ups are partnering with private sector and finance groups to develop B2B solutions.

Gaps

Existing investment in research supports the ICT centric innovation ecosystem. Furthermore, access to capital and resources is limited and there is lack of specific programmes to attract FDI in the ICT sector. While the number of investors is growing, a lot more needs to be done in order to help entrepreneurs to bootstrap and provide them with sustainable funding mechanisms. Consequently, there is a need to improve and develop new instruments and policies to enable new resource platforms for the ecosystem.

Ecosystem stakeholder: "There is lack a private sector playing a role. Government has funding structure but they do need meet the need of entrepreneurs. (E.g., form 20-30 people and a chicken farm, we will give you lots of money)."

Ecosystem stakeholder: "There are no equal opportunities for everyone. Big guys will continue to find more and more resources and investment; small guys don't find much success."

Ecosystem stakeholder: "I know lots of research funded by us but they get IP somewhere else. Somebody is happy to get some fees for research, while someone else gets the big picture."

3.5 Market and networks

3.5.1 Literature review: Market and networks

Kenya has 47.24 million people, a national GDP per of USD 1 455⁵⁴, and a GNI per capita of USD 1 380.⁵⁵ Kenya is member of both COMESA⁵⁶ and EAC,⁵⁷ giving it an estimated regional market size over 500 million people. Looking at the 2017 Global Competitiveness Index (GCI),⁵⁸ Kenya was ranked 96 out of 138 economies, improving from previous years. Compared to its composite rank of 96, the GCI report highlights more positive ranking in market efficiency, financial market development, labour efficiency, business sophistication, and innovation pillars. However, the GCI report also highlights more negative ranking for enabling environment pillars (institutions, infrastructure, and macro-economic context) and human capital pillars (health and education skills). Overall, the Kenya market is generally regarded as efficient, but the market competitiveness is weighted down by Kenya's enabling environment and its human capital contribution. Kenya is classified as a factor driven economy, and a lower middle-income country.

Under the Kenya Vision 2030, steps to increase its market competitiveness have been set out. Kenya enacted the 2015 Special Economic Zone Act with special Incentives to boost exports potential. Besides improving Kenya export capabilities, this initiative is aimed at nurturing competitive industries, fostering linkages between ecosystem stakeholders, and accelerating job creation. Because ICT is a cross cutting enabler and stakeholders face different barriers, special incentives might be required to complement such economic zones.

To address equal market access for government contracts for the youth, the Kenya Government launched a directive in June 2012 to allocate 10 per cent of all government procurement to youth-owned enterprises. In 2013, this rule⁵⁹ was amended to allocate 30 per cent of all government procurement to enable equal opportunities for women, youth and persons with disability. The aim was to enable them to take a more active role in the economy. However, based on a USAID report⁶⁰, perceptions are that the government funds and procurement access are not always transparent. Similarly, a directive to promoting consumption of local products and services has been launched that reserves a minimum of 40 per cent of all goods and services that are procured by the government at all levels have need to be produced locally.⁶¹

⁵⁴ 2016 GDP/capita (current, USD) – See <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=KE>

⁵⁵ 2016 GNI/capita (current, USD) – See: <http://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=KE>

⁵⁶ www.comesa.int/

⁵⁷ www.eac.int

⁵⁸ www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobalCompetitivenessReport2016-2017_FINAL.pdf

⁵⁹ <http://agpo.go.ke/pages/about-agpo>

⁶⁰ www.usaid.gov/documents/1865/kenya-youth-assessment

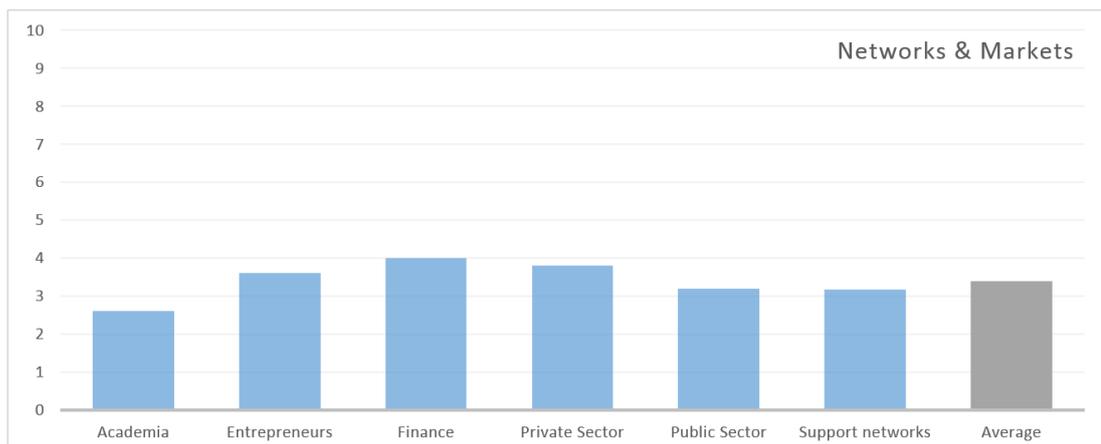
⁶¹ www.trade.go.ke/sites/default/files/BUY_KENYA_BUILD_KENYA_STRATEGY_v2_1.pdf

Understanding key stakeholders in an innovation ecosystem is critical for stakeholders to find resources, to co-create policies, and to develop collaborations. Some efforts were done to map both the SME and start-ups ecosystems, notably in the Argidius foundation report⁶² and the Nailab report⁶³. However, these maps fall short of a *who-is-who* in the ecosystem. Additionally, there is no dedicated formal network helping the ecosystem develop. However, the Kenya Private Sector Alliance⁶⁴ through its ICT committee, can play a role. By contrast, Rwanda has a dedicated ICT chamber with a separate management team nurturing the ecosystem development. Although many associations and organizations- such as KICTANET, KITOS, ISOC, etc. – are active in the ICT ecosystem, they play limited and siloed roles in fostering digital entrepreneurship and innovation. Many informal networks exist and serve the ecosystem well. One such example is the Kenya Innovators WhatsApp group.

3.5.2 Pillar strength: Market and networks

Based on the interviews, scores were assigned reflecting respondent views on the strength of market and networks in the ecosystem. Scores are indicated on a 0-10 scale, which is based on the results of stakeholder views – combining values of 0-2 per question – on whether respondents felt the domestic markets were well developed, whether trade flows were possible, whether public procurement was at an appropriate level, whether they had a clear mapping of the ecosystem, and whether networks were present.

Figure 17: Pillar strength by stakeholder group: Market and networks



Source: ITU

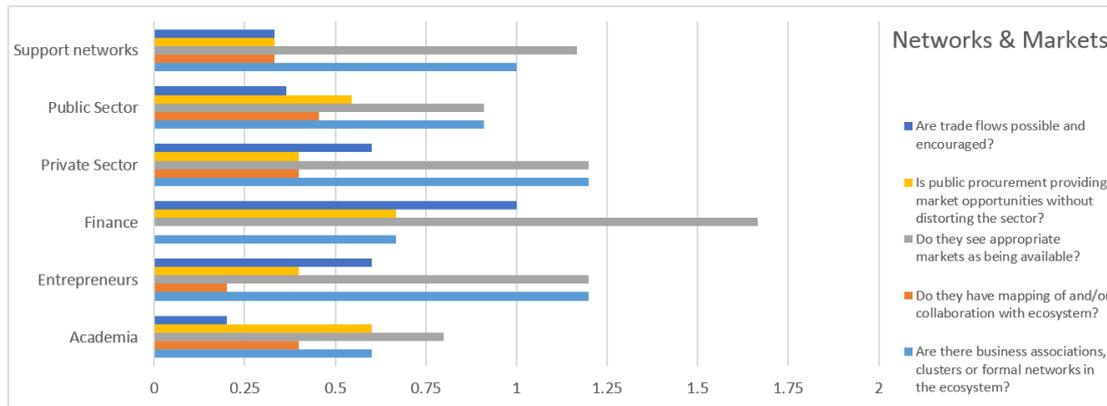
Opinions regarding the markets in Kenya were relatively consistent. Most stakeholders considered access to market as decent in Kenya. Stakeholders do not have a high opinion of public procurement but believe that a good enough opportunity is available for innovators to start in Kenya. Ecosystem mapping is not available according to most respondents, which prevents networks effectiveness. Trade flows support also received a low opinion.

⁶² www.argidius.com/wp-content/uploads/2015/03/Argidius_Kenya_Landscape_Public.pdf

⁶³ The Kenya ICT Startup Landscape, Nailab and ICT authority, 2016

⁶⁴ <http://kepsa.or.ke/sector-comittees/>

Figure 18: Pillar strength by survey question: Market and Networks



Source: ITU.

3.5.3 Main points and themes: Market and networks

Domestic and international markets are available but innovators need opportunities to engage

According to a private sector respondent, "markets are available but you need to have a smart innovation as well". All stakeholders feel that there are many opportunities both in Kenya and regionally via the various economic communities. Many companies based in Kenya were successful in entering other markets such as Rwanda, Tanzania, Uganda, and Zambia. However, as one stakeholder said: "much of the opportunities are seen at the low and middle income sectors; and innovators tend to ignore them". Addressing these type of opportunities might require partnership with established firms "going to the market is an expensive task, which is why a lot of people come to us and leave that task to us because we know how to work in the market." For start-ups, lobbying capabilities, access to network resources, and access to existing customers are all seen as barriers to reaching sustainability.

Despite a start-up ability to develop app-based and web solutions, they also need partnership to engage with customers. Finding their first customer is not seen as the problem, but finding a market opportunity is. A few start-ups have been successful targeting low and middle income customers by fostering the right partnership between their start-ups and private sector. One such partnership led to the creation of micro-finance solutions such as micro-credit application, insurance, etc. Another opportunity for innovators is public procurement. With the country in the process of automating all its processes and citizens services, domestic procurement offers opportunities for innovators. Central government efforts are noted, especially with the procurement laws, but local government is lagging behind.

Market access and perception are issues

Respondents in support groups noted that public sector needs to provide bootstrapping opportunities so entrepreneurs can validate their business. "When government doesn't buy, the innovator doesn't get references, do not get to make mistakes, doesn't allow to have to sell to export to export market." Despite, recent effort by government to address market inclusion for youth, women, and persons with disabilities; public procurement is perceived distorted and inefficient. One distortion is a potential bias by procurement officers for established solutions. As one public sector stakeholder said: "They may be either unwilling to read the laws correctly or not take a risk with new solutions. They may prefer the safe choice with the big companies."

Additionally, entrepreneurs and SMEs also need to build the right solutions. But respondents also expressed the view that entrepreneurs may not have access to the right problem to solve the right needs. Efforts to engage innovators are underway by some public sector champions such as the Kenya Revenue Authority (KRA), the ICT Authority (ICTA), and the Communications Authority (CA).

In addition, academia respondents expressed the view that the lack of trust of innovation in Kenya is a critical factor. Students are seen as able to develop solutions, but finding a market for these solutions is difficult: *"They create apps on Google Play, but Kenyans don't trust local developers"*. Thus, Kenya is seen as relying too much on outside solutions instead of those from within the country. There are efforts to address this with the *"Buy Kenya-Build Kenya"* and *"brand Kenya"* initiatives, but the impact is not felt in the digital ecosystem.

Need for structured networks to support scaling of innovation

Entrepreneurs reported that there are not enough support organizations to help guide them. Doing business inside the country or regionally is expensive. Access can be expensive for someone starting a business, and it is even more costly for a start-up outside Nairobi. Regional support networks exist but mostly facilitate services for their membership. **Organization such as the Kenya IT and Outsourcing Society (KITOS) and Kenya Private Sector Alliance (KEPSA) are perceived as not well structured enough to support digital innovators.** Some organizations such as KENET are seen as successful in promoting uptake of technology use in universities. There are networks that provide valuable opportunities in the ecosystem, including KICTANET, KITOS, Internet Society, Startup Grind, MeetUps, mLab, Nailab, Demo for Africa, Gear Box, Fablabs, banking associations, and various developer networks and associations. In addition, many domestic and international networks are uncoordinated in their agenda.

Entrepreneurs expressed shared pain concerning the lack of an 'ecosystem yellow pages'. To put it bluntly, one stakeholder said: *"Sitting in the seat of an entrepreneur, one of the things that makes us moves slow is the lack of information on where to get funding. We need people to guide us even though we're past the point of an incubator"*. Without information about to how get started, to understand IP, to find resources including funding and mentors; the ecosystem growth is slower.

Need to promote innovation for global export

The capabilities to promote and support innovation for global export is a barrier for some entrepreneurs. *"If I have created a good ICT product today, I'd like to target Nigeria, Uganda and Tanzania to reach out to a larger customer base. A population of 40 million people seems like a lot in Kenya, but good products coming out of United States and India have a reach of 300 million"*, said an entrepreneur. **Besides branding the issues, trade policies are not supportive enough of innovation in Kenya.** *"There needs to be a more targeted trade. I mean, I wonder sometimes, why a trade delegation is coming from Ukraine"*, and other respondents expressed the need for improved communication and access to a comprehensive trade facilitation platform. A trade support framework was lacking in the views of many.

3.5.4 Gaps and strengths: Market and networks

Strengths

Kenya is well connected regionally and is growing rapidly. This is seen as offering market opportunities to nurture the development of globally competitive solutions. A few private sector stakeholders are able to partner with entrepreneurs and start-ups to create new B2B services or appropriate solutions targeting the domestic market. Efforts are underway with public sector stakeholders to address equal market access for innovators, and to build Kenya as an innovation brand that can create appropriate solutions for both domestic and global export markets.

Gaps

Despite enthusiasm and efforts by champions to support market access, more is needed to focus the existing initiatives and support development of key sectors. Additionally, **innovation in Kenya** has a brand perception issue compared to international players. Efforts to foster better procurement support for youth and entrepreneurs are not seen as effective, and some stakeholders see a need to encourage collaboration and develop networks.

Ecosystem stakeholder: "There are too many networks and communities working silos. The hubs are the only places where there's an attempt to get people to come together to talk."

Ecosystem stakeholder: "The markets are there but there is no guidance for entrepreneurs to target these markets and leverage the opportunities."

Ecosystem stakeholder: "When government doesn't buy, the innovator doesn't get references, doesn't get to make mistakes, doesn't allow learning and cannot export."

3.6 Culture and communities

3.6.1 Literature review: Culture and communities

The weak performance in cultural support, risk acceptance, and start-up skills pillars, and according to the GDI pillar definitions, entrepreneurship is seen as risky either due to corruption issues or unfavourable job status. In Kenya, corporate jobs are highly preferred for cultural reasons, but the private sector cannot meet demand. Due to limited jobs, youth is turning towards entrepreneurship without being fully prepared for it. According to the *Workforce Connections: Kenya Youth Assessment* report⁶⁵ released by USAID, the majority of young people are entering the labour market through informal sector apprenticeships. According to the same report, there are several perception issues among the youth when it comes to entrepreneurship. For example, some groups believe that the only way to be economically productive when starting a business is to receive a grant. This is indicative of early stage entrepreneurial cultures. Both the GEI report and the USAID report points to the lack evidence of a strong entrepreneurial culture, albeit one that is focused on opportunity development supported by a strong business culture.

Development of ecosystem communities has been fuelled by support from stakeholders in public, private, academia, and the media. Success stories of entrepreneurs⁶⁶, and stakeholder events⁶⁷ have catalysed the enthusiasm for the ecosystem. Specific communities such as those built by women entrepreneurs⁶⁸ are strengthening diversity and equality in the ecosystem. Thus, there is evidence of a developing entrepreneurial culture supported by various communities within the ICT ecosystem.

3.6.2 Pillar strength: Culture and communities

Based on the interviews, scores were assigned reflecting respondent views on the innovation culture in the ecosystem. The scores are indicated on a 0-10 scale, which is based on the results of stakeholder views – combining values of 0-2 per question – on whether respondents were part of communities in the ecosystem, whether they were aware of regular gatherings, how they saw perceptions of entrepreneurship, risk and failure, and their views on diversity in the ecosystem.

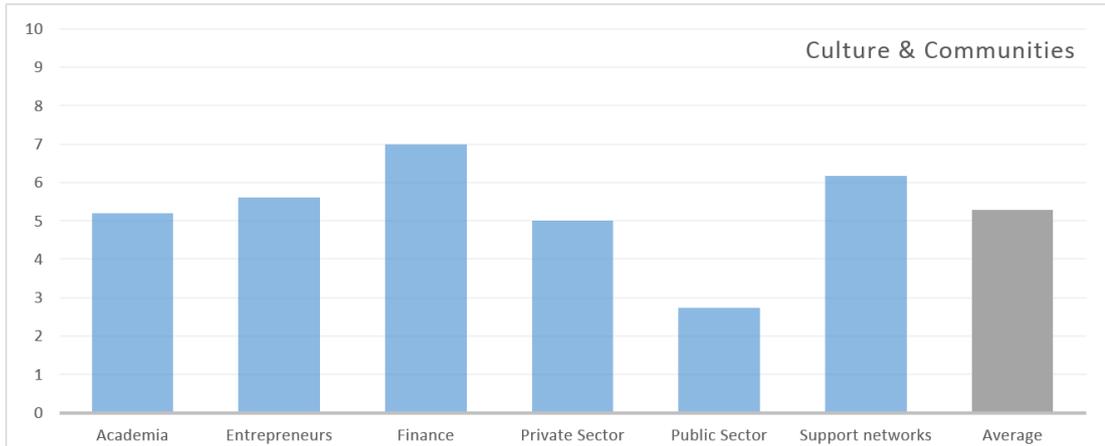
⁶⁵ https://www.usaid.gov/sites/default/files/documents/1865/Kenya_Youth_Assessment_Final_Report.pdf

⁶⁶ <http://enterprise54.com/10-top-young-kenyan-entrepreneurs-in-technology/>

⁶⁷ <http://innovationweek.co.ke/>

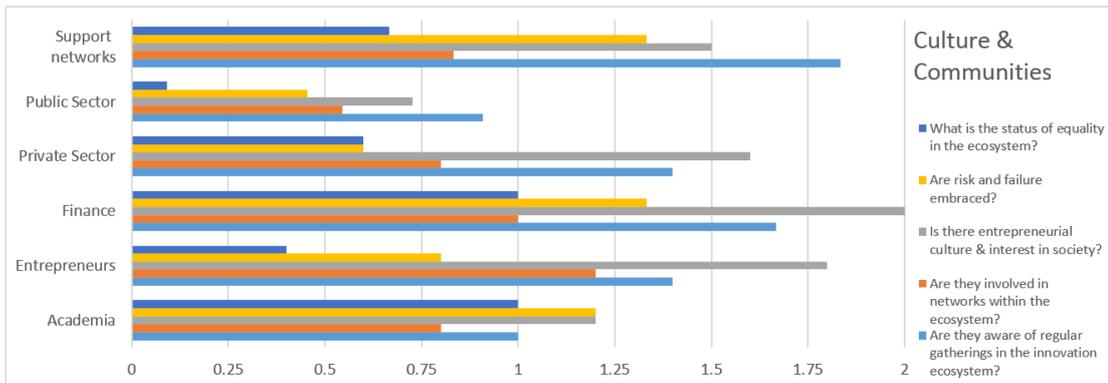
⁶⁸ www.hapakenya.com/2014/07/31/top-10-kenyan-women-tech/

Figure 19: Pillar strength by stakeholder group: Culture and communities



Source: ITU.

Figure 20: Pillar strength by survey question: Culture and communities



Source: ITU.

Views on culture and community in Kenya were largely in sync across the stakeholder groups though the public sector rated the pillar lower than the others. There is high interest in entrepreneurship in the country. While Kenyans are willing to take risks, failure are not well perceived. There is also a visible gender divide when it comes to ICT entrepreneurship and representation of women in the sector. Furthermore, most groups felt that communities were well engaged in networking and events that support the ecosystem.

3.6.3 Main points and themes: Culture and communities

Entrepreneurial culture is developing but at early stage

There is a lot of enthusiasm about entrepreneurship in Kenya. Respondents noted that everyone is excited in the ecosystem, and participating in various events, competitions, hackathons, etc. "entrepreneurship is a mantra. It feels a bit too much though- not everyone can be an entrepreneur". Entrepreneurship has been glorified, leading to misalignment in expectation.

In regard to the type of entrepreneurship, respondents expressed the view that people have a habit of building side businesses in Kenya. These could be small or big businesses, playing intermediaries, or simply trading. On one hand, the lack of jobs is pushing people to capitalize on opportunities and seek income. In doing so, respondents said that many fail and go back to regular jobs. On the other hand, some small success stories keep the enthusiasm in the ecosystem going. The majority is seen failing due to low bootstrapping opportunities from support services, resources and cultural barriers.

Entrepreneurs are learning the entrepreneurial way of failing and trying again, thus the entrepreneurial culture is seen as developing.

Communities of entrepreneurs are developing around events and projects

Groups and communities are beginning to develop around specific issues or problems. These communities are largely developing around programmes and events such as NaiLab, Demo Africa, Nairobi Innovation week, ICT week, business conferences, Meetup, and a few public sector innovation gatherings, to cite a few. Most events are seen driven by non-public stakeholders; although the public sector supports a few such as the National Science Week and the Tax Summit. Organizers primarily drive the agenda of such events, but all serve well as informal networks and relationship opportunities for ecosystem.

Existing communities have a good competitive spirit but not yet as vibrant or sustainable. Entrepreneurial support group noted that the spirit of collaboration is often lacking. Despite the increasing number of gathering, some respondents are not convinced about the maturity of the start-ups. As investors are not able to cash out on their support of the ecosystem activities, they are undecided whether to fund further activities. And as many of the events are seen as 'social events' and 'marketing gimmicks', the communities in Kenya have room to grow in order to achieve sustainability and vibrancy.

Risk aversion depends on circumstances and opportunities

Many investors in Kenya are willing to take risks, albeit out of necessity rather than choice. Respondents noted that people are willing to accept failure because they have nothing to lose. Youth unemployment is high in the country, and public and private sector jobs are not growing at a rate that can meet the demand. Among the older generations, risk aversion remains more pervasive, making entrepreneurship a less likely path "*I think risk and failure are almost celebrated. It doesn't stop young people*". Most respondents see growth in failure, and that failing is accepted in general but not necessarily welcomed. Many fail and go back to general employment, but serious entrepreneurs continue exploring their opportunities.

Very few stakeholders have developed an appetite for risk management, including entrepreneurs, finance, and the private sector groups. More challenging for the ecosystem is the perception of risk taking for an investor. In the words of one respondent, "*If you tell an investor you've tried something twice, the investor will think you're not sure of yourself. He will ask you why it took two turns to get it right.*" Thus, the risk mindset supporting an entrepreneurial community is seen as lacking. One key reason is the low availability of risk investors such as angels, seed finance stakeholders, and early stage venture capital funds. Overall, demographics, an enabling environment, success stories, prospect for jobs, and access to opportunities are all impacting on risk aversion.

Programmes targeting the gender divide exist but rural communities lack representation

Notable efforts are underway from the public sector and other stakeholders to increase inclusiveness in the ecosystem. Programmes exist for access to government procurement by specific groups such as youth, women, and person with disabilities. Other notable efforts include the MobiGirls initiative to expose women to the idea of technology, private sector internships programmes, etc. Another initiative is Akirachix, which grew out of community of women talents in technology. However, some of these programmes are mainly accessible in Nairobi.

Rural community participation in the ecosystem is low. "*Poorer and rural communities are not well represented. Organisations have taken an interest in these groups, but it can get better... special needs and people with disabilities also need to be looked at*". While acknowledging that the ecosystem is overwhelmingly male dominated and urban centric, some respondent see the root cause for the divide in the education system. Others see cultural biases as the culprit for this divide.

3.6.4 Gaps and strengths: Culture and communities

Strengths

The culture of entrepreneurship is beginning to develop in Kenya. People in the country, especially the youth in the field of technology are willing to take risk. Communities are building around informal networks at events and various gatherings. Some of the informal networks are able to structure themselves and provide various services to their members.

Gaps

There is need to foster and support many of these informal networks and to build up stronger communities in the ecosystem. There are some cultural barriers to entrepreneurship in Kenya. While the youth is open to risk, the older generation is not. Many in Kenya are not intrinsically motivated to become entrepreneurs but are forced to start their enterprises due to a lack of jobs. Furthermore, representation of women and rural communities is low in the ICT innovation space, and they lack resources to be effective.

Ecosystem stakeholder: "If you come up with 10 start-ups and fail at two, people will only notice the ones you failed at."

Ecosystem stakeholder: "There is a very strong culture of entrepreneurship in Kenya but it has mostly to do with lack of jobs in the economy."

3.7 Policy and regulation

3.7.1 Literature review: Policy and regulation

Kenya adopted a national ICT policy⁶⁹ in 2006 with the broad aim to harness the potential of ICTs for economic growth and poverty reduction by concentrating on infrastructure development, human capital, stakeholder participation, and appropriate policy and regulatory frameworks. Kenya Vision 2030 was then developed to guide the national development, to build the ICT sector, foster STI, and leverage ICT as a cross-cutting enabler to accelerate the development and competitiveness of other sectors. The development of a framework to implement the Big Four plan for 2018-2022 offers a great opportunity to create further enabling policies that will foster the ecosystem.

The first five-year Medium Term Plan⁷⁰ delivered under Kenya Vision 2030 showed that many policies have helped to stimulate the development of the ICT innovation ecosystem and laid the foundation for further growth. Other notable policy documents, including the Connected Kenya 2017 Master Plan⁷¹ later revised as the ICT Master Plan 2017⁷², the ICT Master Plan 2017⁷³, and the National Broadband Strategy⁷⁴, have also played key roles in both hard and soft infrastructure development. To address existing challenges in enabling infrastructure, Kenya undertook specific measures such as public private partnership investment, liberalisation, unbundling of network and services, and incentives for incubation centres. These efforts have paid off and have enabled hard infrastructure development. However, soft infrastructure build-up has been slow, and evaluation of projects such as the

⁶⁹ www.researchictafrica.net/countries/kenya/National_ICT_Policy_2006.pdf

⁷⁰ Medium Term Plan 2008-2012, Government of Kenya

⁷¹ www.cofek.co.ke/National%20ICT%20Kenya-2017-Master-Plan.pdf

⁷² <http://icta.go.ke/national-ict-masterplan/>

⁷³ <http://icta.go.ke/national-ict-masterplan/>

⁷⁴ http://icta.go.ke/pdf/The_National_Broadband_Strategy.pdf

Technology Park⁷⁵ and the digital villages⁷⁶ show mixed reviews. To remove additional barriers facing the ecosystem, many new policies and strategies have been drafted, including a new ICT policy⁷⁷ and a national cloud computing strategy⁷⁸. However, these documents have yet to see approval through the executive and legislative processes.

Concerning procurement laws, in response to challenges faced by certain groups, Kenya has developed the access to government procurement⁷⁹ (AGPO) regulations to enable equitable access to government procurement contracts. However, these measures are not doing enough to foster demand of innovative solutions such as cloud services in the public sector. Further work is needed to stimulate public demand of innovative ICT solutions, especially those coming from local Kenya innovators and their technology SMEs.

In regard to innovation policies, a new policy framework for STI⁸⁰ was developed in 2012 to remove barriers such as unfocussed research agenda, inadequate funding, presence of weak innovation institutions, over reliance on external resources, poor industry and academia linkages, lack of a monitoring and evaluation framework, and weak science culture. As a result, Kenya has strengthened its STI governance framework, through new agencies including the National Commission for Science and Technology (NCST)⁸¹, the Kenya Innovation Agency (KENIA)⁸², and the National Research Fund (NRF)⁸³. The STI policy framework also advocated several measures to be taken including co-funding of innovation and commercialization, developing a framework for venture capitalists and angel investors, developing a mechanism to retain the highly talented and attract the best from the diaspora, and enhancing creativity and learning by discovery through developing entrepreneurship skills. Kenya has developed a well-orchestrated national innovation system, however many of the articulated measures such as the venture capital framework have yet to be operational through specific programme and policy support.

⁷⁵ www.konzacity.go.ke/the-vision/history/

⁷⁶ Pasha Project Handbook, ICT authority : <http://icta.go.ke/pasha-project-handbook/>

⁷⁷ <http://icta.go.ke/national-ict-policy/>

⁷⁸ www.c4dlab.ac.ke/2015/06/how-kenya-will-transition-to-the-cloud/

⁷⁹ <http://agpo.go.ke/>

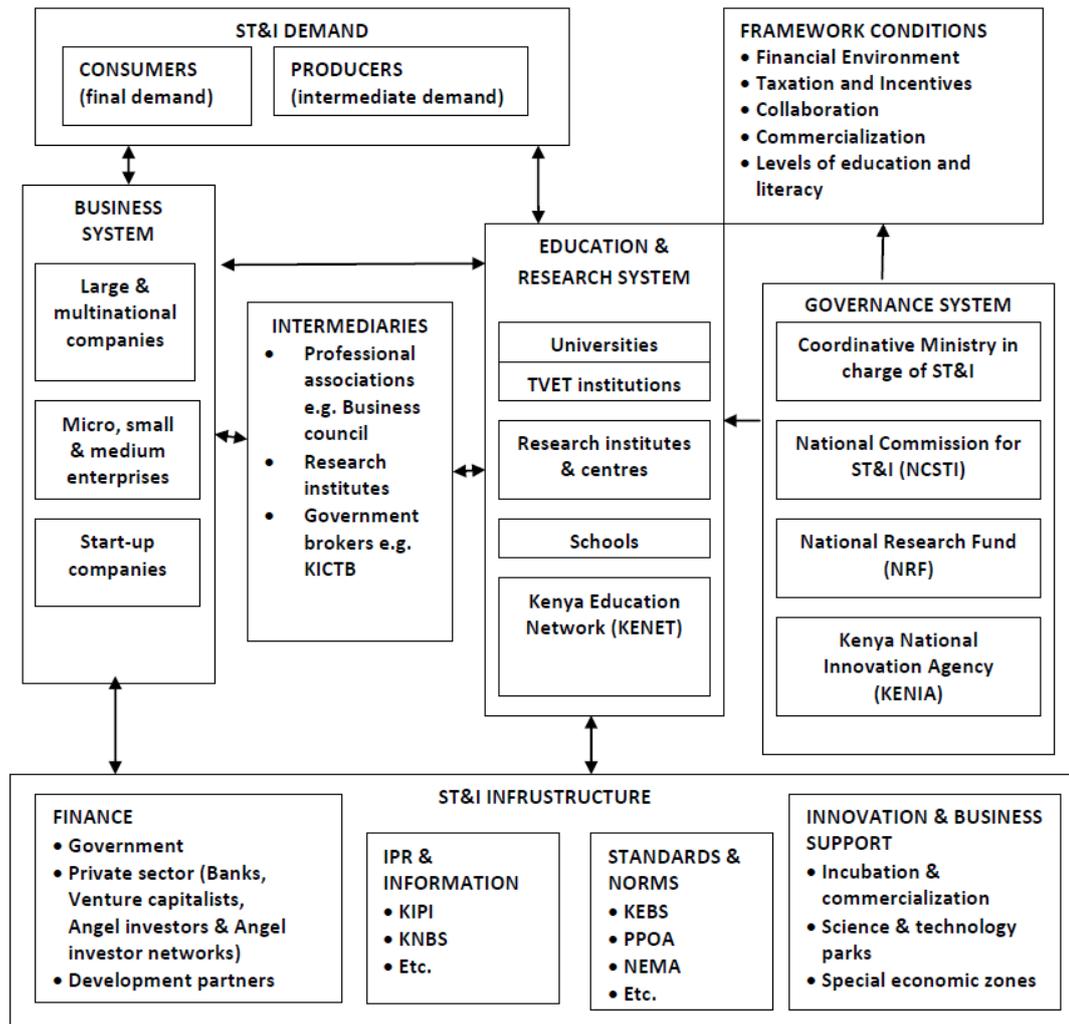
⁸⁰ Policy framework for Science Technology and Innovation, 2012, Government of Kenya https://www.strathmore.edu/wp-content/uploads/2016/10/sti_final_policy_draft-1.pdf

⁸¹ www.nacosti.go.ke/

⁸² www.innovationagency.go.ke/

⁸³ www.researchfund.go.ke/

Figure 21: Major components of Kenya national innovation system



Source: Ministry of Higher Education, Science and Technology, Kenya

In regard to R&D policy, according to a March 2016 World Bank economic report⁸⁴, research spending by Kenya firms are at least 40 per cent lower compared to firms in Ghana, Egypt, or South Africa. Total R&D spending was equivalent to just 0.5 per cent of company revenues, with the vast majority spent on internal research. Furthermore, the Global Innovation Index 2017 report⁸⁵, Kenya ranked 80 of 127 countries with an efficiency ratio of 0.66. This low efficiency ratio highlights inefficiencies in the ability to translate innovation input (such as R&D USD) into effective innovation output (such as patents). Additionally, Kenya has very few specialized examiners available to handle patent applications. Together these factors contribute to an underperforming innovation system in Kenya. In fact, data reported by Kenya Industrial Property Institute (KIPI)⁸⁶ stakeholders revealed that very few patents are filed by entrepreneurs, SMEs or universities, and over 75 per cent of patents have foreign application origin.

Concerning SME policies, Kenya enacted an SME law⁸⁷ in 2012 that provides for the promotion, development and regulation of micro and small enterprises (MSE). This law also established the MSE

⁸⁴ www.oxfordbusinessgroup.com/news/kenya-pushing-rd-higher-education

⁸⁵ <https://www.globalinnovationindex.org/gii-2017-report>

⁸⁶ www.wipo.int/edocs/mdocs/mdocs/en/wipo.../wipo_ip_hre_12_ref_tbc1kenya.pdf

⁸⁷ Micro and Small Enterprises Act of 2012, Kenya

Authority, a dedicated agency with objectives of nurturing the business environment, inspiring an entrepreneurial culture, facilitating formalization, promotion of representative organizations, and upgrading of the informal micro and small enterprise sector. However, studies by a Kenya think-tank⁸⁸ has shown that this new agency has struggled to secure resources for the planned MSE fund from parliament. Furthermore in reviewing their current programmes⁸⁹, more effort is needed to meet expectation, namely to enhance coordination of sector players and embrace information and communication technology in all sectors.

Regarding finance policies, Kenya laid out specific measures and key investment targets to develop financial enablers in support of Kenya Vision 2030. In 2013, a public private partnership act⁹⁰ was adopted to foster FDI and private investment. Specific new funds were created as a result, including the Women Enterprise Fund (WEF)⁹¹, the Youth Enterprise Development Fund (YEDF)⁹² and the Uwezo Fund⁹³. A comprehensive financial sector reform project was expected to stimulate resource mobilization and to support the key flagship projects under Kenya Vision 2030. Kenya has seen some success in attracting infrastructure funding, however it is struggling with attracting risk investment. More notably, the STI policy called for specific new framework to attract venture capital, angels, R&D co-funding which have yet to deliver results. Additionally, although efforts were made in supporting innovation and entrepreneurship in non ICT sectors, they fell short in expanding capital requirement for the needs of the ICT centric innovation ecosystem.

In regard to trade policy, the newly revised 2017 national trade policy (NTP⁹⁴) and the updated 2017-2022 national export development and promotion strategy (NEDPS⁹⁵) seek to mainstream trade support of SMEs in global trade, improve performance of their value chain through leveraging business process outsourcing and information technology and IT enabled services. In exploring the related policy documents, Kenya has acknowledged that SMEs face many challenges including market access, credits access, business skills, non-tariff barriers, trade facilitation, to cite a few. With Kenya being signatories to many international treaties, the government has set a clear vision to mainstream e-trade within the overall economy. However specific strategies and programmes supporting this vision remains elusive. The policy documents refer to complementary ICT policies, but fall short because existing programmes are siloed to enable e-commerce development, and new ones are needed to integrate the ICT value chains with the SME value chains. For example, programmes such as *Brand Kenya*⁹⁶ and *Buy Kenya-Build Kenya* have low engagement with stakeholders in the ICT centric innovation ecosystem. Thus, more efforts are needed, namely to nurture development of business-to-business (B2B), and business-to-consumer (B2C) and government-to-citizen (G2C) services connecting SMEs and Kenya innovators to global markets.

Kenya Vision 2030, and various policies by the government of Kenya have led to significant reforms and contributed substantially to the growth of infrastructure, programmes, FDI, resource access, and development of new STI stakeholders. Many programmes are still uncoordinated, especially regarding the needs of the digital innovation ecosystem. Specifically more work is needed to secure appropriate resources, enact missing policies, and create new integrative programmes that can accelerate the transformation towards the Kenya Vision 2030 goals.

⁸⁸ www.ieakenya.or.ke/publications/research-papers

⁸⁹ www.mseauthority.go.ke

⁹⁰ www.treasury.go.ke/guideline.html?download=604:public-private-partnership-act-2013

⁹¹ www.wef.co.ke/

⁹² www.youthfund.go.ke

⁹³ www.uwezo.go.ke/

⁹⁴ National Trade Policy 2017, Government of Kenya

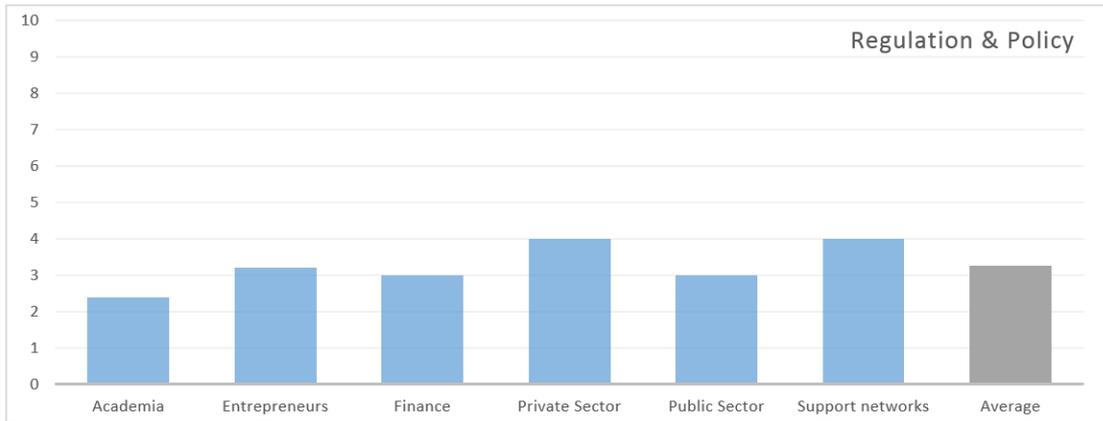
⁹⁵ <http://kepsa.or.ke/download/national-export-development-and-promotion-strategy/#>

⁹⁶ www.brandkenya.go.ke/

3.7.2 Pillar strength: Policy and regulation

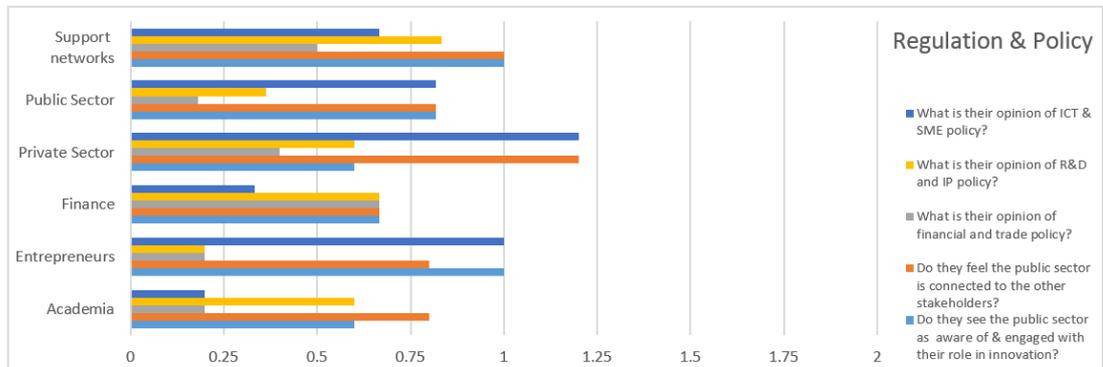
Based on the interviews, scores were assigned reflecting respondent views on the strength of talents and champions in the ecosystem. The scores are indicated on a 0-10 scale, which is based on the results of stakeholder views – combining values of 0-2 per question – on whether respondents felt policy in IP and R&D, ICT and SMEs, and finance and trade were appropriate, and whether they saw the public sector as being well connected and aware of their role.

Figure 22: Pillar strength by stakeholder group: Policy and regulation



Source: ITU.

Figure 23: Pillar strength by survey question: Policy and regulation



Source: ITU

The private sector and support networks have a better overview on policy issues than most other groups, which is reflected by their diverging concerns depending on their particular foci and experiences. Most stakeholders feel that the public sector is aware of its role, but its engagement is both disconnected and fragmented. Conversely, none of the groups have a good opinion about R&D or IP policies in Kenya, and expressed a strong need for increased resources for the former and improved awareness about the latter. Stakeholders regard financial policies to be good, but that a lot more can and needs be done to incentivise investment and ease taxation.

3.7.3 Main points and theme: Policy and regulation

Public sector is aware but low on engagement, and the ecosystem lacks trust

The public sector is seen as aware of its role in the ecosystem; it has created a number of new institutions to lead activities under the Kenya Vision 2030, such as the Kenya Innovation Agency. However, some stakeholders noted that the public sector is not proactive in reaching out to other stakeholders.

The engagement of the public sector is seen driven by the performance contract on innovation. Government institutions are creating some activities around it, but these activities are seen as deficient in respect to outcome, outreach, and alignment. Some respondents expressed the view that non-public stakeholders initiate most of the engagement to solve their pressing needs and this may leave many others untouched. But there are some noted exceptions to this directional outreach, as institutions like the Kenya Revenue Authority, the Ministry of ICT and its related authorities (ICTA and CA) are actively reaching out and working with the ecosystem.

Respondents also noted that many policies are outdated and do not support the digital innovation ecosystem. Overall, many stakeholders felt excluded from participating in the policy making process with many describing some of the reasons as lack of awareness and interest. The public sector expressed a different opinion and noted that all consultation mechanisms are open and transparent, but only big companies take part. Entrepreneurs can be involved with the public sector if there are clear and transparent mechanisms to support the ecosystem. These views were supported by many respondents who noted the lack of trust between government departments, and between the public and private sectors. The lack of awareness and trust seems to lead to low engagement in the ecosystem, and these challenges are seen as widening the gap between public sector, innovators and the private sector.

Enforcement, awareness, and support for intellectual property is needed

Though there is IP legislation, the policy is seen as insufficient and requiring guidance. Stakeholders have a much muted attitude towards intellectual property in Kenya. Reasons for this include: challenges in awareness, transparency, complexity and cost of applying for patents. Most intellectual property in the country is from international companies protecting themselves in the Kenya market – such as the pharmaceutical industry. Bigger companies – like local telecommunication companies – are able to protect and defend themselves, while smaller firms, start-ups, and entrepreneurs are struggling.

Multiple institutions – such as KIPI, the Kenya Copyrights Board (KECOBO), and the required technology transfer offices of universities – are tasked to guide innovators in this area, but they are seen as working in silos and do not possess the resources needed to develop and provide adequate guidance. Evidence for this being that most innovators are generally unaware of the right protection mechanisms and the choices available. A few entrepreneurs reported to have been given access to intellectual property trainings from entrepreneurial support groups, like those offered by NaiLab. Resources and professionals in the field of intellectual property are reportedly scarce. There is a need for intellectual property lawyers, ICT intellectual property experts, judges, et cetera. This combination of factors contributes to challenges in intellectual property protection and enforcement including a backlog of cases in the legal system.

Perceived unfair taxation, and lack of incentives and policies

To allow early-stage start-ups to grow, entrepreneurs and private sector groups feel that the government needs to relax or simplify certain policies, such as taxation. In the words of one respondent *"We lack a clear policy by the government on how to support innovations. When youth comes up with innovation ideas, they are not supported and so their ideas do not mature. We need to have clear policies to support and help develop initiatives."* Present policies are seen as focused on urban centres, although the existence of certain isolated incentives at the rural level was noted. Some stakeholders acknowledged public sector efforts to be more business friendly, including efforts by the ministry of industrialization and enterprise development. To accelerate nurturing the ecosystem, respondents expressed the view that the government should prioritize and act on policies pending legislative or cabinet approval such as the new ICT policy.

Many domestic institutions, such as pension funds are potential sources of funding, but respondents believe these institutions are missing incentives to engage. Some respondents noted the existence of funds from various domestic and international sources including foreign venture capital, but these were not accessible to the ecosystem, due to risk perception, appropriateness of the funding, or the lack of

fundamental accompanying services such as transaction advice. Providing incentives for investment in the ecosystem and reducing cost burdens for entrepreneurs would encourage more young people to start the journey of entrepreneurship and create a critical mass of new firms in the ecosystem.

Strict financial regulations, unclear support and coordination to foster digital innovation

The financial sector is seen as firmly regulated and not conducive to innovation. Strict rules from banking regarding collateral, as well as restrictive policies with respect to new technology, are barriers for many banks to innovate financial products. Fintech is seen as safer investment for the sector as emerging technologies have fewer regulatory barriers. However, respondent noted that innovators come up with some really good solutions but they do not know who to go to for approval, as coordination of regulation can be unclear for some areas of digital innovation, such as fintech – and no central mechanism or platform to consult for guidance exists, which leads to confusion. As an example, they noted that the Communications Authority regulate mobile app, while the Central Bank regulate finance tools. Without coordinated effort by all stakeholders, private sector expressed the view that, the banking systems will continue to be weak as evidenced by recent cyber hack at banks in Kenya.

There is a notable gap in the continuum of resources including risk capital, special sector funds and crowdsourced funds. In general, financial policy is seen improving, as evidenced by the recent government cap on high interest rates from bank rates. However, more incentives are reportedly needed to attract new resources in the ecosystem.

SMEs need support services and private sector driven policies to be competitive

SME policies are seen failing because existing funds and programmes are perceived as neither sufficient nor inclusive to support their growth. However, larger firms are reported having access to more resources to grow. Both of these conditions lead to what one stakeholder called the Mathew effect: "Firms who are big enough continue getting more attention and resources, while new firms are left out." Existing services and programmes from the public sector are seen as too uncoordinated to generate impact and not inclusive of the ICT sector. Additionally, there is no harmonized process in ICT policy to support SME. For example, dedicated efforts are needed to nurture B2B services and e-commerce platforms beneficial for the ecosystem. There are missing resources to enable SME growth and increase competitiveness through support services for quality control, standards, import of needed hardware, and development of prototyping centres.

3.7.4 Gaps and strengths: Policy and regulation

Strengths

The public sector has recognized its role as a stakeholder in the ecosystem. Various policies exist or are underway, and alignment through the performance contract has generated some much-needed focus on innovation across various public sector actors driven by the strong and ambitious Kenya Vision 2030. Specific government institutions are actively working with the ecosystem, and engaged in co-creation of initiatives together with other stakeholders. Many new laws, new programmes, new institutions and initiatives are starting to address broader issues for all sectors. And where gaps exist, ecosystem champions are stepping up their efforts to address the challenges.

Gaps

The engagement of the public sector with other stakeholders however was one-sided and driven by non-public sector actors. Collaboration between the various public stakeholders was seen to be lacking, because many programmes were perceived as uncoordinated or overlapping. Certain laws, notably tax policy and specific areas of regulation – such as ones related to financial businesses, FDI, research, intellectual property, SMEs – were reported to not be conducive to digital innovation and entrepreneurship.

Ecosystem stakeholder: "We have 43 banks but no bank will grant credit on the basis of an idea. The government needs to incentivize investment."

Ecosystem stakeholder: "There is a perception that the patent system is for rich companies. Very few universities even apply for IP. Most of the IP is from the pharmaceutical field."

4 Holistic review of the ecosystem

4.1 Collected analysis

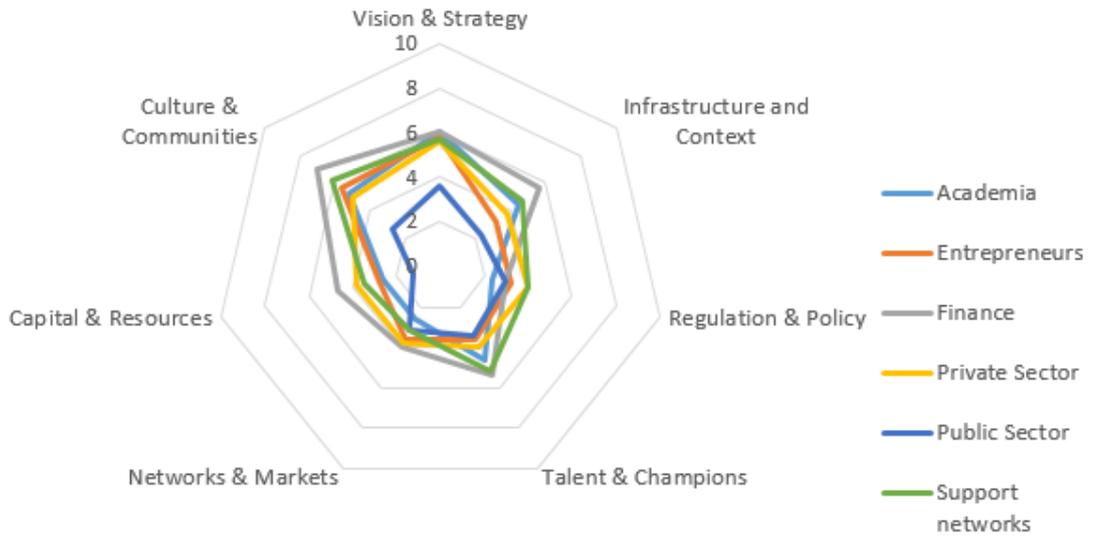
Central space

The central space of an ecosystem canvas is where the various programmes, resources, champions, networks and communities come together to support the journey of innovation. Looking at the specifics in Kenya, there are not enough of these ingredients coming together to facilitate the journey of innovators. Connections do exist between networks, champions and communities; but these connections are seen as weak since most of those who are "connected" continue to work in silos. As a result, programmes and policies do not have the right synergies and resources to be effective. Similarly, champions exist in the ecosystem but they are not engaging with early start-ups to share their journey, experience and knowledge. Overall, the central space seems to be lacking a dialogue between and among various stakeholder groups. Though there are several networks, communities, initiatives and programmes to encourage innovation ecosystem growth, stakeholders feel that these are not delivering the required results. Inefficiencies in the ecosystem are impacting early-stage innovation, growth of the ecosystem, and the ability for scaling startups and turning them into high growth innovative businesses. Contributing factors to the ecosystem not reaching its full potential include among other, missing linkages, as well as key stakeholders and champions not adequately fulfilling their roles in supporting entrepreneurs through the innovation journey and guiding innovation dynamics through a strategic framework and leadership. In broad terms, the ecosystem in Kenya can be described as being in a stagnating phase,

Comparative analysis of pillars

Comparing the pillar strengths from the various stakeholder groups, there was a general agreement overall. However, the public sector gave most pillars a significantly lower score than other stakeholder groups. Vision, talent and culture were seen as the strongest pillars. Most organisations perceived themselves as working within a clear framework to achieve their vision, and there is a good base of talent in Kenya. Though there is a need for collaborative engagements and need for appropriate 21st century skills. The pillar of culture also came with a caveat that the entrepreneurial nature of people in Kenya was mostly due to a higher rate of unemployment. Access and quality of infrastructure was perceived as poor due to ecosystem stagnation and poor distribution across Kenya. Stakeholders also identified regulations and access to market as challenges, primarily due to lack of R&D, technology transfer, financial support, fostering trade policies and network support. Capital was seen as the weakest of all the pillars due to lack of resources for innovators and lack of targeted efforts at FDI.

Figure 24: Overall opinions by stakeholder group



Source: ITU

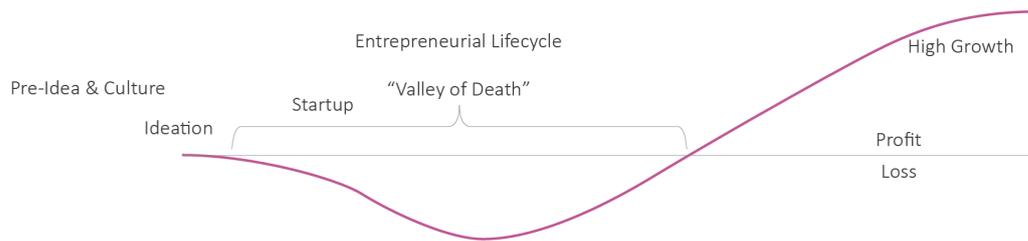
The views on ecosystem pillars reflect the discussions of an early-stage ecosystem with many challenges. The stakeholder interface canvass will reflect individual stakeholder dynamics shaping the Kenya innovation ecosystem.

Stakeholder interface canvas

This section discusses how to strengthen the digital innovation framework of Kenya. The stakeholder interface canvas quickly analyses the work of the ecosystem in covering the key activities needed in order to take innovations from pre-ideation to high growth. It describes the role each stakeholder group can take on to support entrepreneurs and innovators at each stage of their lifecycle.

The canvas is based on the 'valley of death curve', which shows the lifecycle of innovation and entrepreneurship. The lifecycle reflects growing companies, and notably identifies the 'valley of death', a period after ideation when innovators require significant investment and support, and where there is a high risk of failure as a business. This is possibly the most critical period for the ecosystem to provide support, though support throughout the lifecycle is critical. Similar to the need for support from all pillars of the ecosystem, if any part of the entrepreneurial lifecycle becomes a common failure point, it will vastly reduce the chances of success for all entrepreneurship in the ecosystem.

Figure 25: Stakeholder interface canvas



Entrepreneurship Phase	Pre-Idea	Ideation	Startup	The "Valley of Death"	SME
Entrepreneurs	Entrepreneurial interest	Problem discovery	Develop business models	Build collaboration	Expand & exit
Finance	Research funding	Seed funding	Angel investment	Venture capital	Business finance, equity & loans
Entrepreneurial Support	Gatherings & events	Hackathons & competitions	Coworking & soft infrastructure	Incubators & accelerators	Business associations & networks
Private Sector	Success stories	R&D programs	Internal incubator	B2B services	Skill training programs
Academia	Entrepreneurial inspiration	Basic research	Spin off facilitation	Skill training for entrepreneurs	Develop human capital
Public Sector	Vision & strategy	IP & R&D support	Public procurement	Tax support	Trade & finance policy

Source: ITU

The table in Figure 25 shows that each stakeholder group has a specific set of actions for the role they play in supporting innovators through the lifecycle. The roles mentioned under ‘Entrepreneurs’ are unique in that entrepreneurs, rather than primarily providing support to the ecosystem, receive support from the ecosystem, and are expected to perform the work of entrepreneurship and innovation.

The roles for each stakeholder group are noted in the stakeholder interface canvas above, and are explained here:

Entrepreneurs

- **Pre-idea:** Entrepreneurial interest: Before creating a start-up, potential innovators must have an interest in entrepreneurship.
- **Ideation:** Problem discovery: Entrepreneurs must discover and focus their work on relevant problems as they ideate a new innovation.
- **Start-up:** Develop business models: In creating start-ups, entrepreneurs need the skills to develop strong business models.
- **The valley of death:** Build collaboration: To get one another through the valley of death, entrepreneurs need to be ready to collaborate and share resources.
- **SME:** Expand and exit: As start-ups develop into proven SMEs, entrepreneurs will need to have the opportunity to expand, becoming high growth SMEs, or to exit through buy-outs or IPOs.

Finance

- **Pre-Idea:** Research funding: Resources need to be provided in order to do basic research, leading to innovations.

- **Ideation:** Seed funding: Early stage, high risk investment, generally under USD 100 000, is needed to launch a start-up. It comes from various sources, including investors and the public and private sectors.
- **Start-up:** Angel investment: Start-ups need small, one time, early phase investment, provided by angel investors or networks in order to operate and develop their business.
- **The valley of death:** Venture capital: In the valley of death firms require significant, still high risk funding in order to bridge the gap between growth potential and profitability.
- **SME:** Business financing, equity and loans: Once well established, firms need more traditional sources of lower risk finance. This comes in various forms, but all focus on SMEs and late stage start-ups.

Entrepreneurial support

- **Pre-idea:** Gatherings and events: Events for innovators and potential innovators spread entrepreneurial culture and provide the support needed to begin the entrepreneurial lifecycle.
- **Ideation:** Hackathons and competitions: Ideation processes and competitions reward innovators for successful ideation and help to build connections to foster the process.
- **Start-up:** Co-working and soft infrastructure: Knowledge sharing institutions and resources are needed by early phase start-ups in order to develop and gain necessary skills.
- **The valley of death:** Accelerators and incubators: As start-ups develop, accelerators and incubators help them to develop their businesses through coaching, mentorship and connections with investors and other resources.
- **SME:** Business associations and networks: Associations and chambers advocate for and support businesses in the market and with the public sector. They also provide key networking and other services.

Private sector

- **Pre-idea:** Success stories: Successful innovators need to be visible and accessible to younger entrepreneurs as mentors and inspiration.
- **Ideation:** R&D programmes: Funding and support for R&D by private firms is often a major source of support for upcoming innovations, both within the firm and outside.
- **Start-up:** Internal incubator: Often, start-ups and entrepreneurs are supported by in house incubators run by established industry firms in their field.
- **The valley of death:** B2B services: Start-ups in the valley of death rely on B2B services, often at special rate, in order to make their transition to profitable businesses.
- **SME:** Skill training programmes: As businesses grow, private skill training is needed in order to provide human resources needed in the sector.

Academia

- **Pre-idea:** Entrepreneurial inspiration: Universities need to provide environments and communities which inspire and foster new entrepreneurs.
- **Ideation:** Basic research: Basic research contributes to the ideation process by working on practical problems and developing valuable innovations.
- **Start-up:** Spin off facilitation: Universities need to foster and support spinoffs, start-ups that emerge from the research environment based on basic research.
- **The valley of death:** Skill training for entrepreneurs: Start-ups in the valley of death require training in business skills and soft skills from academia to survive.

- **SME:** Develop human capital: Academic institutions are responsible for ensuring that there is sufficient and appropriate human capital available in the ecosystem.

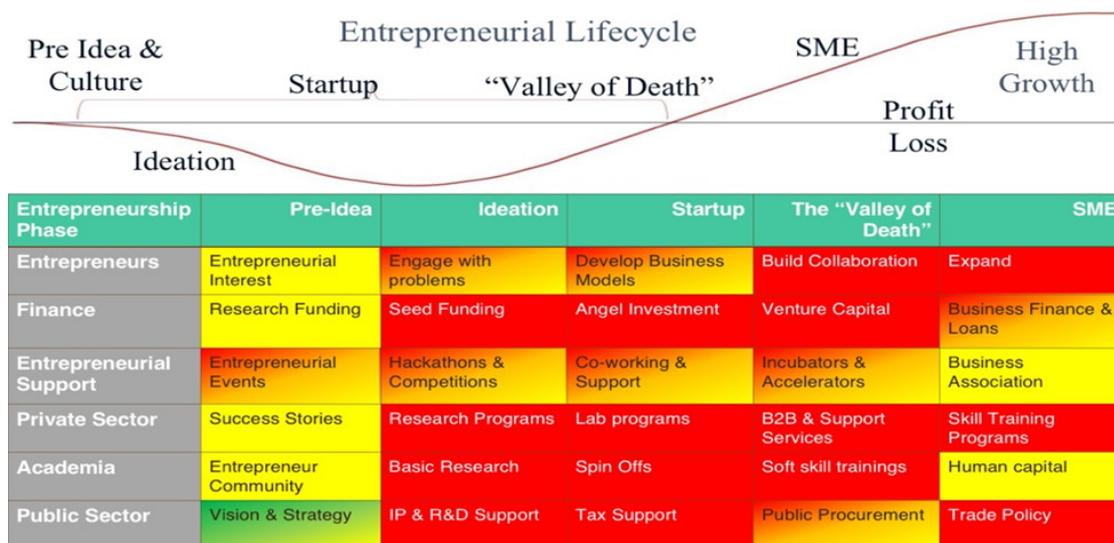
Public sector

- **Pre-idea:** Vision and strategy: The government needs to provide a clear vision and strategy for the innovation ecosystem, and bring together stakeholders in support of them.
- **Ideation:** Intellectual property and R&D support: Public policy needs to support intellectual property rights and research activities, through funding, legal protections and other measures.
- **Start-up:** Public procurement: Public procurement and tenders is an essential source of contracts for many early stage start-ups, is properly organized and implemented.
- **The valley of death:** Tax support: Start-ups in the valley of death often survive in part because of supportive tax policies which reduce operating costs and provide some added capital.
- **SME:** Trade and finance policy: As innovative business grow, they rely increasingly on international markets and capital investments. Policies are needed to foster those activities.

Taking this canvas, it is possible to identify gaps and areas of strength to quickly develop a *heat map* of activities in the innovation ecosystem. Below is the same canvas with commentary on the areas, and colour coded to show gaps. The colours were based on survey data, desk research and interviews, and represent the following:

- green cells were reported as being well supported;
- yellow cells were partially, but insufficiently supported;
- yellow/red cells were largely unsupported, but efforts have been initiated;
- red were largely unsupported.

Figure 26: Completed stakeholder interface canvas for Kenya



Source: ITU

The following provides further explanations about the ratings in Figure 26.

Entrepreneurs

- **Pre-idea:** Entrepreneurial interest: There is entrepreneurial interest in Kenya, but cultural issues and age-dependent risk aversion limit entrepreneurship. Also, entrepreneurship is primarily driven by unemployment.
- **Ideation:** Engage with problems: Innovations being developed are mismatched with the needs of the market in Kenya. Most innovations are primarily targeted at foreign markets. Innovators are unable to identify the right problems to offer solutions, and few initiatives exist by public sector to focus innovators on the problem of the country.
- **Start-up:** Develop business models: Due to a scarcity of soft skills among entrepreneurs, appropriate business models and pitching skills are unavailable.
- **The valley of death:** Build collaboration: There are efforts at collaboration between entrepreneurs, but it is mostly informal. Formal networks are not tailored to the needs of ICT entrepreneurs.
- **SME:** Expand: Domestic growth is limited for SMEs due to issues with market size, funding and non-financial support. There is need for trade facilitation support, market access, and developing competitive clusters.

Finance

- **Pre-idea:** Research funding: Respondents said funding was available but only for basic research at universities.
- **Ideation:** Seed funding: Some finance is available for early phase projects. Most of it comes from competitions and private sector support networks.
- **Start-up:** Angel investment: There isn't a well-developed network of angel investors in the country and access to these resources is not easy.
- **The valley of death:** Venture capital: Some projects can draw foreign venture capital but regulations and policies are not very favourable for venture capital. Risk capital is limited, although some private sector firms may be active for their own needs.
- **SME:** Business finance and loans: Credit is available for SMEs, however, there needs to be better access and transparency.

Entrepreneurial Support

- **Pre-idea:** Entrepreneurial events: There are many events active in the ecosystem but they are not necessarily creating a substantial impact, nor reaching critical mass.
- **Ideation:** Hackathons and competitions: There are some hackathons and competitions happening across the year but most of them are restricted to urban areas, and mostly around Nairobi.
- **Start-up:** Co-working and soft infrastructure: Several co-working spaces are available in the ecosystem for those living in major urban areas.
- **The valley of death:** Incubators and Accelerators: There are a number of incubators and accelerators, some of them are doing well at encouraging entrepreneurship. But scale and effective are low given the current success stories.
- **SME:** Business associations: There are many formal networks in Kenya for all stakeholder groups, but not all of them are truly engaged in fostering ICT innovation ecosystem.

Private sector

- **Pre-idea:** Success stories: There are several successes within the ecosystem. However, appropriate and ineffective linkages with the ecosystem do not allow knowledge sharing, nor enable these success stories to be high growth companies.

- **Ideation:** Research programmes: Private sector is mostly dependent on research carried out by foreign actors.
- **Start-up:** Laboratory programmes: There are very limited lab programmes available to access from private sector.
- **The valley of death:** B2B and support services: Stakeholders feel that barring a few, most larger private firms in Kenya are not really providing substantial support for innovation.
- **SME:** Skill training programmes: The ecosystem is investing or engaging little in skills training programmes. When they exist, many are for need based entrepreneurs.

Academia

- **Pre-idea:** Entrepreneur community: Kenya does have a community of entrepreneurs but they are not linked with the academia. Although few universities, in Nairobi and around Nairobi, are building these communities.
- **Ideation:** Basic research: Very little basic research is happening at universities, and academia seen as more focused on technical papers.
- **Start-up:** Spin offs: Academic institutions are not successfully creating spinoffs, though some efforts are noted in a few institutions.
- **The valley of death:** Soft skill training: Business skills are not a sufficient part of education at universities that primarily focus on technical and theoretical knowledge rather than practical and managerial experience.
- **SME:** Human capital: The Kenya education system is rich in human capital. However, it is currently unable to fully leverage and equip this talent pool with appropriate skills.

Public sector

- **Pre-idea:** Vision and strategy: There exists a strong vision framework for public sector institutions. However, cohesive coordination remains a major hurdle.
- **Ideation:** Intellectual property and R&D support: Intellectual property law and enforcement were reported as key issues in the ecosystem with little awareness and expensive procedures being major barriers.
- **Start-up:** Tax support: Taxation policies are not very favourable to entrepreneurs and investors.
- **The valley of death:** Public procurement: Though strong public procurement rules exist on paper; their inefficient implementation present barriers for government demand access by innovators. Thus, entrepreneurs are not able to fully engage problems facing public service.
- **SME:** Trade policy: Though there is a high potential in international market, trade facilitation programmes are seen unfriendly and ineffective in fostering innovation in Kenya.

Taken together with the other elements of our analysis, the stakeholder canvas reflects an early stage ecosystem. There are many activities that are underdeveloped or not present at this time. Some activities, especially those related to the work of the private sector and the developed strategies are in process, though often not yet sufficient for the needs of the ecosystem. The work of finance, academia and the private sector are more seriously underdeveloped, which may be partially due to the issues of understanding and coordination of roles in the ecosystem.

4.2 Overarching themes

Kenya Vision 2030 is aligned to solid political, economic and social pillars. This overarching vision catalysed the economic transformation of the country towards a digital society. However, government ambitions for a digital economy and its Kenya Vision 2030 are not yet anchored by its potential capabilities, though the government is aware of its role, and taking significant steps in the right

direction. These steps, however, need a clear roadmap of policies and programmes to achieve the mission and vision.

Many new policies, institutions, programmes and flagship projects are underway as part of Kenya Vision 2030, but much remains to be done to develop a cohesive framework where all these initiatives fit together and engage the digital innovation ecosystem. There are many missing enabling policies to nurture the ecosystem including policies in taxation, investment, trade, SME, FDI, R&D, ICT, and financial regulations. Furthermore, a change of mind-set and focus on strategic sectors is necessary – an area for which the Big Four agenda can help providing direction. The overall impression is that ICT is regarded as mere tool, and not seen as a strategic enabler as called for under the Kenya Vision 2030, and reaffirmed in recent development strategy. Therefore the ICT sector, as a key strategic sector, should have its policy adjusted accordingly. Kenya has an opportunity to develop a common agenda and guide digital innovation to move the country forward.

Another key theme is that the talent in Kenya is burning out because they are not supported in their journey. There are many missing supportive building blocks such as mentorship networks, training ecosystems, resources, and infrastructure. There is an acute need to develop, nurture and support programmes and services needed by stakeholders, including developing training ecosystems, nurturing B2B services, promoting innovation in Kenya, developing soft infrastructure, improving linkages between academia and the private sector, and providing better access to domestic and foreign markets among others. Without access to a continuum of resources, new enabling policies and programmes, and guidance of digital innovation, the ecosystem is in stagnation phase.

4.3 Good practices from Kenya

4.3.1 BRCK (entrepreneur)

Hardware and connectivity start-up BRCK has transformed how access to connectivity is seen in the largely unconnected parts of Kenya. What started as a SIM card and aerial extender to provide Wi-Fi connectivity in far-flung areas has now expanded into an educational tool, with a hard drive that comes with pre-stored educational and entertainment content. The BRCK business model is evolving rapidly and creating solutions in many verticals of the economy. BRCK is a good example of a successful entrepreneurial spirit that has leveraged technology by analysing the challenges in the ecosystem and meeting the needs of the community.

4.3.2 C4D Lab (academia)

C4DLab is an R&D and start-up incubation lab established by the University of Nairobi that aims to help build the Silicon Savannah in the region. C4DLab supports faculty and students to conceptualize, create community projects, commercialize them and increase their visibility. It also offers a platform for public-private-academic collaboration in the digital ecosystem, besides enhancing linkages between various stakeholder groups via events, workshops, hackathons, competitions and soon-to-be-launched toolkit for facilitating commercialization of research.

4.3.3 Communication Authority of Kenya (public)

The Communications Authority of Kenya (CA) is the communications sector regulatory authority. It envisions access to and use of information and communication services by all in Kenya by 2018. For this purpose, it has been successful in facilitating the transformation of lives through progressive regulation of the information and communication technology sector. CA is in the process of developing an engagement framework for the innovation ecosystem, actively fostering linkages with various stakeholders, promote policy enabling rural inclusion, and facilitate market access by bringing start-ups to international conferences such as ITU telecom world.

4.3.4 ICT Authority (public)

The Information and Communication Technology Authority (ICTA) is the government authority tasked with rationalizing and streamlining the management of all Government of Kenya ICT functions; and transforming Kenya into a regional ICT hub and a globally competitive digital economy. Through programmes, projects and policies it promote ICT literacy, capacity, help establish ICT standards for public sector human resource; and develop, deploy and manage infrastructure and services for public service transformation. ICTA is championing key initiatives in fostering ICT innovation and entrepreneurship, as well as open government dataset development.

4.3.5 Demo Africa (support)

DEMO Africa is one of the flagship initiatives of LIONS@frica and aims to connect start-ups in Africa to the global ecosystem. DEMO Africa is the place where the most innovative companies from Africa get a platform to launch their products and announce to Africa and the world what they have developed. Demo Africa holds events and networking opportunities that foster knowledge dissemination, build capacity for the ecosystem, and help spread the entrepreneurial culture.

4.3.6 Gearbox (support)

Entrepreneurs requiring resources to prototype their products needs physical space and access to rapid prototyping equipment. The Gearbox model offers such spaces under different sustainability models of use. As a member of Gearbox, entrepreneurs can gain access equipment, tools, machines, training, community events, mentorship, and networking. Members can also meet other entrepreneurs, designers, artists and engineers – and seek training, mentorship and guidance from them.

4.3.7 iHub (support)

Founded in 2010, iHub is a globally recognized organization that is deeply steeped in the local technology innovation culture. It is fair to say that the iHub has been both the main catalyst for regional technology acceleration and a role model for technology hubs across emerging markets, now including Kenya. iHub aims to become one of the best regional support system for ICT focused technology entrepreneurs and individuals who aspire to create great companies that tackle some of the biggest challenges their communities are facing.

4.3.8 iLabAfrica, Strathmore University (Academia)

iLabAfrica is a centre of excellence in ICT innovation and development based at Strathmore University in Nairobi. It was established to address the Millennium Development Goals (MDGs) and to contribute toward Kenya Vision 2030. The research centre of the university is involved in interdisciplinary research, student engagement, collaboration with government, industry and other funding agencies. It is one of the forward thinking universities of Kenya that is investing in advanced researched and making efforts to commercialize its findings.

4.3.9 Kenya Revenue Authority (public)

The Kenya Revenue Authority (KRA) has been re-engineering its processes in sync with the idea of a Digital Kenya to enhance service delivery in the country and create a conducive environment for increasing the tax base. In 2013, its iTax project integrated with 44 banks via payment gateways to allow tax payers to file returns online. KRA is extending their innovation leadership in public service transformation by linking via memoranda of understandings with various universities, related networks locally, and globally, to adopt best international standards. KRA has also developed an open annual competition that serves as a platform to stimulate domestic innovation. The KRA vision is clear and

has specific activities that support a full bridge for an open innovation platform with key stakeholders of the ecosystem.

4.3.10 Kenya ICT Action Network

The Kenya ICT Action Network (KICTANet) is a multi-stakeholder network of members from civil society groups, private sector, development partners and media that is committed towards ensuring the availability of accessible, efficient, reliable and affordable ICT services. Through its various efforts and collaborations, it has been successful in bringing together different players in the area of ICT to work towards a better policy and increased engagement with the government.

4.3.11 Konza Technopolis (Public)

Konza Technopolis is the flagship project for the ICT sector under Kenya Vision 2030. It is intended to help develop human capacity to encourage students to enter science and technological fields; create an innovation pipeline to facilitate growth in incubation centres, accelerators and R&D labs; reach out to companies to invest in technology; and, establish a smart city where the environment is conducive for innovation. The first phase of Konza Technopolis— to be developed as a public-private partnership — is expected to create over 20 000 direct and indirect jobs. Konza Technopolis will also provide mentorship and resources at incubation centres that the government plans to set up in all the constituencies of Kenya.

4.3.12 Nailab (Support)

Nailab is a Nairobi-based start-up incubator that tries to lower the entry barriers for ICT entrepreneurs who want to start and scale their businesses in Kenya. Launched in 2011, several success stories have graduated from Nailab, including Tusqee (a mobile app that allows schools to send children's grades to their parents by SMS) and MyOrder (an application that allows street vendors to open their own mobile web shop, allowing customers to order and pay by mobile phone). Nailab serves a critical role in the ecosystem as a resource centre, an incubation centre, and a networking centre.

4.3.13 Sidian Bank (Finance)

Sidian Bank has transformed itself from a medium-sized financial services provider catering to small-to-medium business enterprises, to an innovative bank with a unique portfolio of financial services for entrepreneurs. To accelerate its transformation to top Tier I bank, Sidian Bank has been riding on the digital wave. From introducing biometric data for transactions to offering mobile loans to customers, the bank is one of the leading adopters of digital tools in the finance sector and not just in the area of digitization of data. The bank works with global start-ups, such as Uber, to provide innovative financial solutions to entrepreneurs in Kenya.

4.3.14 Digischools (public)

As an initiative of ICTA, Digischool is a Digital Literacy Programme (DLP) borne out of the government vision to make sure every pupil is prepared for today's digital world, and to transform learning in Kenya into a 21st century education system. This programme is targeting primary education by integrating ICT with the education curriculum to enhance effective and delivery of content to the learners. It does not introduce ICT as a subject, but rather use ICT as an enabler to accelerate learning. Under the programme, all primary schools will be targeted. What is interesting about this initiative is that Kenya is developing a platform that has the potential to see much demand for the ecosystem stakeholders, as well as seed growth opportunities for developing a potential content ecosystem, if adequate policies are in place.

5 Priority objectives

In innovation policy, identifying high visibility political targets and connecting them with their policy underpinnings is a critical exercise to ensure both political support and sustainable progress. In this spirit, the following set of priority objectives represent key political or strategic goals found during the research process. Each is explained, rooted in its political background and sources of support, and then connected with a number of the recommendations made in the following section of the report and the benefits to the country are explained. A graphic will accompany each layout.

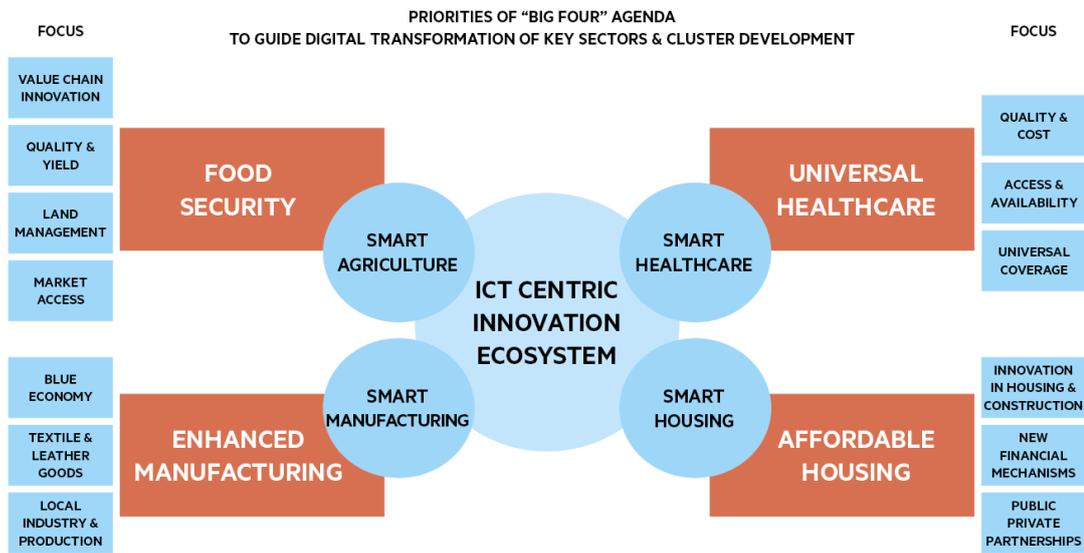
Based on the Kenya Vision 2030, which sets out an overarching vision for the digital economy, and the immediate priorities for national development elaborated in the Big Four agenda, the following priority objectives have been developed, and specific recommendations made to support these priority objectives.

Figure 27: Anchoring Kenya Vision 2030 to the digital innovation ecosystem framework



Considering both, long-term vision as well as short-term targets articulated in the Big Four agenda, which reaffirms the ICT ecosystem's critical role as enabler for national development, the following areas were isolated as priorities for key sector transformation. Due to their strategic value, and quick win potential of immediate actions, these priority areas present an excellent opportunity for flagship project development, which will assist in the delivery of the Big Four agenda, and help foster a vibrant ecosystem and the digital economy in Kenya overall.

Figure 28: Priorities of Big Four agenda to guide digital transformation of key sectors and cluster development



The achievement of the Big Four agenda, and the long term vision of the ecosystem can be accelerated through specific enablers that require the creation of incentives and programmes that guide the ICT centric innovation ecosystem to engage with Big Four agenda priorities, and facilitate the adoption of new technology platforms in key sectors. Strengthened engagement and the implementation of targeted projects and initiatives will help the formation of digital cluster around the “Big Four” and accelerate the development of sustainable tech-enabled solutions in the areas of smart agriculture (food security), smart healthcare (universal coverage for healthcare), smart housing (affordable housing), and smart manufacturing (enhanced manufacturing). A two pronged approach of guiding innovation dynamics and creating incentives and flagship projects to integrate ICT into key sectors, will help create immediate impact for achieving the goals of the Big Four agenda, while positively affecting the long term target of sustainable socio-economic development in Kenya. The alignment of creating ecosystem enablers targeting long-term vision and immediate priorities of the country allows for the most efficient use of resources and maximum impact – *the most bang for your buck* – while also offering a straight-forward path to digital transformation, giving initial digital transformation roadmaps and flagship projects- specific focus.

The implementation of the following recommendations will help create the necessary momentum, guidance, direction, linkages, cluster development, and support to overcome the issues of a stagnating ecosystem and nurture a vibrant, sustainable one.

5.1 Kenya as the regional ICT hub and globally competitive digital economy

5.1.1 Background

Kenya is well positioned to become a regional ICT hub in the Africa region. Kenya is the regional market leader in East Africa, and benefits from a number of advantages in talent, labour efficiency, geographical endowment, and policies. It has done a good job at developing hard infrastructure, improving ease of doing business, and developing a number of sectors including agriculture, tourism, forestry, and manufacturing. Kenya is already considered an entry point to the regional market for many international companies. Kenya has access to a regional market that is more than 10 times its current population of 47 million people.

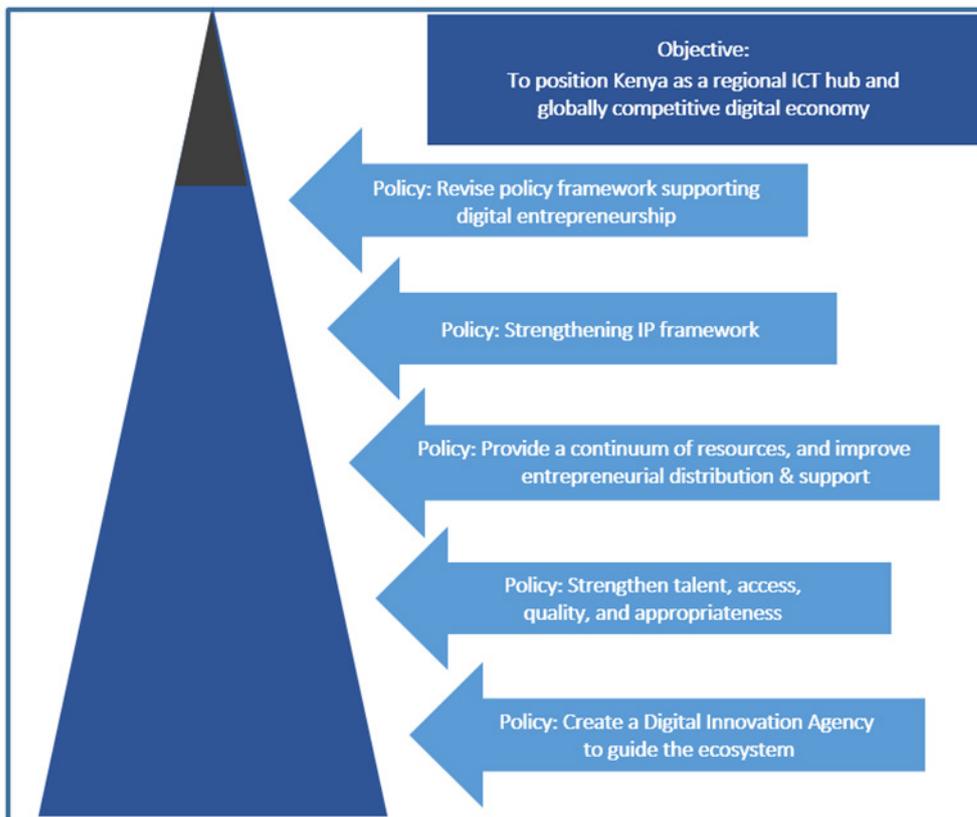
Kenya Vision 2030 provides an overarching umbrella vision to transform Kenya into a middle income industrialized country by 2030 – for which the recent Big Four plan provides priorities to target in the immediate future that will improve conditions and set up the country for achieving its long-term vision. This common vision has universal agreements with all stakeholders, but many gaps have surfaced. Kenya research infrastructure is undercapitalized, its talent is missing many skills, and its entrepreneurs are struggling to achieve success. Kenya also has many policies and programmes that are inadequate to foster digital entrepreneurship and innovation. These include talent access and appropriateness, low resource availability in the ecosystem, and various misaligned policies and programmes that do not support the ecosystem or cluster development around priority areas.

Many efforts are underway to address some of these challenges – particularly in the realm of the Big Four Agenda, which strengthened the key strategic role of digital technologies as enabler – however there is no holistic framework to address them, and harnessing ICT centric innovation has yet to be made an explicit focus in development policy. Moreover, the synergies and collaboration is lacking as stakeholders are working in silos. These gaps if addressed have the potential to ensure the Kenya Vision 2030 objectives are achieved.

5.1.2 Related recommendations

Leveraging these factors to build up the country reputation as a regional competitive ICT hub, and utilize digital technologies to accelerate sustainable socio-economic development will require a number of actions, starting from reviewing and revising the policy framework for intellectual property, start-ups, and SME. In addition, resources for entrepreneurial support must be amplified to improve distribution and access of appropriate talents and soft infrastructure. This will require the creation of a dedicated digital innovation institution, and development of a continuum of resources for equitable access and support of the ecosystem.

Figure 29: Position Kenya as regional ICT hub and globally competitive digital economy



Source: ITU

5.1.3 Benefit

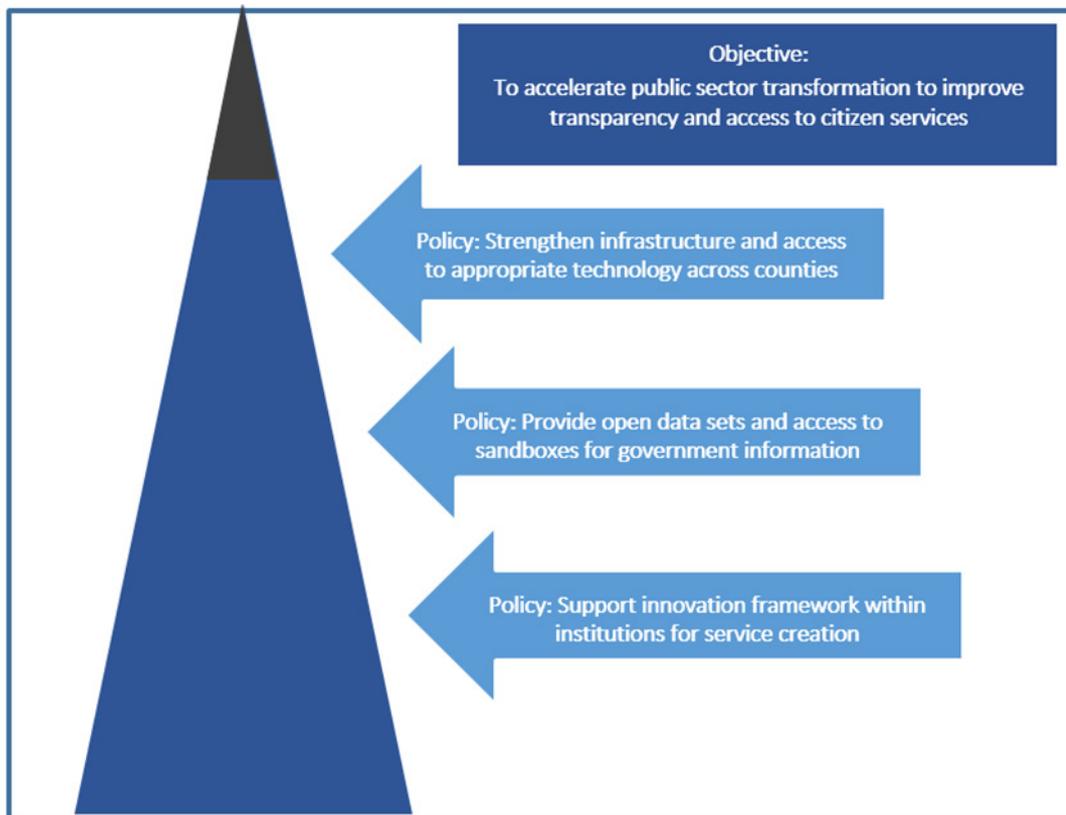
Beyond the obvious benefits of overall economic growth, establishing a series of strong, innovative, start-ups in Kenya will set the stage for further growth, in two ways; first, by building a core of experienced entrepreneurs, and second by developing the country as an ICT leader. The core of experienced entrepreneurs can provide the next generation of expertise, mentorship, success stories, and investment needed in the ecosystem. However, strong entrepreneurs can only develop if strong support mechanisms exist. A central and strong digital innovation agency can help coordinate the currently disconnected efforts of the public sector towards effectively operationalizing the innovation ecosystem.

5.2 Accelerate public sector transformation

5.2.1 Background

One of the major barriers to developing a strong ICT centric innovation ecosystem is that the public sector is envisioning a digitally enabled future without fully committing to systemic transformations. Stakeholders noted that while the public sector is making a lot of efforts to digitalise its roles and responsibilities, it is not doing enough efforts to digitalize the system of e-governance. Digitalizing the system of governance will require systemic process redesign for public services through leveraging ICT. The few efforts to digitize government services have helped to achieve some momentum, but the process should be accelerated, supported by other activities.

Figure 30: Accelerate public sector transformation



Source: ITU.

5.2.2 Related recommendations

The efforts launched in Kenya to digitalize government services have generated some momentum; though the process can be accelerated through stronger support, projects and collaboration between the ecosystem and public sector. Kenya needs to actively engage the ecosystem in developing B2G and G2C services. Building open data sandboxes with support, developing ecosystem engagement frameworks, and strengthening infrastructure and access to appropriate technology throughout Kenya will significantly contribute to achieve the desired outcome.

5.2.3 Benefit

Transformation of the public sector would improve transparency and increase trust in the government. Furthermore, innovation frameworks for public institutions would enable continuous improvement of public services, and help nurture an entrepreneurial and innovation culture in public service delivery. Addressing the issue of infrastructure gaps, meanwhile, would create affordable and high quality infrastructure across the country, that can then be leveraged to foster innovation beyond urban centres. Finally, allowing innovators access to public data in sandboxes would aid them focus on creating solutions to problems in Kenya, while enabling them to develop their competencies leveraging the public sector demand. This in turn would allow entrepreneurs in Kenya to create competitive products and services for export.

5.3 Promote inclusion and socio-economic development

5.3.1 Background

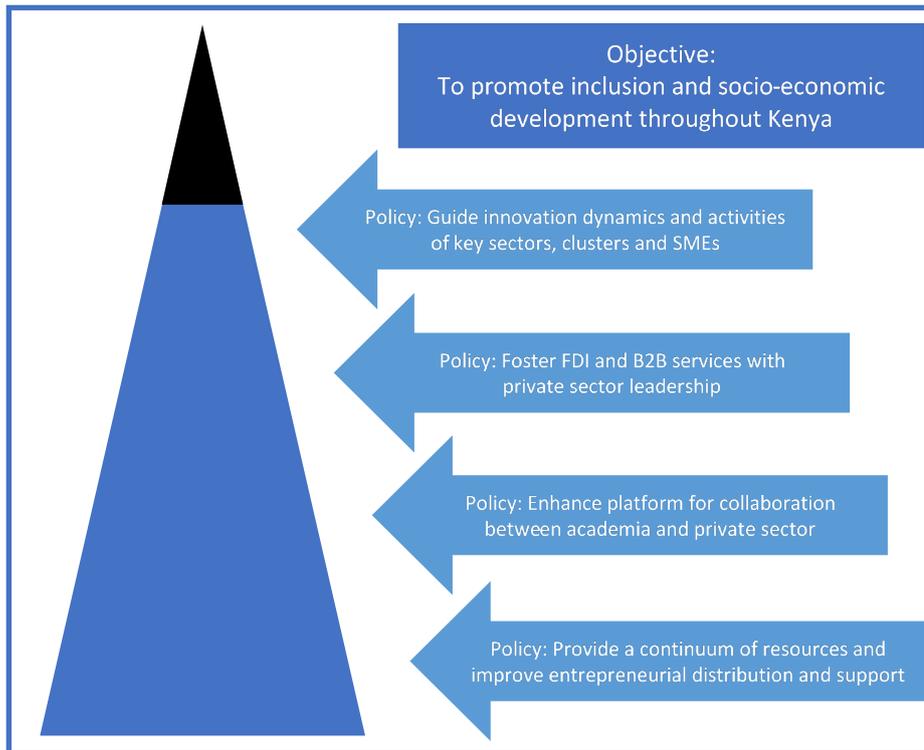
There has been noticeable improvement in hard infrastructure over the past two decades in Kenya, but this growth has stalled. Last mile connectivity needs to have sustainable business models. Though soft infrastructure exists and can help create appropriate solutions, these are few and most are not connected to research institutions. Much of the resources – skills training, mentorship, funding, infrastructure (labs, hubs, accelerators, incubators), etc. – are restricted to urban areas.

The Kenya ecosystem is also faced with weak leadership from the private sector. In a 2016 survey⁹⁷ by the Kenya National Bureau of Statistics, close to half a million small enterprises shut down annually in Kenya. Most of these SMEs, or MSMEs fail because they do not receive adequate nurturing to grow. There is a huge opportunity to reduce this failure rate by leveraging ICT, especially through collaboration between technology start-ups and private sector firms.

Additionally, there is a need for more dialogue and collaboration between all stakeholder groups to truly promote inclusion and socio-economic development through cluster formations, and platforms for collaboration between academia and private sector.

⁹⁷ www.standardmedia.co.ke/business/article/2000221491/why-400-000-smes-are-dying-annually.

Figure 31: Promote inclusion and socio-economic development



Source: ITU

5.3.2 Related recommendations

Kenya can achieve inclusion by developing innovation leadership in the private sector through greater collaboration, incentives and programmes to foster the ecosystem, cluster development, and the engagement with local issues and priorities of the Big-Four agenda. It will also require new incentives to foster a business ecosystem offering B2B services to the ecosystem. Together, these can have the transformational impact of creating sustainable business models, and bringing informal sectors into the regular economy. Guiding digital cluster formation, fostering FDI and B2B ecosystem with private sector leadership, enhancing platforms for collaboration between academia and private sector, together with the availability of a continuum of resources to the ecosystem, will provide the critical mass needed to create economic inclusion and sustainable solutions that address the sector targets of the Big Four agenda.

5.3.3 Benefit

Guiding innovation dynamics and activities of clusters, key sectors and SMEs would encourage the distribution of entrepreneurs in Kenya overall and increase solutions to immediate development priorities of the Big Four agenda. Policies that favour of FDI and private sector investment in the ecosystem would be able to bring in improved financial support for early-stage entrepreneurs. Moreover, enhanced collaboration between academia and the private sector would allow the two groups to share resources and thus facilitate the development of much more substantial research. Taken together, these recommendations will help strengthen the ICT sector in Kenya, enable digital transformation, develop the private sector, and help create and maintain sustainability of the ecosystem as well as the overall national capacity for innovation.

5.4 Accelerate digital transformation for the “Big Four”

5.4.1 Background

While the country has implemented significant efforts to build foundations for achieving Kenya Vision 2030 – in the areas of transport, electricity distribution, education, ICT infrastructure and improvements regarding ease of doing business, a large amount of people in Kenya find themselves in vulnerable position in respect to housing, health care, food and job security. The government’s Big Four agenda lays out specific targets to be reached by 2022, to ensure food security, affordable housing, job creation through enhancing manufacturing, and access to healthcare for every citizen. Digital innovation enhances processes, products, services, reach and scalability of solutions and the ICT centric innovation ecosystem can have a critical impact on accelerating the delivery of the Big Four agenda. In theory, ICT centric innovation, the digital economy and the adoption of new technological trends have been identified as strategic enablers for the agenda, though a dedicated strategy or implementation framework to reach these goals is yet to be developed.

Apart from the success stories of M-Pesa and mobile financial services, the ecosystem is not reaching its potential. There is a tremendous opportunity to jump start the currently stagnating ecosystem, and lacking cluster development and facilitate “smart” sustainable solutions for the Big Four agenda that utilize innovation, and ICT integration in specific key sectors as enablers.

The main barriers to overcome are missing guidance and innovation leadership, lacking adoption of technology platforms in key sectors, and not enough incentives and enablers and missing linkages, and very importantly, the lacking engagement of the ecosystem and missing concerted action towards specific local issues – something the Big Four agenda can provide.

The government needs to take on innovation leadership role, in which it scales efforts to enable the adoption of digital innovation in the economy, actively accelerating digital transformation in key sectors for the Big Four, increases linkages and collaboration with industry, guides activities, as well as provides a continuum of resources that promote entrepreneurs, SMEs and private sector engagement towards developing technology enabled solutions for smart agriculture, smart housing, smart healthcare and smart manufacturing. These “smart” solutions can be leveraged to improve quality, cost and delivery of health services and the field of insurance, improve the agricultural value chain, the construction, mortgage and housing industry, as well as enhance manufacturing and boost the blue economy, fishing and shipping industry, through improved access to information, financial mechanisms, and process optimization to increase value addition and market access of the local industry.

A framework with sector mapping, projects and programmes needs to be developed to accelerate the integration of digital innovation into key sectors, and to leverage the transformative potential of digital technologies and the ICT centric innovation ecosystem to deliver on immediate priorities and long-term vision for sustainable socio-economic growth and prosperity.

Figure 32: Accelerate digital transformation for the “Big Four”

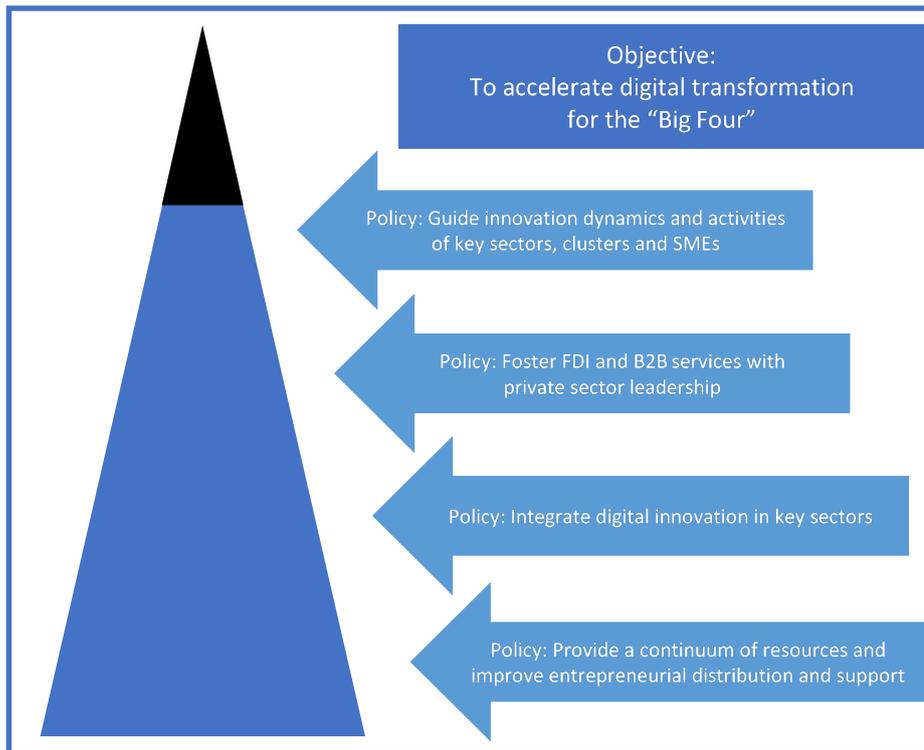


Figure 32: Accelerate digital transformation for the “Big Four”. The graphic is a pyramid that reflects the main policies needed to meet the objective to accelerate digital transformation for the Big Four agenda. These policies include: Guide innovation dynamics and activities of key sectors, clusters and SMEs; Foster FDI and B2B services with private sector leadership; Integrate ICT innovation in targeted key sectors to accelerate delivery of Big Four agenda; and provide a continuum of resources and improve entrepreneurial distribution and support.

5.4.2 Related recommendations

Kenya can achieve the goals of the Big Four agenda through accelerating digital transformation by integrating ICT innovation into key sectors. The focus here lies on developing specific enablers that will facilitate private sector, and ecosystem engagement towards developing solutions for the identified priority areas along the lines of using digital to improve food security (e.g. smart agriculture solutions), enhance manufacturing (e.g. smart manufacturing solutions), provide access to affordable housing (e.g. through smart housing solutions), and universal access to healthcare (e.g. smart healthcare solutions) – and facilitating cluster development in these fields. This requires the government to take an active role in building or adapting existing sectoral based initiatives towards Big Four agenda solutions, to develop a leadership role in the private sector through stronger collaboration, partnerships, incentives and programmes, facilitating ICT integration into key sectors, nurturing specific digital cluster formation, policy and regulatory reform of sectors, fostering SMEs and B2B services, foreign direct investments and providing a continuum of resources for entrepreneurial support & the ecosystem including dedicated funds to develop “smart” solutions to the Big Four agenda. One of the main focuses for accelerating digital transformation for the “Big Four”, is the development or adaptation of specific initiatives and flagship projects.

5.4.3 Benefit

These recommendations will accelerate the achievement of the Big Four Agenda through facilitating digital transformation and will further assist in strengthening the innovation ecosystem and ICT sector

in Kenya – with a strong focus on the development of actionable roadmaps and flagship project implementation. Taken together, efforts in guiding innovation dynamics, key sector integration, and cluster development towards the Big Four, would increase the sustainable solutions to the immediate priorities of the development agenda, encourage the distribution of entrepreneurs, foster the digital economy, as well as increase to the overall competitiveness of the Kenyan ecosystem and the national capacity for innovation. The creation of dedicated funds and financial resources, as well as policies in favour of FDI and private sector investment would allow improved financial support for early-stage entrepreneurs which will further benefit the ecosystem, and create jobs, while increasing the conditions and pool of potentially successful start-ups growing into SMEs and high growth firms.

6 Recommendations

6.1 Revise legal regime and promote incentives

Stakeholders have identified specific issues with the policy regime. First, there is no strong institution to guide ICT innovation activities. This leads to a lack of coordination and engagement between the public sector and other stakeholders. The broad mandate of the Kenya Innovation Agency (KENIA) leaves it less able to concentrate efforts on the specific requirements of the ecosystem. Additionally, there is no clear framework for stakeholder groups to engage in strengthening their own digital innovation ecosystem. KENIA also lacks a monitoring, evaluation, and implementation framework needed to follow and guide progress in a specific sector such as ICT. To address this and other issues facing the ecosystem, a dedicated institution needs to be established, or an existing body repurposed and strengthened, which is tasked with advocating within the government on behalf of the ecosystem. This new institution must be able to hold regular consultations and discussions with digital ecosystem stakeholders and must retain the capacity and budget to undertake essential projects and advocacy efforts. It also needs a framework to help understand stakeholder actions, systematically monitor and evaluate development of framework conditions, and undertake specific projects in collaboration with others to address and resolve challenges that would lead to innovation. In Chile, Finland, Hungary, and Israel, policy experimentation has been at the core of entrepreneurial success. Grassroots ecosystem stakeholders have driven this experimentation process through the means of key bridging institutions such as Foundation Chile, SITRA (Finnish technology fund for Research and Development), and OCS (Office of the Chief Scientist) in Israel. The ITU digital innovation framework and processes included in this report can help seed much of the needs of such a Kenya based institution.

In addition, a package of new policy measures can help facilitate the growth of innovative businesses and strengthen the ecosystem. Further, alleviating the tax burden to foster a culture of entrepreneurship. This may be achieved by allowing tax holidays for the first couple of years that a company is in business, or until the company crosses a certain threshold of profitability.

Immigration regulations are also an issue to target. Streamlining talent migration laws will prove beneficial for encouraging talent and valuable human capital from within the region, or the rest of the world, to the Kenya ecosystem.

Resources needed to help entrepreneurs bootstrap are limited and many entrepreneurs reported to have relied on competitions and grants at the beginning. Others reported to have used outside crowd funding platforms. There are only very few angels and venture capitalists, and no structured incentives or mechanisms exist to foster their growth. In this respect, the public sector could apply various model instruments for the purpose of creating resources and networks to assist early stage entrepreneurs to bootstrap. For example, in the United States, recent laws have allowed crowd equity investment to surpass venture capital funding. Policy learning and adapting best practices will enable Kenya to address the funding issue in its ecosystem.

Last, there is a need for systemic incentives to foster digital cluster formation, increase private sector leadership, and provide guidance for the strategic use of digital technologies and ICT integration in key sectors of the economy, and specifically related to addressing the Big Four agenda. Many leading private sector or financial stakeholders – such as banks – are not creating a leading B2B ecosystem. The Kenya ecosystem appeal to domestic and foreign investors is also negatively affected by missing incentives.

Though there have been efforts made in the realm of PPPs, these prove not to be sufficient enough in generating the critical mass for well-functioning ecosystem in which large firms co-exist with small firms to create competitive sectors within the economy. The government should also offer area- based and activity-based incentives to clusters and ensure an innovation-friendly public procurement system.

Combined, a dedicated innovation bridging agency in accord with specific laws and a readjusted incentive structure will be able to enhance public private collaboration, and provide mechanisms for a structured, yet organic development of the ecosystem that empowers all stakeholders to actively engage. Resulting from this framework for policy experimentation, the Kenya ecosystem will increase its regional and global competitiveness.

Table 1: Recommendation: Revise legal regime and promote incentives

POLICY IMPLICATION	CHALLENGE	RECOMMENDATIONS
Revise policy framework supporting digital entrepreneurship	Legal issues including taxation, immigration, IP, finance, and public procurement all were noted as barriers.	Tax holidays for early stage start-ups. Loosened immigration requirements for ICT professionals and entrepreneurs. Revised financial laws, incorporating provisions for crowdfunding, investment. Strengthened and streamlined IP laws and development of a National IP policy which is currently lacking. More innovation friendly public procurement requirements.
Create a Digital Innovation Agency to guide innovation dynamics in the ecosystem and enable integration of ICT innovation in key sectors	Lack of engagement and collaboration between the public sector and other stakeholders. Lack of guiding ecosystem innovation activities to foster Kenya Vision 2030 and Big Four agenda Lack of cluster formation and ICT integration in key sectors that enable socio-economic development along overarching vision	New institution to guide ICT innovation dynamics and ecosystem activities. Create a digital innovation agency with funding and mandate to promote programmes and policies to support the ecosystem. Provide guidance and resources to facilitate cluster development, and integration of ICT innovation and relevant digital technologies into key sectors Share resources for project via MOUs and PPPs. Develop an ecosystem map.

POLICY IMPLICATION	CHALLENGE	RECOMMENDATIONS
Incentivise FDI and B2B services with private sector leadership	<p>Large firms are relatively uninvolved with innovation.</p> <p>Innovators require key inputs of imported hardware and software.</p> <p>Fibre optic and other services are expensive for start-ups.</p> <p>Digital transformation in key sectors is slow to uptake</p>	<p>Develop incentive structures for larger companies to improve B2B offerings, especially connectivity and other needed services outside the traditional portfolio of big corporation.</p> <p>Create a platform to encourage SMEs to develop solutions for larger firms and banks.</p>
GOOD PRACTICES		
Swiss government	<p>The Swiss Government allows a tax holiday of up to 100 per cent over 10 years, depending on sector and location. This includes provisions for cantonal and municipal taxes.</p> <p>Available through: www.vaud.ch/fileadmin/user_upload/_temp_/pdf/20120202_brochure_allegements-fiscaux_en.pdf</p>	
Israel Innovation Authority	<p>The Israel Innovation Authority is an independent and impartial public entity that operates for the benefit of the Israeli innovation ecosystem and Israeli economy as a whole. Its role is to nurture and develop Israeli innovation resources, while creating and strengthening the infrastructure and framework needed to support the entire knowledge industry. The Israel Innovation Authority advises the government and Parliament committees regarding innovation policy; and monitors and analyses the dynamic changes taking place throughout the innovation environments in Israel and abroad. The authority also creates cooperation with counterpart agencies to promote technological innovation in the Israeli industry and economy.</p> <p>www.matimop.org.il/about_authority.html</p>	
Estonia entrepreneurship	<p>In recent years, Estonia has used a powerful set of policies to position itself as a regional and global ICT leader. These have included: direct support to entrepreneurs and support networks, investment in ICTs to digitize and transform public services, immigration laws which have made the country accessible and attractive to entrepreneurs and technology workers, tax codes and regulations which lighten burdens and encourage risks, education and community building efforts to encourage entrepreneurs, and a range of other actions, covering most areas relevant to innovation.</p> <p>http://kasvustrategie.mkm.ee/index_eng.html</p>	
Canada immigration laws	<p>Points based immigration in Canada has been identified as a good practice for increasing high-skill immigration.</p> <p>www.cic.gc.ca/english/immigrate/skilled/apply-factors.asp</p>	
Business angel laws in Turkey	<p>Turkey has initiated, an attractive notion around the world, broadly called "Business Angels" into its finance market. The legal framework relating to the Business Angel Scheme was established and tax incentives norms were introduced for the qualified persons. It aims to introduce a new instrument for SMEs at their early development stages and having funding difficulties, increase professionalism and improve business culture and ethics among angel investors make angel capital an institutionalised and trustworthy source of finance, make angel investments attractive through state supports.</p> <p>https://www.treasury.gov.tr/en-US/Pages/Business-Angel-Scheme</p>	

POLICY IMPLICATION	CHALLENGE	RECOMMENDATIONS
Swedish Competition Authority	The Swedish Competition Authority awards public bids using traditional metrics, but incorporating advantages for innovative projects, sustainability and young and/or small businesses. www.konkurrensverket.se/en/publicprocurement/	
Thailand board of investment activity and area based incentives	Thai board of investment has a set of area based and activity based incentives, which enable multiple mechanisms for developing the ecosystem, especially in rural areas around clear local economic activities. This new thinking enables ICT for example to become a cross cutting cluster using activity based incentive, while other sectors use area based incentives. www.boi.go.th/index.php?page=criteria_for_granting_tax	

Specific areas of needed policy revision are outlined below, including international good practices, which can be used as a basis for policy experimentation.

Table 2: Policy examples: Revise legal regime and promote incentives

Policy	Challenges Addressed	Example
Tax holidays for early stage start-ups	Moderate taxation on small businesses. Early stage start-ups are still impacted by tax burdens and enforcement procedures. This is especially true with local and municipal taxes and fees.	The Switzerland Government allows a tax holiday of up to 100 per cent over 10 years, depending on sector and location. This includes provisions for cantonal and municipal taxes. Available through: www.vaud.ch/fileadmin/user_upload/_temp_/pdf/20120202_brochure_allegements-fiscaux_en.pdf
Loosened immigration requirements	Human capital in technical fields is insufficient, both in quantity and quality. The education system will take time to develop domestic human capital. Drawing international talent can supplement domestic needs and contribute to a pool of mentors and champions. The current system is relatively open, but doesn't present a strong draw to talent or entrepreneurs.	Points based immigration such as the Canadian system has been identified as a good practice for increasing high-skill immigration. Available through: www.cic.gc.ca/english/immigrate/skilled/apply-factors.asp The Startup Chile programme, offering support, grant funding and other resources in exchange for relocating to Chile and supporting the local ecosystem. Available through: www.startupchile.org/
Crowdfunding	There is a lack of high net worth individuals. The diaspora community represents an underused resource. Crowdfunding is an emerging method of financing start-ups.	The US SEC recently established guidelines for equity crowdfunding, opening it up as a means of financing and allowing investment by a wider population. Available through: https://www.sec.gov/info/smallbus/secg/rccomplianceguide-051316.htm

Policy	Challenges Addressed	Example
Investment	Investment is broadly liberalized, with low taxation and immigration benefits. Few incentives exist to actively promote investment activity, especially investment in private sector R&D. There is a desire to attract global businesses to establish offices in country.	Israel has developed a range of incentives for investment, notably matching funds to be provided by the government, collaboration opportunities, tax benefits and incentives to develop human capital. Available here: www.financisrael.mof.gov.il/Financisrael/Docs/En/publications/InvestorsBooklet.pdf
Strengthened and streamlined IP laws	The legal regime for IP is substantial, yet no dedicated national IP policy framework exists, contributing to the a general lack of awareness about it and perceived weak enforcement..	WIPO has a collection of best practices related to promoting IP for SMEs and assisting them in enforcement. Available here: www.wipo.int/sme/en/best_practices/
More innovation friendly public procurement requirements	Public procurement is a major component of the demand for ICTs. SMEs and start-ups often feel disadvantaged by various requirements under the current procurement system.	The Swedish Competition Authority awards public bids using traditional metrics, but incorporating advantages for innovative projects, sustainability and young and/or small businesses. Available here: www.konkurrensverket.se/en/publicprocurement/
Ecosystem mapping and matchmaking	Lack of a clear mapping of the innovation ecosystem. Need for improved coordination, collaboration and access to soft infrastructure.	Startup Delta works to attract start-ups, map services, and ensure access coordination. Available here: www.startupdelta.org/ Notably, there was a need for an improved procedure to shut down businesses. Startup Delta links to that process here: http://startup.ondernemersplein.nl/ending-your-business/

Related to the aforementioned recommendation, the following project or implementation framework is proposed.

Table 3: Proposed project: Digital Innovation Bridging Agency

Policy or Project Project #1: Digital Innovation Bridging Agency	Champions: TBD
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<u>Challenge</u>	<u>Value Proposition</u>	<u>Recommended Action</u>
<p>Engagement and collaboration between the public sector and other stakeholders.</p> <p>Guiding ecosystem innovation activities to foster Kenya Vision 2030 and Big Four agenda</p> <p>Reduce barriers in the ecosystem.</p> <p>Cluster development and ICT integration in key sectors</p>	<p>Guide Innovation Dynamics</p> <p>Improve innovation efficiency</p> <p>Provide more influence to stakeholders for innovation policy and issues.</p> <p>Sectoral guidance for ICT integration & cluster development in support of developing solutions to local problems and Big Four agenda</p> <p>Need for sectoral and ecosystem guidance to engage with Big Four Agenda and local problems.</p> <p>Create "skin in the game" and more effective innovation programmes.</p>	<p>Create a digital innovation agency with funding and mandate to promote programmes and policies to support the ecosystem.</p> <p>Take leadership role through, sectoral guidance facilitating ICT integration and cluster development</p> <p>Provide guidance and dedicated funds towards addressing local problems and Big Four Agenda.</p> <p>Share resources for project via MOUs and PPPs</p> <p>Open platform for networking in the ecosystem.</p> <p>Champion revision of laws and incentives with multi-stakeholders</p> <p>Public sector advocacy around all government institutions.</p>
<p><u>Mission Achievement Criteria</u></p> <p>Ongoing, stable agency.</p> <p>Orientation of public sector in working within the ecosystem.</p> <p>Acceleration of digital services creation.</p> <p>Integration of ICT clusters with other sectors.</p> <p>Annual ecosystem mapping and assessment.</p>	<p><u>Mission Budget</u></p> <p>\$0.5 million opex/4 years.</p> <p>\$1 million capex.</p> <p>Additional funding required on a per-project basis, with objectives to gather joint funding via PPPs and international development funding.</p>	

6.2 Nurturing appropriate talent

A theme consistently mentioned by respondents was the lack of available skills in the ecosystem. This scarcity includes soft skills, as well as technical skills, and was particularly pronounced in relation to the availability of experienced talent. To address this issue, two key components of the recommendations need to be targeted.

First, the existing curricula should be updated to include practical learning on contemporary technology platforms and skills. This activity should progress simultaneously with the introduction of EdTech solutions and community outreach to further encourage talent to take up industry appropriate skillsets. These activities would increase baseline digital literacy and adoption of technology. Efforts towards revising the curriculum are currently underway in some of the innovative academic centres – like the C4D laboratory at the University of Nairobi.

Second, there needs to be more consistent collaboration and cooperation between academia and the private sector, combined with efforts to engage members of the diaspora to act as mentors in education and the private sector. Additionally, talent should be given opportunities for increased mentorship and skills development in the real world. Several variations of this theme can be adopted, such as private sector training programmes embedded in degree programmes, internship opportunities, collaboration on syllabus development and improving the skill set of professors. This nexus can provide talent with appropriate skills and experience and help guide talent into innovative firms, research bodies, and start-ups as and when they graduate.

Alongside hubs and training programmes, investment, especially into the development of a skills ecosystems similar to the one developed by Hungary, offers the ability to foster talent even in rural areas of the country. All of the above should be oriented towards making the most of international investors and the resources of the diaspora community.

Table 4: Recommendations: Nurturing appropriate talent

Policy Implication	Challenge	Recommendations
Strengthen talent, access and quality and appropriateness	<p>Lack of appropriate technical skills.</p> <p>Lack of sufficient human capital in the domestic ecosystem.</p> <p>Limited availability of soft skills.</p>	<p>Community outreach for ICT education</p> <p>Continued efforts at skills gap analysis and attraction of global universities.</p> <p>Professional mentorship and promotion of success stories.</p> <p>Attract Kenya diaspora as mentors in the education and private sector.</p> <p>Update curriculum to include more product management, marketing and IP management.</p> <p>Introduce EdTech solutions in education system</p>
Enhance platform for collaboration between academia and private sector	<p>Outdated curriculums falling short of ecosystem needs.</p> <p>No focus on research in talent.</p>	<p>Improved curricula, early career development and internships.</p> <p>Strengthened programmes such as embedded skills training, internships, labs and collaborative syllabi.</p> <p>Attract Kenya diaspora as mentors in the education and private sector.</p> <p>Platform for collaboration and communication between private sector and academia.</p> <p>Improve access to labs for growing practical skills.</p> <p>Develop a skills and mentoring ecosystem for entrepreneurs.</p>
Good practice		
Australia's Open Access College	<p>Open Access College is an R-12 government distance education school for students who cannot access a local school, or who want a broader curriculum. It uses a blended approach of online, virtual classroom lessons in small groups through 200 instructors. The college is a leader in flexible and online learning and uses a blended teaching model supported by high quality learning materials. A major focus has been on using <i>Flipped Learning</i> pedagogy and innovation in the use of technology to engage students in learning. Its partnership with CISCO has been particularly fruitful as it offers the experience of more hands on and interactive training as teachers and students are able to share resources, including visual materials.</p> <p>https://www.openaccess.edu.au</p>	

Policy Implication	Challenge	Recommendations
Ireland's ICT Skills Action Plan	In January 2012, in a direct response to specific skills shortages for people with high-level ICT skills in Ireland, the Department of Education and Skills published a joint government – industry ICT action plan aimed at building the supply of high-level ICT graduates. One of the key measures in the plan was the roll-out, from March 2012, of more than 800 places on intensive NFQ level 8 higher diploma ICT skills conversion programmes by higher education providers in partnership with industry. A second phase of the programme was rolled-out in late 2012 for a further round of specialist programmes aimed at addressing identified ICT and software development skills gaps. It was estimated that 45 000 jobs would be created within the ICT sector in Ireland between 2014 and 2018.	www.technikpact.nl/cdi/files/b9c58845bf48d8b6696d5a0722c4161890422728.pdf
True Innovation, Thailand	True Corporation is a telecom operator in Thailand. They have recently established a series of projects under the umbrella of True Innovation. This includes incubation, investment and competitions with a specific focus on working together with universities in order to develop resources for young people with an interest in ICT innovation.	http://ecommerceiq.asia/true-corp-digital-park/
Hungary Input programme	Hungary has launched a start-up support programme for its ecosystem after wide consultations in the country following the Budapest Runaway manifesto . A subsequent project, funded by EU, the INPUT programme aims to develop success stories for start-ups. The programme has three pillars: education, mentoring and market access. Hungary's programme is a good example of government intervention to guide an innovation ecosystem with a facilitative approach to help resolve its challenges without creating market distortion. In fact the programme seeks to grow the community supporting the start-ups via its innovative approach to building sustainable support networks, competitiveness, and talents growth.	www.inputprogram.com/

Related to the aforementioned recommendation, the following project or implementation framework is proposed.

Table 5: Proposed project: Developing appropriate talent in Kenya

Policy or Project	Champions: TBD	
Project #2: Developing appropriate talent in Kenya		
<u>Challenge</u>	<u>Value Proposition</u>	<u>Recommended Action</u>
Lack of appropriate technical skills.	Encourage entrepreneurship and ICT careers.	Update curriculum to include more product management, IP management, marketing.
Limited availability of soft skills.	Develop a more effective human capital.	Improve availability of technical non-degree skills.
Outdated curriculums falling short of ecosystem needs.	Engage the innovators in education sector and provide demand for start-ups.	Improve access to labs for growing practical skills.
No focus on research in talent.		Introduce Edtech in education system.
		Improve partnership with private sector for internship and mentorship.

<u>Mission Achievement Criteria</u>	<u>Mission Budget</u>
Number of critical labs with private sector support.	USD 2 Million towards fostering EdTech solutions and updating curriculum/ 4 years.
Engage x% of students in internships and mentorships.	USD 1.0 Million towards improving private sector internship and apprenticeship / 4 years.
Benchmarking of curriculum.	USD 1.0 Million seed funds towards improving availability of critical labs with private sector support/ 4 years.
Key events and activities in Edtech.	

6.3 Develop support for ecosystem

Since the ecosystem is in an early phase, many resources do not yet meet the needs of the stakeholders. In particular, there is a need to develop hubs and training programmes, improve access to seed funding, venture capital, and – more importantly – provide needed support services in an effective yet not too intrusive manner across the ecosystem. Overall, the ecosystem must provide a continuum of resources to improve entrepreneurial distribution and support, and offer much needed guidance in the entrepreneurial journey, as well as in facilitating the engagement with local issues and priority areas (e.g. incentivizing cluster development for the “Big Four”).

Two major barriers that have been holding Kenya back from being a vibrant digital ecosystem is the unavailability and unequal distribution of resources, as well as the lack of sustainability of innovation spaces.

A continuum of funding at all stages is needed to encourage entrepreneurs to engage with challenges – such as achieving the Big Four Agenda- and develop viable solutions that the market needs. Beyond seed capital funding, resources are also needed to develop a training and mentoring business ecosystem that can focus on providing skills and knowledge to entrepreneurs, and which – eventually – guide the ecosystem to create new clusters and increase orientation in key sectors. Without this continuum of resources and services to encourage talents to start their entrepreneurial journey or guide them into targeting specific priority issues through dedicated funds, the ecosystem will not be able to reach the critical mass needed to become competitive nor will it be possible to sustainably develop solutions to local issues.

A number of national and international actors have strong experience and created good practices in developing hubs and training programmes; these may be engaged as partners for establishing such projects in Kenya. Existing incubators and hubs are creating knowledgeable entrepreneurs. However, these types of institutions are too few in numbers to meet the need of the ecosystem and not accessible for most stakeholders. This can be traced back to a lack of investment and sustainability of the hubs. Programmes, similar to INPUT in Hungary, can help Kenya develop an organic business and training ecosystem that is inclusive of rural areas and counties, by allowing entrepreneurs to have access to physical spaces, such as hubs across the country.

In urban centres, good practices such as Gearbox and fablabs should be supported and replicated to develop support for the ecosystem, while in rural areas, as mentioned above, Kenya could opt to adopt a training ecosystem framework, modelled after the Hungary INPUT programme. This could also be combined with programmes such as the Telecentre network models of Rwanda. Taken together, Kenya will have an ecosystem that fosters inclusive infrastructure, where both content and workspace is available to innovators in rural and urban settings.

In addition, the development of clusters would allow an even denser network of connections. Cluster formation can be encouraged by bringing together interrelated companies from one specific sector, through dialogue and location, which allows for sharing knowledge, resources and infrastructure. Facilitation and strengthening of resources occurs due to the geographical proximity of the market players, which reduces implicit costs and area to be covered in order to collaborate.

To jump start the stagnating ecosystem and create critical mass, much needed public funding has to be made available. Once the ecosystem is catalysed and innovators are able to develop appropriate solutions, the private sector will take over leadership role to continue the ecosystem development.

Table 6: Recommendations – Develop Support for Ecosystem

Policy Implication	Challenge	Recommendations
Provide a continuum of resources, improve entrepreneurial distribution and support, and facilitate issue-driven engagement	<p>Digital innovation is concentrated in big cities.</p> <p>Lack of appropriate resources throughout the ecosystem.</p> <p>Missing direction towards priority issues and lack of solutions and engagement regarding local problems</p>	<p>A continuum of services (labs, hubs, accelerators, incubators) and development of culture and communities are priority. Provide a continuum of funding sources, e.g., venture capital, angels, crowd funds, R&D, etc.</p> <p>Develop a training and mentoring business ecosystem for focus on providing skills and knowledge to entrepreneurs.</p> <p>Develop stakeholder awareness, provide guidance, and incentives to engage with local problems such as solutions to achieve Big Four Agenda. Integrate the ecosystem in both public and private sector needs.</p>
Guide innovation activities of clusters and SMEs	<p>Stagnating ecosystem.</p> <p>There seems to be no guidance for innovation activities</p> <p>Need for cluster development and ICT sector integration around Big Four agenda</p>	<p>Create a platform to encourage SMEs to develop solutions for larger firms and financial institutions.</p> <p>Guide the ecosystem to create new clusters and increase orientation in key sectors towards the Big Four agenda priority areas.</p> <p>Incentivize digital transformation and ICT integration in prioritized clusters through guidance and dedicated resources</p> <p>Facilitate access to international market.</p>
Good practices		
Corallia, Greece	<p>Corallia is an initiative that manages a series of ICT centric innovation clusters in Greece. They focus on bringing together innovative ICT firms and key resources in a number of verticals. These connect with a series of "innohubs" designed to provide incubation and support services, including outreach services to young innovators.</p> <p>www.corallia.org/en/about-corallia.html</p>	

Policy Implication	Challenge	Recommendations
Start-Up Nation Central, Israel	Start-Up Nation is a new initiative in the Israeli innovation ecosystem designed to connect start-ups in Israel with problems in a number of key verticals, such as FinTech, agriculture and healthcare. It then matches those projects with resources from around the world, including MNCs, investment and governments interested in seeing those solutions developed.	www.startupnationcentral.org/
Start-up Chile	Start-Up Chile is an accelerator programme run by the Chile Government, which serves two key functions in developing the ecosystem. First, it attracts various start-ups and international talent to Chile by providing incentives (Space, funding, support) for companies to launch in or relocate to Chile. Second, it requires the founders of those start-ups to participate in social programmes to educate young entrepreneurs and foster entrepreneurs in Chile.	http://startupchile.org/about/
Rwanda Telecentre Network	The Rwanda Telecentre Network provides basic level access to ICT tools and infrastructure, allowing many people who would not otherwise have access to use ICT services. They began as public sector initiatives, but with the understanding that they will be converted to private ownership over time. RTN can further evolve by fostering international partnerships especially with low cost technology providers, public supports, and local domestic players.	http://rtn.rw/
Hungary Start-up Programme	Hungary has launched a start-up support programme for its ecosystem after wide consultations in the country following the Budapest Runaway manifesto . A subsequent project, funded by EU, the INPUT programme aims to develop success stories for start-ups. The programme has three pillars: education, mentoring and market access. It is a good example of government intervention to guide an innovation ecosystem with a facilitative approach to help resolve its challenges without creating market distortion. In fact, it seeks to grow the community supporting the start-ups via its innovative approach to building sustainable support networks, competitiveness, and talents growth.	www.inputprogram.com/

Policy Implication	Challenge	Recommendations
Start-up America	Startup America is a high profile initiative launched by the White House to promote high growth entrepreneurship that will seed economic growth primarily in the United States. According to the white house factsheet: "Startup America is an initiative to celebrate, inspire, and accelerate high-growth entrepreneurship throughout the nation. This coordinated public/private effort brings together an alliance of the country's most innovative entrepreneurs, corporations, universities, foundations, and other leaders, working in concert with a wide range of federal agencies to dramatically increase the prevalence and success of America's entrepreneurs".	www.startupamericapartnership.org/

Source: ITU.

Related to the aforementioned recommendation, the following project or implementation framework is proposed.

Table 7: Proposed project: Catalysing Kenya ecosystem sustainability

Policy or Project Project #3: Catalysing Kenya ecosystem sustainability		Champions: TBD	
<u>Challenge</u> Digital innovation concentrated in big cities. Stagnating ecosystem. No guidance for innovation activities. Lack of appropriate resources throughout the ecosystem.	<u>Value Proposition</u> Accelerate the digital transformation. Improve inclusion and creation of services. Provide a continuum of services from research to exit.	<u>Recommended Action</u> Create a training and support service ecosystem throughout Kenya. Facilitate access to international market. Develop and diffuse good practice hubs. Integrate the ecosystem in both public and private sector needs. Guide cluster creation.	
<u>Mission Achievement Criteria</u> 30 per cent of counties have labs, hubs, accelerators, incubators or spaces for innovators. 50 per cent Increase in the number of local venture capital, angels, crowdfunding platforms. 30 per cent of counties have access to training and mentoring business ecosystem to provide needed skills and knowledge for entrepreneur. Identify and support minimum of 4 key sectors with digital cluster formations.		<u>Mission Budget</u> USD 5 million for supporting labs, accelerators and incubation space formation. USD 5 million in developing training and mentoring ecosystem throughout Kenya. USD 5 million in support for key clusters development. USD 5 million to support events and activities that stimulate ecosystem engagement in developing appropriate solutions.	

6.4 Strengthen public sector innovation

The objectives stated in Kenya Vision 2030 for the political governance pillar aim at "a democratic political system that is issue-based, people-centred, result-oriented and accountable to the public", and will require an accelerated public sector transformation as a key enabler. One main factor facilitating this vision is the development of a more responsive innovation agency that focuses on *digital* across

all sectors. This dedicated innovation agency has a coordination function and will utilize new policy experimentation for a more responsive and accountable public sector to be developed.

Another core enabler will leverage digitalization, not only of services but also processes that will help to transform government efficiency. The public sector in Kenya is seen as very enthusiastic, but working in silos. Many ministries are known to have redundant and overlapping programmes. With only limited resources available, it become a challenge to reach impact. Since there is an evident lack of collaboration and engagement, platforms need to be developed, which encourage public-private collaboration in digital transformation. These platforms require experts from the public sector and other stakeholder groups to work collaboratively to transform citizen services. This will generate the dual benefit of engaging the ecosystem to assist government institutions in addressing citizen issues, while also generating an increasing demand and a testing ground for young companies.

The Information Communication Technology Authority (ICTA) and other institutions are involved in open data platforms, but these efforts do not fully address the issue. Initiatives, such as these, can be enhanced by adapting an open data approach and providing technological sandboxes in which the open data sets, challenges, and resources are made available together, to allow for targeting and solving specific problems at once. These initiatives would attract the private sector and innovators under a set open innovation frameworks. This approach can be used, for instance, to address and solve the last mile issue that Kenya is facing.

The Kenya Revenue Authority (KRA) and the Communications Authority of Kenya (CA) are seen as leaders in engaging the ecosystem with their engagement frameworks, yet their efforts do not go far enough. KRA engages annually with specific innovation events around tax services, engages with academia, both domestic and international, in regard to tax research, and engages very proactively with the innovator community. CA actively supports innovators in bringing them to the international scene, and has developed an engagement framework which establishes rules of engagement, and is actively connected to the ecosystem via formal and informal mechanisms.

Public sector transformation can be accelerated through continually analysing and adapting to international best practices, developing engagement frameworks for the ecosystem, actively connecting and interacting with expert networks, and by building platforms for open collaboration with potential flagship projects.

Table 8: Recommendations – Strengthen Public Sector Innovation

Policy Implication	Challenge	Recommendations
Strengthen infrastructure and access to appropriate technology across counties.	Lack of appropriate resources throughout the ecosystem.	Continually analyse and adapt elements from international best practices. Develop ecosystem engagement innovation framework. Develop networks with subject matter experts and universities.
Support innovation framework within institutions for service creation.	Lack of collaboration and engagement. Lack of expertise and knowledge of problem.	Public institutions develop innovation frameworks supporting a key sector. Develop platforms for collaboration and engagement. Platform for public-public and public-private collaboration in digital transformation.

Policy Implication	Challenge	Recommendations
Provide open data sets and access to sandboxes for government information.	Lack of transparency and trust across the board.	Put in place a sustainable institutional framework to develop and proactively release open government data. Provide sandboxes for experimentation with new technology and methodologies for service delivery. Global benchmarking and evaluation.

Good practices

Estonia e-government	Estonia, with its population 1.3 million people, has recently emerged as a global leader in e-Governance. From electing your representative online and filing your income tax from the comfort of your living room in less than five minutes to e-signing of legal contracts, Estonia's electronic ID push has created a connected society within its geographical boundary and made private and public services both easily accessible and personalised. Its e-Estonia project has also transformed the capital city of Tallinn into an innovation hotspot – all while protecting individual privacy. Today the vast majority of the Estonia population have e-IDs, which were used more than 80 million times in 2014. This can also be attributed to the soar in the number of services available online – 40 in 2003 to 1 600 in 2015. Over the years, e-Estonia has led to an unprecedented level of transparency and accessibility; convenient and flexible exchange of private, government and corporate data; a healthier, better educated and connected population; and a prosperous environment for business and entrepreneurship. https://e-estonia.com
Kenya Revenue Authority open innovation, Kenya	The Kenya Revenue Authority (KRA) is charged with collecting revenue and administering policies. With its flagship project iTax, KRA helped transform the tax base and service delivery to citizens. KRA is extending their innovation leadership in public service transformation by linking via MoU with various universities, related networks locally and globally with aim towards adopting best international standards. KRA has also developed an open annual competition, which serves as a platform to stimulate domestic innovation. KRA vision is clear and has specific activities that support a full bridge for an open innovation platform with key stakeholders of the ecosystem. www.kra.go.ke/

Related to the aforementioned recommendation, the following project or implementation framework is proposed.

Table 9: Proposed project: Strengthening public sector innovation

<u>Policy or Project</u> Project #4: Strengthening Public Sector Innovation	<u>Champions:</u> TBD
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<u>Challenge</u>	<u>Value Proposition</u>	<u>Recommended Action</u>
Lack of collaboration and engagement	Accelerate public service transformation	Develop ecosystem engagement innovation framework
Lack of transparency and trust across the board	Improve transparency and trust	Develop platforms for collaboration and engagement
Lack of appropriate resources throughout the ecosystem	Create mechanisms for continuous evaluation and evolution	Develop networks with subject matter experts and universities
Lack of expertise and knowledge of problem	Improve access to resource and knowledge	Global benchmarking and evaluation
<u>Mission Achievement Criteria</u>		<u>Mission Budget</u>
Number of open government data		Re-appropriate existing funds towards newer priorities.
Every major institution to have an innovation framework within a year.		USD 2 million to develop sandboxes platforms for open government data.
Everyone is engaged at least one platform in the ecosystem.		USD 0.5 million to support a major event for public service transformation/year.
All institutions to have an innovation framework in 3 years.		
One major event for public service transformation.		

6.5 Strengthen B2B engagement platforms

The digital innovation capacity related to small firms is seen as deficient. Although platforms – such as e-commerce and microfinance – are beginning to emerge, there is not enough support for the transformation of the various critical sectors. Most of these initiatives originate from early start-ups, but large businesses are still not engaged in assuming new roles. Banks for example have many customers who are SMEs, but barely any non-banking services are offered to them. Sector transformation will require many new B2B services, which require the removal of barriers for small firms and their growth.

One key issue is that ICT itself is not seen as a strategic sector. Some ICT services and imports are taxed as manufacturing sectors. Given the sectors' potential for exponential impact on making traditional non-ICT sectors more competitive, ICT needs to become a key strategic sector. Particularly benefits and import facilitation will be necessary, along with targeted programmes and availability of specialized funds.

Incentivizing private sector leadership will require the realignment and creation of new incentives to attract domestic and foreign investment, as well as co-investment resources.

Recognizing ICT as a strategic sector, co-investing in infrastructure projects with the private sector, increasing attractiveness for foreign resources to develop key sectors, facilitating engagement of traditional businesses in the technology ecosystem with smaller firms; will all assist to attract FDI and strengthen private sector.

Table 10: Recommendations – Strengthen B2B Engagement Platform

Policy Implication	Challenge	Recommendations
Foster FDI and B2B services with private sector leadership	<p>Lack of collaboration and engagement</p> <p>Traditional businesses are not changing their business models</p> <p>Difficulties in raising capital and developing the ICT private sector</p>	<p>ICT needs to be recognised as a strategic sector</p> <p>Co-investment in infrastructure projects with private sector</p> <p>Increase attractiveness for foreign resources to develop key sectors</p> <p>Facilitate engagement of traditional businesses in the technology ecosystem with smaller firm</p> <p>Promote and attract relevant foreign talent and leading companies towards transformation of key sectors</p> <p>Develop SME engagement with traditional businesses while leveraging technology</p> <p>Increased market competitiveness of Kenya goods and services</p>
Good practices		
Israel Yozma Program	<p>Israel's Yozma is one of the few cases in the world that represent a successful intervention in the area of venture capital by a government. To help incentivise economic growth in Israel, the government in 1993 launched the Yozma programme, thereby entering the modern-day venture capital industry. Yozma has earned worldwide recognition as the creator of the Israeli venture capital industry. Yozma makes equity investments in technology companies engaged in fields where Israel has demonstrated world leadership. The Group targets high-growth companies in the sectors of Communications, Information Technologies and Life Sciences. Since inception the Group has managed more than US\$ 220 million and made direct investments in about 50 portfolio companies.</p> <p>www.yozma.com/overview/</p>	
Ireland Economic Program	<p>Under its economic reforms in the last couple of years, a range of new employment permits for those looking to work in Ireland have helped Ireland turn towards the path to becoming the go-to location for ICT. The country has also launched a masterplan for National Skill Strategy 2025 that aims at driving sustainable economic growth and, thereby, improving lives and lifestyle. This strategy has been envisioned to position Ireland as a country where talent can thrive.</p>	
Kashikorn Bank B2B Services	<p>K-Bank covers about 75 per cent of the market share in Thailand. With smart strategic planning, the bank has become No. 1 in the digital banking space with their mobile banking alone accounting for 40 per cent of the market share. In the last year alone, mobile banking subscribers of K-Bank have grown by 80 per cent, and they expect to reach 5 million users this year. A major reason for this is that the bank has adapted really well to the changing digital ecosystem, and not just in the areas of digitisation of data but by offering digital and mobile banking services. It is also one of the leading banks in the country to collaborate with FinTech and start-ups; and have their own innovation centre in which they have invested heavily.</p> <p>https://www.kasikornbank.com</p>	

Policy Implication	Challenge	Recommendations
EIT Digital/Startup Europe, Europe	EIT Digital delivers breakthrough digital innovations to the market and breeds entrepreneurial talent for economic growth and improved quality of life in Europe. It does this by mobilizing a pan-European ecosystem of over 130 top European corporations, SMEs, start-ups, universities and research institutes. Similarly, Startup Europe "aims to strengthen the business environment for web and ICT entrepreneurs so that their ideas and business can start and grow in the EU". www.eitdigital.eu/	

Related to the aforementioned recommendation, the following project or implementation framework is proposed.

Table 11: Proposed project: Developing a B2B ecosystem platform

Policy or Project		Champions: TBD	
Project #5: Developing a B2B ecosystem Platform			
Challenge	Value Proposition	Recommended Action	
Lack of collaboration and engagement	Catalyse private sector development	Promote and attract relevant foreign talent and leading companies towards transformation of key sectors	
Traditional businesses are not changing their business models	Reduced risk and increased market resilience	Develop SME engagement with traditional businesses while leveraging technology	
Difficulties in raising capital and developing the ICT private sector	Digital transformation led by private sector	Increased market competitiveness of Kenya goods and services	
	Increase FDI in key sector		
	Attract foreign talent		
Mission Achievement Criteria		Mission Budget	
Devise specific programmes for foreign talent attraction in 1 year.		Government to commit USD 15 million in risk capital and co-investment to support to B2B services of key sectors and promote FDI.	
Develop strategies and actions to attract key companies in 2 years.		USD 2 Million for promotion of Digital Brand Kenya and attract foreign talent and companies over 4 years.	
Some initial risk capital secured with 5-8X RoI.			
Market the digital Kenya brand across key sectors.			

6.6 Strengthening IP regimes

Both IP awareness and IP enforcement seem to be issues in Kenya. There is a need to implement new IP protection legislation and to educate enforcement officials and other stakeholders on the specific nature intellectual property.

The cost of patenting often deters entrepreneurs from protecting their innovations. The slow judiciary process is a further barrier, with cases taking years to reach a judgment. The institutions responsible for the above, including the Kenya national innovation agencies, the Kenya Copyright Board, and the Kenya Industrial Property Institute, do not have sufficient resources nor the appropriate talent – such as ICT patent experts – to tackle the issue. Moreover, universities and technology transfer offices are not coordinated enough with other stakeholders, and they often lack funding and human resource capacities.

At a policy level, the framework needs to be strengthened in consultation with experts and stakeholders across the country. Kenya requires a strong institutional framework to support protection of IP. This framework also needs to incentivise IP and work on a strong redressal mechanism. To help the

ecosystem navigate through the current challenges, the creation of new services is urgently needed. Many good practices at an international level – such as the Singapore IP Regime – are available to assist in transforming and strengthening the Kenya IP regime.

Table 12: Recommendations: Strengthen IP regimes

Policy Implication	Challenge	Recommendations
Strengthen IP framework	<p>SMEs and entrepreneurs do not have knowledge of how to patent, how to protect and how to seek redressal.</p> <p>Academia fostered with commercialisation is lacking.</p>	<p>Revise IP laws to be relevant to the changing nature of ICT and digital technologies.</p> <p>Strengthen IP focused TTOs, and enables commercialisation mechanisms.</p> <p>Work towards creating a cadre of IP experts across the country.</p> <p>Develop strong and agile institutional frameworks to support protection of IP.</p> <p>Create mechanisms for training and capacity building of start-ups and SMEs.</p> <p>Create an ecosystem of ancillary services (IP awareness-raising and training, technological information services including database searches, customised IP management advisory services, financial assistance).</p> <p>Incentivise the creation of a cadre of IP professionals.</p> <p>Improve IP registration mechanisms.</p> <p>Develop a toolkit and scale deployment.</p> <p>Strengthen IP protection and redressal mechanism especially for start-ups and SMEs.</p> <p>Scale good practice platforms that enable university IP creation, and IP transformation.</p>
Good practices		
Singapore IP Protection Regime	<p>Singapore provides one of world's most robust regimes for the protection a company's intellectual property. In 2015, the World Economic Forum's Global Competitiveness Index ranked Singapore second in the world for intellectual property protection. The high ranking results from a concerted effort by Singapore government to encourage the development and registration of intellectual property in the country and to provide robust legal frameworks for vigorous protection of registered rights. Singapore's business-friendly IP regime has helped bolster the confidence of leading global companies such as Procter and Gamble, Continental, and Mead Johnson, all of whom have selected Singapore as their location of choice for investments in business and research and development, citing the country's strong protection of IP rights as a factor in their decisions. Greater quality assurance of patents granted in Singapore is also a positive contributor to a thriving economy.</p> <p>https://www.ipos.gov.sg/Home.aspx</p>	

Policy Implication	Challenge	Recommendations
Patent boxes in Belgium	On February 2, 2017, Belgium's Parliament approved the innovation income incentive measures. The new rules will extend the scheme to small and medium-sized enterprises (SMEs) and replace the deduction for patent income, which was repealed. Some of the changes resulting from the new scheme include the following: Deduction is no longer limited only to income (and capital gains) from patents and supplementary protection certificates, but now also applies to innovation revenue from plant variety rights, orphan drugs, and copyright-protected market computer programs; deduction remains valid even if mergers or divisions occur within the company; unused deduction can be carried forward to a subsequent tax period. The deduction rate will increase to 85 per cent of the net qualifying income, with an effective tax rate of 5.1 per cent. The deduction will apply to self-developed IP rights, and IP rights acquired or licensed from related or unrelated third parties.	

Related to the aforementioned recommendation, the following project or implementation framework is proposed.

Table 13: Proposed project (Agile IP-Platform)

<u>Policy or Project</u> Project #6: Agile IP-Platform		<u>Champions:</u> TBD	
<u>Challenge</u> SMEs and Entrepreneurs do not have knowledge of how to patent, how to protect and how to seek redressal Academia fostered with commercialization	<u>Value Proposition</u> Create agile IP regimes that can be updated with changing technology trends and needs Facilitate innovation in the ecosystem Protect entrepreneurs and start-ups	<u>Recommended Action</u> Incentivize the creation of a cadre of IP professionals Improve IP registration mechanisms Develop a toolkit and scale deployment Strengthen IP protection and redressal mechanism especially for start-ups and SMEs Scale good practice platforms that enable university IP creation, and IP transformation	
<u>Mission Achievement Criteria</u> Toolkit to share best practice Number of academia to use the toolkits Number of IP professional mapped, trained and identified Number of TTOs		<u>Mission Budget</u> USD TBD 2 Million towards creating IP support systems	

6.7 Integrate digital innovation in key sectors

A central objective for immediate action, is leveraging the use of ICT innovation in key sectors to accelerate delivery of Big Four agenda – which arises from Kenya Vision 2030, and “Big Four” short term priorities for 2018-2022, both of which state the importance of ICT centric innovation as strategic enabler for national development. However, no specific framework or structured approach exists that delineates how exactly to leverage digital, or how to strategically integrate ICT innovation in key sectors to deliver the Big Four agenda.

The central focus of this recommendation is the need to identify opportunities for leveraging digital technology in key sectors – in order to create, update and adapt projects and programs that enable smart solutions to accelerate the “Big Four”. However several issues need to be addressed and then aligned to target “Big Four” priority areas. These issues include: Lacking digital integration in key sectors, lacking linkages and cluster development, lack of projects that have a focus on technology enabled solutions for development, and lacking ecosystem engagement with the current “Big Four” priority agenda, or local issues in general.

Apart from the clear success of clusters in FinTech and mobile financial services, the Kenyan ecosystem is lacking in terms of cluster development and digital transformation of key sectors. Moreover, engagement with local issues – specifically the Big Four agenda – through the use of technology enabled solutions is not sufficiently incentivized. Although some projects and programs to engage with local problems exist, these often do not focus on digital as an enabler. While the government has stated to regard digital innovation as a strategic enabler, targeted projects and initiatives are necessary in order to exploit the transformative potential and the benefits of the technological revolution.

In order to facilitate the development of “smart” (tech-enabled), sustainable solutions that accelerate the delivery of set goals, while laying the substantial foundation for social well-being, and positively impacting long-term growth, very targeted initiatives and projects have to be created or adapted, and need to be complemented with strategic efforts that incentivize Big Four priority status, through activities in guiding innovation dynamics, and building innovation capacity in the ecosystem.

To build these enabling projects – that leverage the use of ICT innovation in key sectors for the acceleration of the Big Four agenda – there is a need to engage in a customized key sector transformation assessment. Its aim being to identify opportunities for action, develop a straight-forward digital transformation roadmap, build national capacity, and most importantly develop bankable flagship projects for priority areas. This assessment and flagship project development will provide the necessary roadmap, an instructional step by step approach about how to optimally integrate ICT innovation in targeted sectors – customized to Kenya’s goal to accelerate the Big Four Agenda.

Table 14: Recommendations: Integrate digital innovation in key sectors

Policy Implication	Challenge	Recommendations
Integrate ICT innovation in key sectors and foster cluster development	<p>Missing guidance and support for digital transformation of key sectors, and the development of tech-enabled solutions</p> <p>Lacking adoption of technology platforms to integrate innovation in key sectors</p> <p>Missing linkages, collaboration and concerted efforts</p> <p>Lack of resources dedicated towards digital innovation</p> <p>Missing alignment of sectors and ecosystem to tackle Big Four agenda</p> <p>Limited ecosystem engagement with local problems</p>	<p>Identify opportunities to leverage digital innovation for solutions to Big Four priority agenda</p> <p>Mapping of key sectors</p> <p>Mapping of relevant emerging technology platform trends</p> <p>Identify scale up opportunities and high impact projects</p> <p>Provide dedicated resources and enablers for ecosystem engagement with Big Four priority areas</p> <p>Incentivize and guide digital transformation in key sectors</p> <p>Create enablers for cluster development towards solutions for Smart Housing, Smart Healthcare, Smart Manufacturing, and Smart Agriculture</p>
Foster ecosystem engagement with Big Four priority agenda (and other local issues)	<p>Lack of knowledge about and engagement with priority issue agenda</p> <p>Lack of expertise, collaboration and linkages</p> <p>Lack of incentives and enablers</p>	<p>Develop a set of clear mechanisms and projects in each sector</p>
Good practice		
AgroIT, bridging cluster in Hungary	<p>AgroIT is a bridging cluster to stimulate digital transformation and demand in the agricultural sector.</p> <p>In addition to traditional cluster benefits of increased synergies and networks, it connects ICT firms with agribusinesses in order to develop innovative ICT solutions in the field of agriculture. To achieve AgroIT's objectives, the stakeholders seek to exploit synergies through more efficient use of resources, communication, advocacy and access to foreign markets. The cluster goal is to increase competitiveness, ensure market presence and support R&D through various mechanisms, such as providing IT services that are appropriate for farmers, expanding the knowledge base and promoting research. It promotes the development of appropriate technology solutions for leveraging and combining robotic or process management systems, software and drones.</p> <p>www.agroit.hu/en</p>	

Policy Implication	Challenge	Recommendations
<p>DigitalSwitzerland, enabling digital transformation through cross-industry association for the ecosystem in Switzerland</p>		<p>Creating a cross-industry association is beneficial for all the stakeholders in the ecosystem. digitalswitzerland is a cross-industry association created from the shared vision of its members to strengthen the country's position as a digital hub and to project those benefits across the whole of Switzerland in sectors such as financial and medical technology, the life sciences and fashion. As a sign of personal commitment and dedication, the members launched several initiatives, focusing on three key areas: attracting outstanding digital talent, helping existing companies master digital challenges and significantly strengthening the Swiss start-up ecosystem. DigitalSwitzerland works on the following core aspects:</p> <p><i>Political framework</i> – Digital innovators, start-ups and entrepreneurs but also a large number of successful SMEs play a role as key drivers of innovation and future growth. digitalswitzerland seeks to combine – and to amplify – the voices of many of these important participants in the digital transformation in order to promote and help shape political conditions and regulatory frameworks that are conducive to the development of new technologies, new business models and the influx of capital and talent.</p> <p><i>Education and talent</i> – digitalswitzerland offers a digital platform that bundles education offerings in the fields of digital innovation and transformation, and provides employees and learners with access to these areas. With the www.educationdigital.ch initiative, digitalswitzerland supports digital education offerings for children and adolescents. It connects existing platforms and provides reach and publicity.</p> <p><i>Start-up enablement</i> – digitalswitzerland initiatives provide start-ups with vital business knowledge and coaching. They offer rich networking opportunities and provide access to funding. At the same time, corporate members and sponsors benefit from high-speed access to leading start-ups and top talent that can help them accelerate their own ideas and their digital transformation processes. Kickstart Accelerator is a core digitalswitzerland programme that provides corporate entities with high-speed access to the Swiss innovation ecosystem. Venture Kick and its programmes and events aim to close the gaps within the Swiss innovation chain. Venture Kick focuses on supporting the development of both Swiss and international founders, from the first idea to successful scaling for international markets. digitalswitzerland creates events, such as the World Web Forum and the Investor Summit, that seek to provide platforms where established organizations, pioneering new talent and influential stakeholders in the digital transformation can build important connections and find further inspiration.</p> <p>www.digitalswitzerland.com/</p>

Policy Implication	Challenge	Recommendations
Corallia, fostering ICT cluster development in Greece	<p>Corallia is a Greek initiative to foster cluster development in ICT. At the moment it incorporates clusters in gaming, microelectronics and space technologies.</p> <p>By bringing together key players in campuses around the country, Corallia allows ICT resources to be shared and integrated more efficiently, and the campuses provide resources, networking and community to the firms housed in them. Corallia's vision is to develop "a Greek environment with the right framework conditions to allow sciences, innovation and entrepreneurship to flourish (again)". Corallia is one of the first organizations established in Greece for the structured and systematic management and development of innovation clusters. It uses productive innovative ecosystems, coordination and support to nurture specific sectors and regions of the country. The clusters build on competitive advantages and export orientation where they exist. Cluster members have access to a portfolio of services addressing R&D, cluster expansion, education and training, commercialization, innovation and technology, and policy action. Three clusters have been developed so far: the Space Technologies and Applications Cluster, the Gaming and Creative Technologies Applications Cluster, and the Nano/Microelectronic-based Systems and Applications Cluster.</p> <p>www.corallia.org/en</p>	

Related to the aforementioned recommendation, the following project or implementation framework is proposed.

Table 15: Proposed project (Developing Digital Transformation Roadmaps for Key Sectors for the Big Four)

Policy or Project		Champions:
Project #6: Developing Digital Transformation Roadmaps for Key Sectors for the "Big Four"		Government of Kenya / Ministry of ICT, Sector champions TBD
Challenge	Value Proposition	Recommended Action
Digital Transformation not well integrated into key sectors	Accelerate delivery of Big Four agenda	Train at least 100 national expert on aligning and guiding innovation for "Big Four".
Specific programs need to be created and/or updated to embrace the digital ecosystem	Facilitate integration of digital innovation into key sectors	Report on states of Big Four key sectors and relevant digital trends
Lack of cluster development	Foster development of "smart" sustainable solutions	Key sector innovation projects that nurture development of tech enabled solutions for the "Big Four".
Insufficient knowledge about solutions for Smart Housing, Smart Healthcare, Smart Manufacturing, and Smart Agriculture	Identify trends in digital innovation relevant to Smart Housing, Smart Healthcare, Smart Manufacturing, and Smart Agriculture solutions	
	Develop flagship projects accelerating tech-platform enabled solutions to Big Four Agenda priority issues	

<u>Mission Achievement Criteria</u>	<u>Mission Budget</u>
Number of experts trained Key sector innovation profile report delivered (<i>customized focus on utilizing digital technologies to accelerate achievement of Big Four</i>), to include: Key sector mapping Identification of scale up opportunities Actionable digital transformation roadmap developed covering four sectors Corresponding flagship project proposals developed Transformation roadmap delivered, and priority projects developed / initiated	USD 450 thousand towards creating customized key sector transformation assessment, including capacity building, digital transformation roadmaps and co-development of flag ship projects

References

The following resources are useful for readers who wish to continue research in systems of innovation:

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Glossary

Kenya organizations, reports and agencies

ERS Economic Recovery Strategy for Wealth and Employment Creation

USAF Universal Service and Access Fund

NACOSTI National Commission for Science, Technology and Innovation

KENIA Kenya National Innovation Agency

ICTA Information Communication Technology Authority

KENET Kenya Education Network

GCCN Government Common Core Network

NOC Network Operating Centre

NOFBI National Fibre Optic Backbone

CCK Communications Commission of Kenya

CBS Central Bureau of Statistics

NASSEP National Sample Survey and Evaluation Programme

EFA Education for All

MOYAS Ministry for Youth Affairs

OLPC One Laptop Per Child

NSE Nairobi Stock Exchange

KNBS Kenya National Bureau of Statistics

KIPPRA Kenya Institute for Public Policy Research and Analysis

KIPI Kenya Industrial Property Institute

International organizations, programmes and agencies

A4AI *Alliance for Affordable Internet*: A actors who have come together to advance the shared aim of affordable access to both mobile and fixed-line Internet in developing countries

ADB *African Development Bank*

American Chamber of Commerce: A series of national and regional groups representing the interests of private sector actors, especially United States multinationals, around the world, through advocacy, services and networking.

BDT *Telecommunication Development Bureau*: The secretariat of the development sector of ITU (ITU-D).

COMESA *Common Market for Eastern and Southern Africa*: A free trade area incorporating 20 African nations.

EAC *East African Community*: An intergovernmental organisation, including a free trade area, common market and other features, composed of six countries in eastern Africa: Burundi, Kenya, Rwanda, South Sudan, Tanzania, and Uganda.

GEI *Global Entrepreneurship Index*: An annual report by the Global Entrepreneurship and Development Institute on the quality of entrepreneurship ecosystems at a national, regional and local level.

GII *Global Innovation Index*: An annual report analysing global innovation along 82 indicators in 7 pillars: Institutions, Human capital and research, Infrastructure, Market sophistication, Business sophistication, Knowledge and technology outputs, and Creative outputs.

GIZ *Deutsche Gesellschaft für Internationale Zusammenarbeit*: The German International Development Agency

Grameen: A Nobel Prize Winning institution which established the concept of micro-credit community lending.

HDI *Human Development Index*: A composite statistic by the UNDP of life expectancy, education, and income per capita indicators, used to rank countries into four tiers of human development.

IDI *ICT Development Index*: An annual ITU report detailing the development of ICTs in all Member States based on 11 indicators in the areas of use, access and skills.

IMF *International Monetary Fund*

Impact Hub: An international network of innovation hubs intended to foster social entrepreneurship with a branch in Kigali.

ITC *International Trade Centre*

ITU *International Telecommunication Union*

ITU-D *ITU Development Sector*

Liquid Telecom: A telecommunication provider operating in Rwanda and throughout the region.

MDG *Millennium Development Goals*: A series of 8 global goals established in 2000, which the UN system and member states committed to achieving by 2015.

MTN: A South African based telecommunication company.

NCTA *Northern Corridor Technology Alliance*: A regional ICT sector alliance formed to champion the implementation of key ICT Projects.

OECD *Organization for Economic Cooperation and Development*

SDG *Sustainable Development Goals*: A series of 17 global goals with development targets defined by the UN, intended to be reached by 2030.

Seedstars: A global start-up competition focused on working in developing and emerging markets.

Smart Africa: An alliance of African nations and international organizations with a shared vision to provide leadership in accelerating socio-economic development through ICTs.

Startup Grind: An international network of events to educate and mentor entrepreneurs through monthly business events and speaking series in cities across the globe, supported by Google.

Startup Live: A programme intended to connect local innovation ecosystems and entrepreneurs on an international level through multi-day workshops, pitching opportunities, and other support services.

Startup Weekend: A global series of multi-day events where teams develop, prototype and pitch new business ideas over the course of a weekend.

UN *United Nations*

UNCTAD *United Nations Conference on Trade and Development*

UNIDO *United Nations Industrial Development Organization*

UNDP *United Nations Development Programme*

USAID *United States Agency for International Development*

WEF *World Economic Forum*

WSIS *World Summit on the Information Society*: An annual multi-stakeholder event, organized by the ITU and other UN organizations, for the purpose of discussing major issues in ICTs and development.

World Bank

WTO *World Trade Organization*

Terminology

Accelerator: A start-up service working with a start-up or entrepreneur for a fixed period of time and providing intensive mentorship and development services.

Angel investment: Early stage investment intended to provide a one-time boost to initially launch and develop a start-up. Often provided by entrepreneurs, friends or families and connected with mentorship.

B2B Business to Business: Services or products from private sector companies intended to be used by other private sector companies.

Cluster: A geographic concentration of interconnected businesses, suppliers, and associated institutions in a particular field.

Collaborative regulation: Regulation created by collaboration among all the various government agencies involved in overseeing the digital economy.

Crowdfunding: Financing a new venture, product or project by collecting small amounts of money from large numbers of investors, often in exchange for perks such as early access to the product.

E-Governance: The application of ICT to the delivery of government services, government communications and backend services and activities within the government.

Entrepreneurial support: Programmes such as incubators, accelerators, labs, and other services which provide entrepreneurs with resources such as training, mentorship and business services.

Exit: A step in a business where the founder sells their investment in the company, often through sale or an IPO, limiting losses from a failing company or making profit from a successful one.

FDI Foreign Direct Investment: Investment in the form of a controlling ownership in a business enterprise in one country by an entity based in another country.

Fintech Financial Technology: The application of ICTs to make financial services more efficient.

GDP Gross Domestic Product: The monetary value of all the finished goods and services produced within a country's borders in a specific time period.

GNI Gross National Income: the sum of value added by all producers who are residents, plus any product taxes not included in output, plus income received from abroad.

Hard infrastructure: Physical infrastructure to support businesses such as mobile and fixed connectivity, power, water, roads, physical plants, equipment and other elements.

ICT Information and Communication Technology: An umbrella term covering wireless and wired communication, the hardware and software related to them and their applications.

ICT Centric Innovation Ecosystem: A description of an innovation ecosystem recognizing that ICTs are often at the centre of innovation, and have a cross cutting role in many other sectors of the economy.

ICT4D Information and Communication Technology for Development: The use of ICTs for the purpose of economic and social development, humanitarian response or promotion of human rights.

Incubator: A start-up service providing business services and trainings, early stage support and mentorship and often office space and communities for start-ups and entrepreneurs.

Innovation: The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.

Innovation ecosystem: The major stakeholders and processes supporting innovation and the establishment of new businesses in a particular area, and their associations and connections.

Investment rounds: A series of investments made in a business intended to develop a business, each round focuses on a different stage of development, developing business models, expanding and scaling.

ISID *Inclusive and Sustainable Industrial Development:* Development in which all parts of society benefit from industrial progress, which provides the means for tackling critical social and humanitarian needs.

IoT *Internet of Things:* The incorporation of sensors, connectivity, software, automation and other ICT solutions to allow objects to collect and exchange data.

IP/IPR *Intellectual Property/Intellectual Property Rights:* The rights of persons over their creations. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time.

IPO *Initial Public Offering:* the first time that the stock of a private company is offered to the public. This often raises significant amounts of capital, but shifts the business to a publicly traded firm.

MNC *Multinational Corporation:* A corporation which operates across national borders.

MOOC *Massively Open Online Course:* Training programmes offered to a wide community through online services.

Open data sandbox: A collection of tools and resources, combined with a collection of open datasets intended to allow experimentation in finding uses for those datasets.

Peer-to-peer lending: The process by which individuals lend their own money to other individuals or businesses directly generally through a mediating entity.

PPP *Public Private Partnership:* A public sector project or business venture executed through a collaboration between a government entity and a private business.

Seed funding: Small amounts of investment, often in the form of grants or angel investment, used to initially launch or develop a company.

SI *Systems of Innovation:* An understanding of innovation as a process representing the flow of information and collaboration between various actors.

Smart cities: Urban development projects that incorporate ICT solutions into the provision of municipal services and the management of municipal assets.

SME *Small or medium enterprise:* A private firm which is beyond the stage of being a start-up, but which is still young, with limited staffing and/or income. The exact definition used in terms of upper and lower bounds on age and scale varies between institutions.

Soft infrastructure: Programmes and resources in an innovation ecosystem which provide mentorship, skills, experience and other knowledge resources to support innovative businesses.

Soft skills: A series of skills such as communication, business management and administration, design, and other skills related to the running of a business, rather than the products or services that business provides.

Support skills: A series of skills such as accounting, legal advisory, regulatory compliance, and other skills necessary to meeting the requirements of running a business, often taken on by outside specialists.

STI *Science Technology and Innovation*

TVET *Technical Vocational Education and Training*

User centred design: A design process focused on the experience of the end user, concentrating on empathy with users and use cases.

Valley of death: The period early in the development of a business where the amount invested in developing the business outweighs its current revenue. Businesses need continuous investment and other supports and often fail during this time.

Valuation: The process of estimating the current worth of an asset or a company, or the result of such an estimation.

Venture capital: High risk investment in an early stage business which have proven growth potential, intended to help the business develop and expand.

Appendix A: Outcome Manifesto Kenya

The section summarizes the outcome of a national level workshop held in Nairobi. Over 70 participants from various stakeholder groups of the ecosystem met to develop a common agenda for the ecosystem. This agenda, taken together with the Kenya Vision 2030, has been used to guide the analysis and review process for strengthening the digital innovation ecosystem in Kenya.

NAIROBI MANIFESTO

Multi-stakeholder Consultation within the Framework of the National Review on the ICT Centric Innovation Ecosystem
2nd December, 2016 Nairobi, Kenya
NAIROBI MANIFESTO

DRAFT

Based on the discussion with various stakeholders surrounding Inclusive Digital Ecosystem in Nairobi, a gathering of about 80 participants identified a few set of challenges and recommendations, which may serve as a base for planning and implementing future activities fostering national ICT centric innovation ecosystem in Kenya. The set of challenges and recommendations developed by the community gathered at this meeting are all equally important and non-binding; so are the gaps that were discussed and must be addressed. These challenges and recommendations are for the purpose of consideration and to be used as an input to the national review to be carried out by ITU.

Recognising the critical role of ICTs across all sectors of the economy and the particular contribution of ICT centric innovation and entrepreneurship to socio-economic development, stakeholders representing the public and private sectors, entrepreneurs, academia, financial and support groups shared the goals that they see for Kenya in the next 3-5 years, for each of the following pillars.

Vision

- There should be a conducive environment for implementation of ideas for start-ups and SMEs.
- There should be well-defined policies for equity, capital support, IP, copyright and trade for innovators under the national Digital Innovation Vision.
- To have an efficient e-Governance system and a paperless ecosystem with efficient digital transactions and communication.
- To be part of a globally innovative society that produces customised solutions for industry and social needs, leveraging government-enabled platforms to empower citizens to access services.
- To become a knowledge-based economy.
- To be a world class leader in standardisation of development and a mobile-first vision to reach the last mile.
- To see Kenya as a leader in regional IT hub and regional R&D in Africa.
- To have more PPP model in innovation; and have a national innovation commercialisation strategy.
- To have access to inexpensive ICT for all by 2018.
- To improve the quality of life by leveraging technology, especially ICT.
- Innovation and entrepreneurship should enter schools at an early stage.

- Technology innovation should become a source of employment and development for Kenya's youth.
- To have a shared platform where innovators can come together, share infrastructure, and offer services/products.
- To have an ecosystem where all the market players and the stakeholders have clear and defined roles.
- The need to leverage the strengths of academia and industry for ICT.

Policy

- There is a need to create and promote tax clinics and favourable policies for SMEs and start-ups.
- There is a need to shorten evaluation periods for government policy and programmes to ensure regular feedback mechanisms.
- There is a need to create harmonised, dynamic and lightweight policies and regulations that promote and support innovators and links sectors to harness ICT innovations.
- Create strong policy protections for intellectual property and cybersecurity that creates a more inclusive and encouraging start-up environment.
- There is a need to have regular interaction with policy makers that creates a dynamic feedback mechanisms and incorporates flexibility and agility in the policy making process.
- There is a need to promote capacity building through policies.

Capital and Resources

- The government should provide funding for innovators to encourage young innovators.
- There should be easy access to capital at all stages.
- Government and international community should provide low cost funding to upcoming innovators.
- The government needs to divert more investments towards ICT innovations.
- The government should launch sovereign funds for start-ups.
- There is room for more public-private partnerships in the digital ecosystem.
- There needs to be a conducive funding ecosystem to enable, foster, fund, protect and market Kenya's innovations.
- There is a need for structured funding schemes for ICT-centric innovations.
- The country needs more incubators and training programmes.
- The finance sector should be structured in such a way that it can positively impact the society and attract the government to support it.
- There is a need for harmonising the thinking around funding start-ups.
- Governments should create forums to connect investors with innovators.
- We need to have fully engaged stakeholders with clear roles.
- Government incentives and subsidies will encourage incubation of ideas.
- Further, incubation centres should be evenly distributed to cover low income areas as well.
- Funding for research in public and private sectors needs to go up.
- Possibly, a TV show with shark-tank model would bring together private investors.
- Overall, an enabling ecosystem for strategic partnership is required.

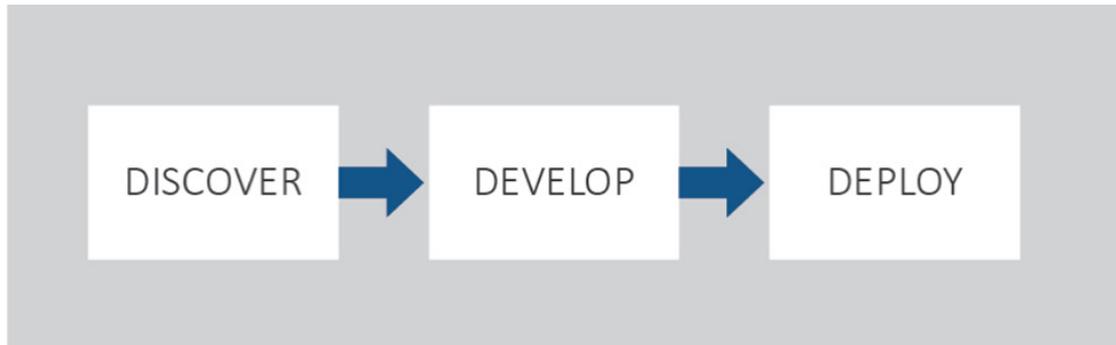
Talent and Champions

- There is a need to nurture young innovators through competitions and innovation programmes at the colleges and universities at the county, sub-county and national levels.
- There is a need to create strong formalised mentorship opportunities for young innovators.
- There is a need to improve the quality of education with a specific focus on STEM while incorporating innovation and entrepreneurial skills throughout the curriculum.
- There is a need to incorporate innovative hand-on courses into the traditional education system.
- There is a need to sensitise students towards societal problems and encourage innovative thought processes to address these gaps.
- There is a need to grow and retail talent in the human resource pool by providing effective and subsidised talent incubation programmes and resources.
- There is a need to facilitate collaboration between stakeholders, especially academia to nurture and support innovative ideas.

Appendix B: Systems of innovation concept

Another fallacy associated with the linear approach is that commercial research and development (R&D) is seen as applied science, and "basic scientific research does not always lead to the design of innovations". Figure B.1 below illustrates this type of innovation process within the economic space of industries and markets.

Figure B1: Linear model of innovation



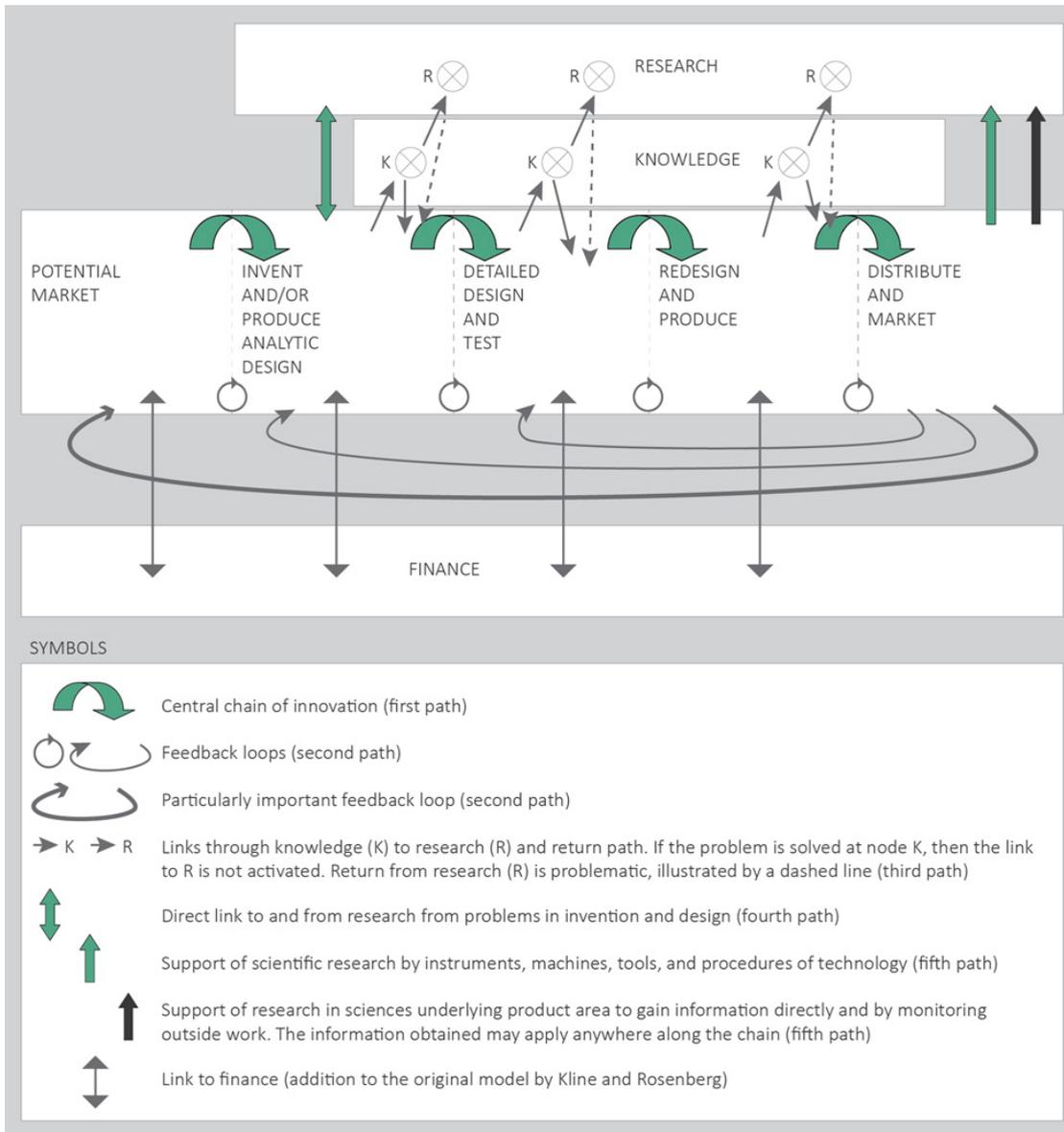
Source: Adapted from Padmore, Schuetze and Gibson, 1997

This view is arguably simplistic and unrealistic. However, its earlier legitimacy is due particularly to its consistency with neo-classical economic theories and 'market failure' explanations for the need for direct and indirect public support of industrial R&D (Arrow, 1962).

Lessons from the post Fordist era brought criticisms to the 'orthodox' linear model of innovation (Fisher, 1999) and lead to the evolution of a more 'heterodox' (Balzat, 2002) approach, with empirical evidence indicating firstly that there is no directionality associated with the innovation process (Nelson & Winter, 1982); and secondly that innovation may occur independently of scientific interaction (Mytelka and Farinelli, 2000). Rather different rates and intensities of feedback exist between upstream (technology related) and downstream (market related) phases of the innovation process (Fisher, 1999). Such considerations support an alternative iterative or 'chain linked' model of innovation characterized by a design initiated chain (motivated by competition) supported by multiple feedback loops, and supplemented by lateral transfer of ideas from one area of the chain to another (Padmore, Schuetze and Gibson, 1997). This conceptualization marks the beginnings of the theory and empirics of the systemic approach to innovation with a greater influence of demand side dynamics and policies (Edquist & Hommen, 1999).

Kline and Rosenberg (1986) earlier influenced the development of the chain linked model by visualising that "all the links in such a chain draw on the existing corpus of knowledge or could be used to create new knowledge through research" (Padmore, Schuetze and Gibson, 1997, pg. 607). They advanced the model through an additional dimension indicating different depths of the level of innovation based inquiry i.e., shallow or deep.

Figure B2: Chain linked model



Source: Adapted from Padmore, Schuetze and Gibson, 1997

The chain link model of innovation, by recognizing: the multidimensional nature of innovation; numerous feedback links among the stages of product development; as well as external sources of knowledge incident on innovation has been an important advancement in innovation theory.

Appendix C: Institutions surveyed

The following institutions and stakeholders participated in the survey.

Institutions surveyed Kenya

Airtel Kenya	BRCK	C4DLab/ University of Nairobi	Communication Authority	Demo Africa
eMobilis	GearBox	ICT Authority	iHub UX Lab	ISOC
KENET	Kenya Bureau of Standards	Kenya Commercial Bank	Kicktanet	KIPI
Konza Technopolis	KRA	Kytabu Educational Technology	Lake Hub	Liquid Telecom
MasterCard	Ministry of Agriculture	Ministry of Education	Ministry of Tourism	mShamba
NACOSTI	Nailab	National Communication Secretariat	National Industrial Training Authority	Regional Consortium Development Africa
Safaricom	Sidian Bank	SohpieBot	Strathmore University	Wananchi Group

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