Guide to Living Labs and Innovation Spaces in IST-Africa Partner Countries

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1. EXECUTIVE SUMMARY

1.1 Context and Objectives

Innovation Spaces started to emerge in African Member States on a gradual basis since 2008 in a response to support Entrepreneurship and emerging Tech communities. Living Labs started to emerge from 2005 as a mechanism to support co-design and community engagement.

The IST-Africa Consortium are undertaking an ongoing study across the 18 participating African countries in North Africa (Egypt, Tunisia), West Africa (Senegal), East Africa (Burundi, Ethiopia, Kenya, Tanzania, Uganda), Central Africa (Cameroon) and Southern Africa (Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland) to undertake an initial mapping of existing and emerging Living Labs and Innovation Spaces supporting technology-related entrepreneurship

IST-Africa has taken a leadership role over recent years in promoting the adoption of Living Labs frameworks and methodologies adapted to African requirements. IIMC was responsible for instigating, designing and organizing the first Living Labs Working Group Meeting in Botswana in May 2011, which resulted in the establishment of the EC – AUC Living Labs Working Group for Africa of which many of its partners are members. It was also responsible for authoring a comprehensive report "*Supporting the Evolution of Sustainable Living Labs and Living Labs Networks in Africa*" in 2011 at the request of the European Commission and African Union Commission, and carrying out validation and training workshops which have resulted in the establishment of national working groups to explore the implementation of Living Labs in Partner Countries, and the launch of several Living Labs in East Africa.

This study provides definitions of Innovation Spaces and Living Labs, an overview of operational Innovation Spaces and Living Labs supporting ICT and Innovation related activities in IST-Africa partner countries and an Innovation Landscape map. It addresses the need of interested African, European and other stakeholders to access comprehensive up to date information on Living Labs and Innovation Spaces across Africa.

1.2 Methodology

This study builds on a previous study and body of knowledge collected by IST-Africa Partners during 2009 – 2011.

This study will be undertaken on an ongoing basis from October 2013 to January 2015. This report outlined initial findings across a subset of the target countries. The methodology leverages desk research and qualitative data collection with key stakeholders in Angola, Botswana, Burundi, Cameroon, Egypt, Ethiopia, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Senegal, South Africa, Swaziland, Tanzania, Tunisia and Uganda, supplemented by follow up e-mails.

Each Living Lab and Innovation Space has been contacted directly and invited to complete and return a profile providing background information and an overview of activities currently being supported. Over time the edited profiles will be published in an Innovation Repository on the IST-Africa portal.

IST-Africa Living Labs Working Group Meetings were organised in Tanzania (08 May 2012), Kenya (28 May 2013) and Mauritius (06 May 2014) with IST-Africa Week as a mechanism to bring together existing and emerging African Living Labs and share experiences with Innovation communities. IST-Africa Living Labs Workshops were organised in Burundi (26 - 27 September 2011); Tanzania (29 - 30 September 2011, May 2013), Uganda (06 - 07 October 2011), Malawi (17 November 2011), Zambia (22 November 2011), Ethiopia (24 November 2011, 06 December 2013), Swaziland (29 November 2011), Lesotho (12 November 2013), Namibia (15 November 2013), Botswana (22 November 2013), Mozambique (03 December 2013) and Tunisia (17 December 2013) to raise awareness of Innovation, Entrepreneurship and Action Research.

1.3 What are Innovation Spaces?

Innovation Spaces can be defined as physical or virtual environments that support entrepreneurs at different stages of development. Innovation Spaces can include Pre-Incubators, Incubators, Innovation Centres, Entrepreneurship Centres, Accelerators, Science Parks, Research and Innovation Parks, and even Co-Working Spaces. While there are many different models of incubation, we will provide some basic definitions. In each case, these definitions should be understood to include both for-profit and not-for-profit approaches.

1.4 What are Living Labs?

Cunningham, P. (2013) defines Innovation as "*the improvement of products, services, processes, business models, policies and concepts in an existing context (whether social or economic) or their* adaptation *from one context to another, with the goal of increasing performance or achieving another desired impacts"*. Adaptation is defined as "*necessary changes required to achieve desired outcomes"*. Increased performance or other desired impacts can be measured through Return on Investment (ROI) and/or Return on Objective (ROO).

We will outline a variety of Living Lab descriptions and definitions from different sources.

DG Information Society and Media, European Commission, 2009[1] defined Living Labs as "*open innovation environments in real-life settings, in which user-driven innovation is fully integrated within the co-creation process of new services, products and societal infrastructures*". It stated that Living Labs bring users into the creative process at an earlier stage of innovation "*to better discover new and emerging behaviours and user patterns, bridging the innovation gap between technology development and the uptake of new products and services involving all relevant players of the value network … [and] allowing for early assessment of the socio-economic implications of new technological solutions by demonstrating the validity of innovative services and business models*".

The European Commission report also identifies benefit statements for the stakeholder groups.

In a developing country context, where income levels are low, bank debt is expensive and capital availability is limited, the potential impact of Living Labs that reduce associated innovation and implementation risks and maximise the likelihood of success, is high.

Just as Living Labs methodologies can be applied in very different contexts, both geographic (or territorial – e.g. urban, suburban or rural, local community or regional, national or cross-border) and thematic (e.g. eHealth, eServices in Rural or Developing Areas, eDemocracy and eGovernance, ICT for Energy Efficiency, Food Security), Living Labs have been defined in a variety of ways. A representative sample of definitions of Living Labs is presented in this document.

One key dimension seen as critically important in an African context is the rural community perspective and engagement, and proposed adaptation of the innovation concept and process, which is often misinterpreted as only tangible, ignoring knowledge or idea creation.

Cunningham, P. (2013) proposes that: "*Living Labs are environments, a methodology or an approach which caters for user-driven open innovation within real-life settings, where end-users collaborate with Innovation Stakeholders to become co-creators or co-designers of innovative products, services, processes, business models or policies. Successful deployments can be replicated (with necessary socio-cultural adaptation) to achieve wider socio-economic impact*".

1.5 Overview of Innovation Activities

North, Central and West Africa

Egypt recognises the ICT sector as a critical component of the national economy. The ICT Policy (2013 – 2017) is focused on achieving sustainable socio-economic development using ICT solutions and key ICT sectors planned to be supported include Digital Identity, Egypt Digital Hub, Basic Infrastructure (Broadband, Cloud Computing, Submarine Cables), Cyber Security & eSignature, Information Infrastructure & Digital Content, Electronics Design & Manufacturing, Legislative and Policies Framework. The Egyptian Government has made a significant investment in capacity building, digital literacy and certification of skills. There are a number of Innovation Spaces active

[1] European Commission, DG Information Society and Media, *Unit F4 New Infrastructure Paradigms and Experimental Facilities. Living Labs for User-driven Open Innovation. An Overview of the Living Labs Methodology, Activities and Achievements.* January 2009.

gradually emerging from 2009 including: *Cairo Hackerspace*[2] *Technology Innovation & Entrepreneurship Center* (TIEC)[3] in Cairo; *The District Co-working Spaces*[4] in Cairo and Maadi; and *icecairo*[5]. These Innovation Spaces range from supporting Pre-Incubation (icecairo), Incubation (TIEC) and Acceleration (The District, TIEC).

Tunisia considers the development of ICT to be a priority in terms of economic and social activities, health, e-learning, renewable energy and control of the natural environment. Tunisia has a National backbone based on fibre optical cables that covers its entire territory and has optical fibre submarine connections to Europe, Asia, the Middle East and America. Innovation Spaces are gradually emerging to include WIKI Start Up[6] which was established in 2011 as an Incubator and Reseau Entreprendre Tunis[7]. A number of Higher Education Institutions are now considering setting up Incubators to support graduates and start-ups in their region. Founded in 2011, *WIKI Start Up*[8] focuses on fund raising, while *Reseau Entreprendre Tunis*[9] *(and Monastir) founded in 2012 is an association of business owners and entrepreneurs*.

Cameroon plays an important economic role in Central Africa. In terms of Infrastructure, there is a national backbone of over 5,000 km of fibre optic cable laid down and financed by the Chinese Government, a fibre optic loop in Douala with a second being laid in Yaounde (Capital) and the establishment of a National Internet eXchange point (IXP) is ongoing, financed by the World Bank. The ICT Policy was adopted in 2007, with the Implementation plan published in 2009 and the Electronic Communications Law, CyberSecurity Law and Electronic Commerce Law adopted in 2010. There are a number of Innovation Spaces active around the country including: *Cameroon Innovation Hub*[10] (Yaounde); *Centre for Entrepreneurship, Research & Innovation* (CERI)[11] hosted by Catholic University Institute of Buea and *ActivSpaces*[12] (Buea and Douala). These Innovation Spaces are primarily focused on supporting pre-Incubation, Incubation and Acceleration. While CERI focuses on Science, Technology, Engineering and Maths disciplines, ActivSpaces is a tech hub focused on supporting web and mobile programmers, designers, researchers, and entrepreneurs. CIB is currently providing virtual support online.

Senegal considers ICT to be an essential part of development. A National Strategy for developing ICT was defined in 2000 with the State Information Technology Agency (ADIE) created in 2004. There is a good legal framework in place with laws addressing Information Society, Electronic Transactions, Cybercrime, protection of personal data and cryptology enacted in 2008. In terms of ICT Infrastructure, the national backbone is under construction, all regions are connected via optical

[2] http://www.cairohackerspace.org
[3] http://tiec.gov.eg/
[4] http://www.district-egypt.com
[5] http://www.icecairo.com
[6] http://www.wikistartup.tn/
[7] http://www.reseau-entreprendre-tunis.org/
[8] http://www.wikistartup.tn/
[9] http://www.reseau-entreprendre-tunis.org/
[10] http://www.cihub.net/
[11] http://www.cuib-cameroon.org/home.php?office=14
[12] http://activspaces.com/

fibre and three submarine cables connect Senegal to the rest of the world. Innovation Spaces include MobileSenegal Hub[13], which was established as a virtual tech hub in 2008 to support training in mobile technology; Jokkolabs[14] which was established as a co-working space in 2010 and CTIC Dakar[15], which was established in 2011 as a tech hub providing Pre-Incubation and Acceleration Services. Established by women in 2012, **JJiguene Tech Senegal[16]** is the first woman's tech Hub in Senegal. While a Living Lab was established in UNIDAF in 2006 there is no information currently available on recent activities.

East Africa

Burundi is slowly building up the institutions and infrastructure following twelve years of crisis up to 2005. A fibre-optic project is currently running to provide ICT infrastructure across the country alongside development of the National Backbone. The National ICT Development Policy was adopted in 2004 and reviewed in 2011 and National Policy on Scientific Research and Technological Innovation and its implementation framework was launched in August 2014 including ICT as one of the focal areas. The *Burundi Business Incubator* was set up in 2010 and has received financial and technical support through USAID to supporting training programmes and local capacity building. During 2013 the Segal Family Foundation piloted the *Social Impact Incubator* in Bujumbura as a capacity building programme and the first cohort graduated in October 2013. During 2014 in partnership with CARE International Burundi, the Social Impact Incubator took in another cohort of 24 incubates. The *UNICEF Burundi Innovation Lab* is focused around technology for development; micro-energy rural entrepreneurship models and leveraging tools and mobile-based platforms to address national challenges.

Ethiopia is one of the fastest growing non-oil economies in Africa but is heavily dependent on agriculture. In line with its ambition to become a middle-income country by 2025, Ethiopia views its ICT Policy and Strategy (2009) as integral parts of the country's larger development goals. The National Science, Technology and Innovation (STI) Policy (2012) aims to create a technology transfer framework to build national capacity. In terms of ICT Infrastructure, there is 12,000 km optic fibre cable radiating from central Ethiopia across the country and connecting all cities, with the capacity to transmit 40 Gbps along with the national backbone. To date, MCIT has established 147 Community Information Centres and 9 community radio stations across the country to provide information on new ICT technology transfer and implementations, healthcare, agricultural information and education issues. *Bahir-Dar ICT Business Incubation Center[17]* was established in November 2009 in Amhara Regional State to support ICT entrepreneurship targeting recent graduates. It provides office facilities, capacity building and advisory services. *iceaddis[18]* was established in two locations in Addis Ababa (hosted by EiABC and downtown) during 2014 to

[13] http://mobilesenegal.org
[14] http://jokkolabs.net/en
[15] http://www.cticdakar.com
[16] http://jjiguenetech.com
[17] http://www.amhara-incubation.org
[18] http://www.iceaddis.com

provide pre-incubation and Incubation support for technology graduates, final year students, professionals and entrepreneurs. EiABC is also hosting a FabLab next door to iceaddis.

Kenya recognises the importance of ICT and Innovation in achieving the Vision 2030 objectives. There are five key policy documents guiding the ICT and Science, Technology and Innovation (STI) sector in Kenya: Kenya ICT Policy 2006 (under review), eGovernment Strategy, Kenya ICT National Master Plan 2017, the National Broadband Strategy and Kenya Science, Technology and Innovation (STI) Policy 2012. In terms of ICT infrastructure, a national fibre optic infrastructure is in place and four submarine cables are online (TEAMS, SEACOM, EASSy, LION). In part due to its pro-Innovation Policy and Regulatory Environment, Kenya has experienced significant growth in Innovation Spaces (private, community driven and hosted by education and research institutions) since 2009 including FabLab[19] (2009) and Computing for Development Lab[20] (C4DLab, 2013) at University of Nairobi; iHub[21] (March 2010); @iLabAfrica (January 2011) and @iBizAfrica at University of Strathmore; m:lab East Africa[22] (June 2011); Chandaria BIIC (July 2011) at Kenyatta University; NaiLab[23] (August 2011); 88mph[24]/Nairobi Startup Garage (August 2011) and GrowthHub[25] (May 2012). These Innovation Spaces provide a mix of Pre-Incubation (iHub; @iLabAfrica; @iBizAfrica; Chandaria BIIC), Incubation (FabLab; C4DLab; m:lab East Africa, NaiLab) and Acceleration (88mph/Nairobi Startup Garage; GrowthHub) services (Cunningham et al 2014[26]).

Tanzania recognises the importance of ICT and Innovation to support socio-economic development as part of the realisation of Development Vision 2025. Two of the three main policies supporting Innovation and Entrepreneurship are currently under revision: the updated Science Technology and Innovation (STI) Policy will incorporate Entrepreneurship and the National ICT Policy of 2003 is under review as part of the development of a new implementation strategy. The digital infrastructure in Tanzania has improved significantly with the fibre-optic network, investment in local Internet Exchange Points, migration to IPv6 and construction of the National ICT Backbone (NICTBB). The eGovernment Strategy was put in place in September 2012. Innovation Spaces include Dar Teknohama Business Incubator[27] (DTBi) which was established in 2011 as a Public, Private Partnership between InfoDev and COSTECH; Buni Hub[28], which was established at COSTECH in October 2011 within the TANZICT[29] Bilateral project; KINU[30], which was established in July 2012

[19] http://fablab.uonbi.or.ke
[20] http://www.c4dlab.ac.ke
[21] http://www.ihub.co.ke
[22] http://www.mlab.co.ke
[23] http://www.nailab.co.ke
[24] http://www.88mph.ac/nairobi
[25] http://www.thegrowthhub.com
[26] Cunningham P., Cunningham M., Ekenberg L.. (2014), Baseline Analysis of 3 Innovation Ecosystems in East Africa, International Conference on Advances in ICT for Emerging Regions (ICTer 2014)
[27] http://www.teknohama.or.tz
[28] http://www.buni.or.tz
[29] http://www.tanzict.or.tz
[30] http://www.kinu.co.tz

and University of Dar es Salaam ICT Incubator[31] (UDICTI) (Cunningham et al 2014). Innovation Spaces are focused on Pre-Incubation (Buni Hub, KINU), and Incubation (DTBi, UDICTI). An Incubator opened by Mara Launchpad in Q1 2013 was closed by 2014. Emerging Living Labs are currently being supported through the TANZICT Programme across the country: Arusha Living Lab[32] (EcoLab); Elimu Living Lab[33] (Sengerema, Mwanza); Mbeya Living Lab[34]; Kigamboni Community Centre[35] (Dar es Salaam); RLabs Iringa and Tanzania Youth ICON (TAYI) Living Lab (Zanzibar).

Uganda's ICT sector is one of the country's most vibrant, fastest growing sectors since market liberalization in 2010, based on a good ICT legal and regulatory framework (Science Technology and Innovation Policy 2009. ICT Policy 2003, which is under review, Rural Communications Development Policy and eGovernment Strategy 2011)**.** ICT Infrastructure is continuously improving with access to three Submarine cables, the National Data Transmission Backbone Infrastructure (NBI) and Electronic Government Infrastructure (EGI). Uganda experienced a rapid growth in Innovation Spaces supporting entrepreneurs from 2010 to include: *Hive CoLabs*[36] established as first tech hub in 2010; *Microsoft Innovation Cen*tre hosted by College of Computing and Information Science, Makerere University (established November 2011); *Outbox*[37] focused on mobile and web entrepreneurs (established July 2012); *Angels Hub*[38] (which took over Mara LaunchPad incubation space in September 2013); iLab@MAK[39] (established 2005). The Innovation Spaces are focused on providing Pre-Incubation (Hive CoLab, Outbox), Incubation (Angels Hub, FinAfrica[40]), Co-working spaces (Hive CoLab, Outbox, The Hub[41]), Entrepreneurial Training (FinAfrica) and commercialisation of apps (*Grameen Foundation AppLab*[42]) (Cunningham et al 2014).

Southern Africa

Angola is an upper middle income country, with good infrastructure, fibre-optic networks and a National Backbone. The Policy Framework includes a White Paper on ICT (2006), National Policy on Science, Technology and Innovation (2011), National Strategy on STI (2011) and a Strategy on Development of Information Technology (2000 - 2010). The National Institute of Small and Medium-Sized Companies (INAPEM) established Angola's first business incubator in June 2014 and an ICT-oriented business incubator is planned with the support of Chevron.

Botswana is a middle-income country with relatively good infrastructure, fibre-optic networks and a National Backbone. The first National ICT Policy [Maitlamo National Policy for ICT Development

[31] http://udicti.coict.udsm.ac.tz/
[32] https://arushalivinglab.wordpress.com
[33] http://www.elabs.or.tz
[34] http://mbeyalivinglab.blogspot.co.uk/
[35] http://www.kccdar.com
[36] http://hivecolab.org/
[37] http://www.outbox.co.ug/
[38] http://angelshub.org/
[39] http://cedat.mak.ac.ug/research/ilabs.html
[40] http://www.finafrica.org/
[41] http://thehubkampala.com/
[42] http://www.grameenfoundation.applab.org

2007] was approved by Parliament in 2007 and the revised Research, Science, Technology and Innovation Policy was approved in 2012. The Government of Botswana decided at an early stage that it is necessary to actively support entrepreneurship. The *Local Enterprise Authority* was established in 2004 to support SMEs, provide training, mentoring, technology adaptation and support services. The *Botswana Innovation Hub* (BIH)[43] was conceived in 2008 within the Botswana Excellence Strategy to support economic diversification, job creation and transition towards a knowledge-economy by encouraging inward investment, research and training in the areas of ICT, Bio-Technology, Energy and Mineral Technology. Programmes include the First Steps Venture Centre, Microsoft Innovation Centre, Cleantech and KitsoWorks. The development of the National Science Park is due for completion during 2016. BIH is receiving support through the Southern African Innovation Support (SAIS)[44] Programme to establish a Global Business Lab[45] and Technology Transfer Office within the University of Botswana; develop a Demand Driven Supply Chain Business Incubation Model; and address youth unemployment and local communities through Living Labs and Training (RLabs Botswana).

Lesotho has a good policy framework including the ICT Policy (2005), Universal Access Fund (2009), Science Technology and Innovation Policy (2010), Communications Act (2012) and National Strategic Development Plan (2013 - 2017). Innovation Spaces and Living Labs are gradually emerging focused primarily around education: School Technology Innovation Centre (STIC) and UNESCO - Science and Mathematics Educator's Federation (SMEF) Thakakhoali.

Malawi's Vision 2020 recognises ICT as a priority sector with the potential to turn around the economy. The ICT Policy (2005) was revised to include Universal Access Issues and re-published in September 2013. A National ICT Master Plan for 2014 – 2031 is awaiting approval by the Government. There are discussion ongoing in relation to UNICEF setting up an Innovation Hub in cooperation with University of Malawi Polytechnic in Blantyre. In early 2014, the Global Center fro Food Systems Innovation at Michigan State University established a regional Innovation Hub focused on agricultural and food systems innovation, in partnership with the Lilongwe University of Agriculture and Natural Resources, with financial support from USAID.

Mauritius has diversified its economy from an isolated mono crop dependent country into a services led economy with five pillars (sugar, tourism, textile, financial services and ICT). Although tourism and financial sectors are well anchored in its traditional economic setup, the ICT sector has recently been propelled into a major role as a strong pillar of the Mauritian economy. In line with the Government's vision to transform Mauritius into a Cyber Island and make of ICT an important engine of economic growth, the National ICT Strategic Plan (NICTSP) was launched in 2007, reviewed in 2011 with a new strategy for the period 2011-2014 branded as "Towards i-Mauritius". The National Broadband Policy 2012 - 2020 sets out a strategic vision for a broadband intelligent Mauritius and national goals within the overarching NICTSP. Innovation Spaces supported by the

[43] http://www.bih.co.bw/
[44] http://www.saisprogramme.com/overview/
[45] http://globalbusinesslabs.com/office/botswana/

Government of Mauritius include: Mauritius Research Council Business Research Incubator Center[46] (MRC-BRIC March 2011); NCB Technopreneurship Programme[47] (2011); Ebene Accelerator Ltd[48] (July 2013). These Innovation spaces offer a mix of Pre-Incubation, Incubation (physical and virtual) and Accelerator services. Living Labs include the Community Empowerment Programme.

Mozambique depends substantially on subsistence agriculture, aluminium and foreign assistance. The National ICT Policy was approved in 2000 and the ICT Policy Implementation Strategy in 2002 providing the framework by which ICT would be leveraged as an enabler and cross cutting issue in all sectors and development programmes. Even though a Business Incubator Strategy is being developed through IPEME, traditionally there has been limited tech entrepreneurship support in Mozambique. Mozambique Information and Communication Technology Institute (MICTI) was initially established within the University of Eduardo Mondlane to provide an Institute for Research and Learning and a Business and Technology Incubator. Mozambique is a beneficiary through the Southern African Innovation Support (SAIS)[49] Programme and STIFIMO Finnish Programme, both of which aims to strengthen the national Innovation ecosystem. Recent players include: MOZDEVZ[50] (2013) as a community of Application Developers and IDEARIO[51], which was launched in Summer 2014 as a tech hub and co-working space offering Pre-Incubation and a 30 day Acceleration Programme. IdeiaLab[52] is cooperating with the FemTech SAIS Programme in Mozambique. The Maputo Living Lab[53] was established in 2011 as part of a three-year project funded the Province of Trentino Italy to build capacity through Summer Schools for students and pre-Incubation through the Informatics Laboratory.

Namibia is a middle-income country that is heavily dependent on extraction and processing of minerals and diamonds for export. As part of Namibia's Vision 2030, it aims to become a knowledge-based economy and sees ICT as the critical sector for the Economic Development of the country by 2030. The ICT Policy provides a framework to accelerate the use of ICT in Namibia and grow the sector. In terms of ICT Infrastructure, the telecommunications backbone was digitised in 1999 with underground fibre-optic cable and Namibia is linked to the rest of the world via the West African Cable System. Innovation Spaces include Bokamoso Entrepreneurial Centre[54] which provides Incubation services and cooperates with FemTech Programme supported by SAIS Programme; FABlab Namibia Technology Centre[55], which was established as a Centre of

[46] http://www.mrc.org.mu/mrc_centres/business_research_incubator_centre
[47] http://technopreneur.ncb.mu
[48] http://ebeneaccelerator.mu/
[49] http://www.saisprogramme.com/overview/
[50] http://mozdevz.idear.io/sobre-nos/
[51] http://idear.io/
[52] http://www.ideialab.biz/
[53] Ciaghi A, Villafiorita A, Chemane L, Macueve G, *Stimulating Development through Transnational Living Labs: the Italo-Mozambican Vision*, In IST-Africa 2011 Conference Proceedings, Paul Cunningham and Miriam Cunningham (Eds), IIMC International Information Management Corporation, 2011, ISBN: 978-1-905824-24-3
[54] http://www.cityofwindhoekcc.org.na
[55] http://www.fablabnamibia.org/

Excellence within the Polytechnic of Namibia in 2014; and Global Business Labs Namibia[56] which is supported by SAIS Programme since 2013 to provide Acceleration services. Stakeholders in Namibia are interested in setting up Living Labs following workshops organised by IST-Africa. An initial Living Lab has been supported as a project under the SAIS Programme since 2013 - RLabs Namibia - to provide training and community development in cooperation with Namibia Business Innovation Institute.

South Africa's 2015 ICT Vision aims that South Africa will be an inclusive Information Society where ICT-based Innovation flourishes. The Department of Communications is responsible for the ICT Policy, which is currently under review lead by the ICT Policy Review Panel appointed by the Minister of Communications. The Department of Science and Technology is responsible for the ICT Research, Development and Innovation Policy and following a consultation process the ICT RDI Innovation Roadmap was adopted in 2013 to guide R&D investments over the next ten years. South Africa has experienced a growth in Innovation Spaces support technology entrepreneurs across the country including: The Innovation Hub[57] (Pretoria), mLab Southern Africa[58] hosted within the Innovation Hub since 2011; Bandwidth Barn[59] (Cape Town); Eastern Cape Information Technology Initiative (ECITI)[60] Incubation programme (East London); Invo Tech Incubator,[61] Durban University of Technology; JoziHub[62] (Johannesburg); Softstart BTI[63] (Midrand, Johannesburg); StartUp 90[64]; Start-Up Garage[65] (Cape Town); LaunchLab[66] (University of Stellenbosch) and Impact Hub Johannesburg[67]. These Innovation Spaces collective support Pre-Incubation (Bandwidth Barn), Incubation (The Innovation Hub; ECITI; InvoTech; Softstart BTI; LaunchLab), Co-working Spaces (Bandwidth Barn; JoziHub; Start-Up Garage; LaunchLab; Impact Hub Johannesburg) and Acceleration Services (mLab SA; StartUp 90). A number of Living Labs were initially supported through the COFISA and SAFIPA Finnish Programmes, which are still making good progress. Some Living Labs were set up on a temporary basis as projects and some new Living Labs have been set established. The most active Living Labs include: Siyakhula Living Lab[68] which is operational since 2005 hosted by University of Fort Hare and Rhodes University (Eastern Cape); Reconstructed Living Lab[69] (RLabs), which has been operational since 2008 supporting community development

[56] http://www.globalbusinesslabs.com
[57] http://www.theinnovationhub.com/
[58] http://www.mlab.co.za
[59] http://www.bandwidthbarn.org/
[60] http://www.eciti.co.za/
[61] http://www.invotech.dut.ac.za/
[62] http://jozihub.org/
[63] http://www.softstartbti.co.za /
[64] http://www.startup90.com/
[65] http://www.capetowngarage.com/
[66] http://www.launchlab.co.za/
[67] http://johannesburg.impacthub.net/
[68] http://siyakhulall.org/
[69] http://www.rlabs.org/

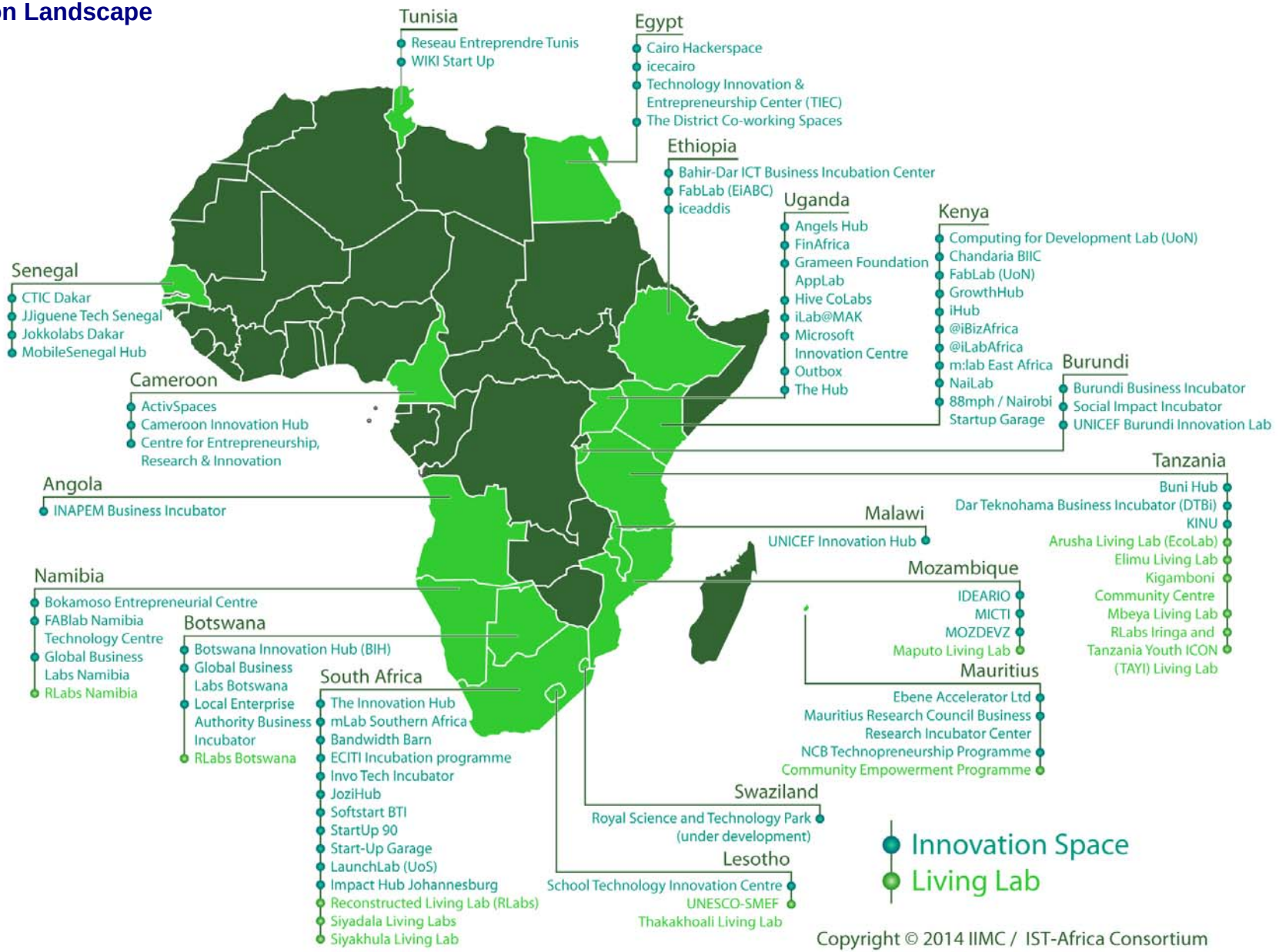
and training (Cape Town) and Siyadala Living Labs[70], hosted by Centre for Community Technologies (CCT) in Nelson Mandela Mandela Metropolitan University, Port Elizabeth.

Swaziland is a low middle-income country with a good policy infrastructure focused on the adoption of ICT to support socio-economic development (ICT Policy 2004, National Information and Communication Infrastructure Policy 2006, Science Technology and Innovation Policy 2012 and Swaziland Communications Commission Act 2013). Swaziland has quite a good fibre optic backbone network and is connected to the SEACOM undersea cable through Maputo, Mozambique. An independent regulator, Swaziland Communications Commission, was established in July 2013. The Government of Swaziland is developing a Science and Technology Park with funding from Taiwan, which will incorporate entrepreneurship Support Services.

The Innovation Landscape map below provides a visual representation of Innovation Spaces and Living Labs in IST-Africa Partner Countries.

[70] http://sict.nmmu.ac.za/

Innovation Landscape



1.6 Conclusion

This report provides an overview of Innovation Spaces and Living Labs in IST-Africa Partner Countries, with a particular focus on those supporting ICT and Innovation related activities.

It is clear that there are differences in the level of intensity and activity of Innovation Spaces and Living Labs within and between IST-Africa Partner Countries, reflecting differences in location (urban, rural, deep rural), differences in community priorities, level of socio-economic development, availability of national resources and available support from the International Donor community.

A common pattern is the relative concentration of Innovation Spaces and Living Labs in urban compared to rural and deep rural settings. This can be explained in a variety of ways ranging from population concentration, proximity to universities and government agencies and ease of access.

While these explanations are easy to understand, it is important to note that common important threads exist, whether the location is urban, rural or deep rural, and whatever the level of socio-economic development of the country. These include high level of youth unemployment, educational gaps – in particular lack of access to appropriate entrepreneurship and ICT skills training, and in the case of Innovation Spaces, limited levels of differentiation and relatively high dependency on grants. It is noticeable that while most Living Labs in IST-Africa Partner Countries have a strong focus on education (and in many case on healthcare), they tend to more well-tuned to local differences. There are a considerable number of under-differentiated Innovation Spaces, particularly those that are primarily co-working spaces rather true pre-incubators, incubators or accelerators.

It is obviously advantageous from a sustainability perspective to co-locate Innovation Spaces and Living Labs with universities or innovation oriented government agencies, as this facilitates re-use of existing infrastructure, equipment, personnel etc. It is positive that the number of Innovation Spaces operating multi-revenue stream business models is starting to increase.

Growth in the establishment of new Living Labs is slower than for Innovation Spaces. This can be explained by the relative simplicity of establishing a co-working space, a lack of understanding of the complexity of establishing and more importantly operating an effective pre-incubator or incubator and the reality that Living labs require cooperation between different stakeholder groups that takes time and effort to put in place.

It is positive that the relative overall level of innovation related activity across most of the IST-Africa Partner Countries has increased dramatically in recent years.

This study is complemented by two other IST-Africa studies entitled “Guide to ICT Initiatives and Research Capacity in IST-Africa Partner Countries”, November 2014, ISBN: 978-1-905824-47-2 and "Guide to Bilateral & Multilateral Cooperation Agreements Supporting ICT/STI-related Activities in IST-Africa Partner Countries", November 2014, ISBN: 978-1-905824-48-9. All three studies will be updated during 2015.

2. INNOVATION AND INNOVATION SPACES

2.1 Innovation

The “Father of Open Innovation” Chesbrough (2006) revised his 2003 definition of Open Innovation as “*the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open Innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology.*”

Collaborative Open Innovation is clearly informed and influenced by previous research, including the work of Von Hippel. Von Hippel (1986) defined Lead Users as “*users whose present strong needs will become general in a marketplace months or years in the future. Since lead users are familiar with conditions which lie in the future for most others, they can serve as a need-forecasting laboratory for marketing research. Moreover, since lead users often attempt to fill the need they experience, they can provide new product concept and design data as well*.”

It is interesting how Open Innovation and entrepreneurship related characteristics are encapsulated in definitions of National Innovation Systems including Furman, Porter and Stern (2002) “*the ability of a country - both a political and economic entity, - to produce and commercialize a flow of new-to-the-world technologies over the long term. National innovative capacity depends on the strength of a nation’s common innovation infrastructure (cross-cutting factors which contribute broadly to innovativeness throughout the economy), the environment for innovation in a nation’s industrial clusters, and the strength of linkages between these two*”, Nelson (1993) “*a set of institutions whose interactions determine the innovative performance ... of national firms*” and Metcalfe (1995) “*that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process*.”

Freeman (1995) argues that “*Whilst external international connections are certainly of growing importance [to innovation], the influence of the national education system, industrial relations, technical and scientific institutions, government policies, cultural traditions and many other national institutions is fundamental*”.

However, Cunningham et al (2014) notes that "*Globalization and technological and social innovations has expanded the universe of contributing Innovation Stakeholders to include Public, Private, Education and Research, Societal, International Development and Funding Sectors, End-user Communities and Innovation Spaces (i.e. Pre-Incubators, Incubators, Innovation Centres, Entrepreneurship Centres, Accelerators, Science Parks, Research and Innovation Parks, and even Co-Working Spaces) inside and outside national borders*".

Figure 1 (Cunningham et al (2014)) provides a summary of key Innovation Stakeholder Groups, each of which can potentially play a role in supporting Collaborative Open Innovation and Entrepreneurship through Living Labs and Innovation Spaces.

It is important to remember, that each Stakeholder Group at both a national and regional level can also be regarded as a potential End-User Innovation Community for ICT-enabled prototypes targeting the specific needs of *their* sector.

Figure 1: Key Stakeholder Groups

2.2 Innovation Spaces

Innovation Spaces can be defined as physical or virtual environments that support entrepreneurs at different stages of development. Innovation Spaces can include Pre-Incubators, Incubators, Innovation Centres, Entrepreneurship Centres, Accelerators, Science Parks, Research and Innovation Parks, and even Co-Working Spaces.

While there are many different models of incubation, we will provide some basic definitions. In each case, these definitions should be understood to include both for-profit and not-for-profit approaches.

Pre-Incubators are focused on addressing the needs of potential entrepreneurs, and in particular help carry out sufficient research to assess the potential for success and their tolerance for risk. In many cases, pre-incubators in an African context are focused on students and recent graduates, and offer training and mentoring programmes of three to six months in duration.

Incubators provide necessary support and services to increase the likelihood of success for committed entrepreneurs, whether start-up or early stage business. Typically, those accepted into incubators either have more experience or have successfully transitioned from a pre-incubator. Incubators offer training and mentoring as well as office space from three months to two years.

Innovation and Entrepreneurship Centres are similar to Incubators in terms of nature and duration of support, but also offer innovation related training and research services to interested stakeholders.

As the name suggests, Accelerators provide more intense support over a shorter duration for start-up or early stage businesses that already have some revenue streams and reference clients.

According to UNESCO[71], Science and Technology Parks have been defined in a number of ways, but essentially includes any kind of high-tech cluster [including technopole, technopark, technopolis, science (and technology) park, science city/town, cyber park, hi-tech (industrial) park, research (and development/technology) park, university research park, science and technology park]. Both the United Kingdom Park Association (UKSPA) and the American Association of University Research

[71] http://www.unesco.org/new/en/natural-sciences/science-technology/university-industry-partnerships/science-and-technology-park-governance/concept-and-definition/

Parks agree that basic requirements include a focus on technology innovation, partnerships between the public, private and education and research sectors and formal and/or operational links with one or more universities, higher education institutes and/or research organisations.

Co-working spaces provide shared services and either dedicated or hot-desk space to provide entrepreneurs, start-ups and early stage companies with flexible, relatively low cost office space. In an African environment, where taking a lease often requires paying twelve months rent in advance, it is easy to understand the popularity and attraction of this type of property service.

The reality is that some Pre-Incubators, Incubators and Accelerators are more equal than others. Some offer little more than co-working space, while others are doing their best to provide a value proposition that will foster the next generation of entrepreneurs in their location. Increasingly, Incubators and Accelerators are experimenting with virtual service delivery, where some training and mentoring is provided (either face-to-face or remotely) but no office space is provided. This both allows more entrepreneurs to be supported simultaneously (as available space is finite and expensive) and also enables service delivery to those who are located too far from their location.

The next section provides an overview of operational Innovation Spaces in IST-Africa Partner countries.

3. INNOVATION SPACES IN IST-AFRICA PARTNER COUNTRIES

3.1 Innovation Spaces in Northern, Central and West Africa

Egypt

Innovation Spaces gradually emerged in Egypt from 2009. Currently, these include: *Cairo Hackerspace*[72], *The District Co-working Spaces*[73] and *icecairo*[74] *(all in downtown Cairo), the Technology Innovation & Entrepreneurship Center* (TIEC)[75], Smart Village, *Fab Lab Egypt*[76] and *Giza Hackerspace* (all in Giza, just outside Cairo). They range in focus from Pre-Incubation (Cairo Hackerspace, icecairo, *Alexandria Hackerspace*[77]*, icealex*), Incubation and Accelerator (TIEC) and Co-working and meeting space (The District, Fab Lab Egypt, Giza Hackerspace, AlMaqarr, Rasheed22, 302labs, Innoventures Startup Circus). Some are described in more detail below.

Cairo Hackerspace was established in September 2009, with a strong focus on promoting open source based innovation. Started initially by engineering students who wanted to work on graduation projects, members now collaborate in a wide range of thematic areas including hardware and software, robotics, science and the arts. Run as a not-for-profit, Cairo Hackerpace is open every evening to students, graduates, professionals and entrepreneurs, providing access to training, Internet connectivity and shared tools.

The District was established in November 2011 as a commercial co-working space for established entrepreneurs after the ideation stage, offering co-working space, private meeting space, Internet access, and since October 2013, a café. As well as offering paid training programmes onsite, The District received support from the Dutch Embassy to launch an entrepreneur support programme in September 2014 focused on knowledge transfer and peer-to-peer skills sharing.

Affiliated with the international co-working space company **icehubs**[78] and the **AfriLabs Network**[79], **icecairo** was established in 2012 as a not-for-profit green-tech innovation hub, with a focus on both services delivered via a physical venue (with Internet access, co-working and meeting space, fab-lab facilities, events, training and the GIZ Responsible & Inclusive Business Hub funded under the GIZ Employment Promotion Programme) as well as online, including a blog and online training. Icecairo is “focused on turning environment and social challenges faced by Egyptian communities into opportunities for the creation of green businesses.” icecairo has been heavily dependent on funding from GIZ and is now trying to diversify revenue streams to achieve sustainability.

The **Technology Innovation and Entrepreneurship Center (TIEC)** was established in September 2010, focusing on pre-incubation, incubation, acceleration and entrepreneurship and business

[72] http://www.cairohackerspace.org
[73] http://www.district-egypt.com
[74] http://www.icecairo.com
[75] http://tiec.gov.eg/
[76] http://www.fablab-egypt.org
[77] http://www.alexhacker.com
[78] http://www.icehubs.com
[79] http://www.afrilabs.com

support. To date, it has incubated 32 companies and supported over 100 startups and early stage companies, and is currently incubating 16 entrepreneurs, half graduates, half experienced professionals. Government funded, it has a national mandate to "stimulate an innovation-based economy through promoting innovation, supporting entrepreneurship and the creation of intellectual property in the ICT field.

Co-located with **Giza Hackerspace, Fab lab Egypt** is a not-for-profit, co-working space and digital fabrication Lab, and member of MIT Fab Lab Global Network. Established in 2012, it offers paid access to co-working space, machines and tools for digital fabrication and prototyping, hands-on MIT accredited curriculum-based training, workshops and events.

Tunisia

Innovation Spaces in Tunisia are relatively recent and include *WIKI Start Up*[80] which was established in 2011 as an Incubator and *Reseau Entreprendre Tunis*[81]. A number of Higher Education Institutions are now considering setting up in-house pre-Incubators and incubators to support recent graduates as well as innovative start-ups in their region.

Established in 2011 in Tunis, the **WIKI Start Up Business Incubator** focusing on helping entrepreneurs get from proof of concept to implementation through the provision of technical assistance, tailored coaching and other resources. Services offered at different stages include Venture Catalyst Services, Venture Fundraising Services and Business Development Services. WIKI Start Up and Carthage Business Angels organised a series of Innovation Workshops in 2013 and WIKI Start Up runs an annual UNIVENTURE competition for potential research spinoffs.

Established in 2012, **Reseau Entreprendre Tunis** (and Monastir) is part of Reseau Entreprendre International, an association of local business owners and entrepreneurs. Mentoring is available from experienced entrepreneurs, as well as monthly group training to build capacity and networks.

Cameroon

There are a number of Innovation Spaces active around the country including: *Cameroon Innovation Hub*[82] (Yaounde); *Centre for Entrepreneurship, Research & Innovation* (CERI)[83] hosted by Catholic University Institute of Buea and *ActivSpaces*[84] (Buea and Douala). These Innovation Spaces are primarily focused on supporting pre-Incubation, Incubation and Acceleration. While CERI focuses on Science, Technology, Engineering and Maths disciplines, ActivSpaces is a tech hub focused on supporting web and mobile programmers, designers, researchers, and entrepreneurs. CIB is currently providing virtual support online.

Founded in September 2013 as a virtual presence by maooni e.V, a German not-for-profit, the **Cameroon Innovation Hub (Cameroon iHub)** is working towards establishing a co-working space

[80] http://www.wikistartup.tn/
[81] http://www.reseau-entreprendre-tunis.org/
[82] http://www.cihub.net/
[83] http://www.cuib-cameroon.org/home.php?office=14
[84] http://activspaces.com/

focused on promoting ICT development and new technologies, and launching innovative web and mobile technology start-ups addressing societal challenges. Currently run by a three person team, it will focus on pre-incubation, incubation and Acceleration.

The **CUIB Centre for Entrepreneurship, Research & Innovation (CERI)** was established in June 2011 as the business and research arm of the Catholic University Institute of Buea founded in May 2010. CERI will evolve into a Research Park, and supports training and development of entrepreneurs, leaders and innovators within the science, technology, engineering and mathematics (STEM) disciplines. CERI is focused on fostering innovation and economic competitiveness through collaboration among national and international stakeholders from the education and research, public and private sectors. CERI hosted a Startup Weekend from 31 October – 02 November 2014.

ActivSpaces has established two co-working spaces in Doula and Buea in the West of Cameroon, focused on web and mobile developers, designers, researchers and entrepreneurs. There are a number of business models being applied, including a monthly fee for co-working space offered to freelancers and entrepreneurs, free co-working space for innovative tech start-ups, and revenue share for start-ups accepted in their six month Activation Bootcamp (which starts in January 2015). ActivSpaces is a member of AfriLabs Network.

Senegal

Innovation Spaces include MobileSenegal Hub[85], which was established as a virtual tech hub in 2008 to support training in mobile technology; Jokkolabs[86] which was established as a co-working space in 2010, CTIC Dakar[87], which was established in 2011 as a tech hub providing Pre-Incubation and Acceleration Services and JJiguene Tech Senegal[88], which was established as the first technology incubator in Senegal for women. Both JokkoLabs and CTIC Dakar are members of AfriLabs.

Established in 2008 with support from Pace University in the US, **MobileSenegal** (now established as the Mobile4Senegal association) was the first Francophone mobile focused incubator in Africa. MobileSenegal focuses on training mobile developers - to date, over 450 participants have completed boot camps and competitions and developed more than 70 applications. To date, grant funding has been provided through Pace University (Google, NCIIA, IBM), and local companies.

Established in April 2011, **CTIC Dakar** is primarily focused on supporting high growth potential ICT entrepreneurs with support from the Government of Senegal, the Telecoms regulator, Orange, World Bank, GIZ and the European Union (Centre for the Development of Enterprise – CDE). CTIC Dakar provides hands-on-business development support and coaching for entrepreneurs, as well as training on financial and communication issues, organises events for young entrepreneurs and has also established in six month duration accelerator program for high potential impact startups. 25%

[85] http://mobilesenegal.org
[86] http://jokkolabs.net/en
[87] http://www.cticdakar.com
[88] http://jjiguenetech.com

of operating costs are contributed by companies supported (through revenue growth sharing), with 30% grant funding, 25% sponsorship and 20% through delivery of business development services.

Established in October 2010, **Jokkolabs Dakar** is part of a network of six co-working spaces in Mali, Burkina Faso, France and Senegal. Focused on addressing social needs in Agriculture, Health, Governance and Primary School Education, leveraging open source is part of its culture.

Established by women in 2012, **JJiguene Tech Senegal** is the first woman's tech Hub in Senegal. It has the objective of encouraging, inspiring and training more women in the tech ecosystem in Senegal through networking, training, mentoring and sharing knowledge. It also aims to increase the number of women in technology and entrepreneurship by encouraging more girls to take STEM (Science, Technology, Engineering and Maths) subjects in school and university. Pre-incubation space is provided, with an emphasis on businesses with high social potential impact. JJiguene Tech Senegal organising monthly meetings, school and university outreach programs, a mentorship program and ICT and entrepreneurial skills training for girls between the ages of 13 – 25.

3.2 Innovation Spaces in East Africa

Burundi

The *Burundi Business Incubator* was set up in 2010 and has received financial and technical support through USAID to supporting training programmes and local capacity building.

During 2013 the Segal Family Foundation piloted the *Social Impact Incubator* in Bujumbura as a capacity building programme and the first cohort graduated in October 2013. During 2014 in partnership with CARE International Burundi, the Social Impact Incubator took in another cohort of 24 incubates. The *UNICEF Burundi Innovation Lab* is focused around technology for development; micro-energy rural entrepreneurship models and leveraging tools and mobile-based platforms to address national challenges.

Ethiopia

Bahir-Dar ICT Business Incubation Center[89] was established in November 2009 in Amhara Regional State to support recent graduate ICT entrepreneurs. It provides office space, capacity building and advisory services. *iceaddis*[90] was established in Lideeta and Kazachise, Addis Ababa (hosted by EiABC and downtown) during 2014 to provide pre-incubation and Incubation support for technology graduates, final year students, professionals and entrepreneurs. EiABC also hosts a FabLab next door and the Ethiopian government proposes to establish a $250 million Ethio ICT technology park. FabLab Addis is planned to be hosted by Addis Ababa University.

Established in November 2009, the **Bahir Dar ICT Business Incubation Centre** is located in the capital of the Amhara Region in North-Western Ethiopia, and targets recent ICT graduates. The longer term objective is to develop BICT BIC into a sustainable technology park of over 11,000m2.

[89] http://www.amhara-incubation.org
[90] http://www.iceaddis.com

The BIC provides co-working space with Internet access and advisory services focused on around marketing, entrepreneurship and financial management. Funding by the regional government, the facilities are used by startups as well as final year students doing internships.

Founded in May 2014, **iceaddis** is located on the Ethiopian Institute of Architecture, Building, Construction and City Development (EiABC) campus in Addis Ababa, in a building made up of six interlocking shipping containers, originally intended to host an art gallery. Iceaddis provides pre-incubation and incubation services, with an emphasis on ICT and green tech. A 12 week business plan training programme is delivered several times a year, with winners securing incubation space. While a social enterprise, most income generated goes to community support. Iceaddis is a member of icehubs and AfricaLabs. Challenges include limited Internet bandwidth and financial support.

Kenya

In part due to its pro-Innovation Policy and Regulatory Environment, Kenya has experienced significant growth in Innovation Spaces (private, community driven and hosted by education and research institutions) since 2009 including FabLab[91] (2009) and Computing for Development Lab[92] (C4DLab, 2013) at University of Nairobi; iHub[93] (March 2010); @iLabAfrica (January 2011) and @iBizAfrica[94] at University of Strathmore; m:lab East Africa[95] (June 2011); Chandaria BIIC (July 2011) at Kenyatta University; NaiLab[96] (August 2011); 88mph[97]/Nairobi Startup Garage (August 2011) and GrowthHub[98] (May 2012). A small but notable actor is Pawa254[99], a collaborative space focused on dynamic creative industry fields. Lakehub[100] is based in Kisumu, Western Kenya. These Innovation Spaces provide a mix of Pre-Incubation (iHub; @iLabAfrica; @iBizAfrica; Chandaria BIIC, Lakehub), Incubation (FabLab; C4DLab; m:lab East Africa, NaiLab) and Acceleration (88mph/Nairobi Startup Garage; GrowthHub) services (Cunningham et al 2014). Some of these are profiled below.

University of Nairobi has hosted **FabLab** for five years (focused primarily on rapid/3D prototyping) as part the Department of Mechanical Engineering and Science and Technology Park, and the **C4DLab** since 2013 as part of the School of Computing and Informatics. Since March 2014, C3DLab is incubating 8 startups and exploring virtual incubation.

Hosted by the IT Faculty, **Strathmore University, @iLabAfrica** was established in January 2011 as a Centre of Excellence in ICT Innovation, Entrepreneurship & Incubation, and Policy Research for Africa. It expanded onto a second floor of dedicated space in June 2014. @iLabAfrica has successfully built industry research partnerships and launched a Master's programme (MSc. MTI) in

[91] http://fablab.uonbi.or.ke
[92] http://www.c4dlab.ac.ke
[93] http://www.ihub.co.ke
[94] http://www.ibizafrica.co.ke
[95] http://www.mlab.co.ke
[96] http://www.nailab.co.ke
[97] http://www.88mph.ac/nairobi
[98] http://www.thegrowthhub.com
[99] http://www.pawa254.org
[100] http://lakehub.co.ke/

Mobile Telecommunications and Innovation. **@iBizAfrica** was set up in January 2012 as an Incubation Programme.

Kenyatta University (KU) launched the **Chandaria BIIC** in July 2011. BIIC aims to support up to 100 innovators per year (including 30% non-KU students), blending research with entrepreneurship training. Their strategy is to sensitize students and the population at large to the importance of job creation. 40 ideas had been nurtured by February 2013. A new building inside the KU Campus has been completed. Partners include NACOSTI, Youth Enterprise Development Fund and Orange.

Jomo Kenyata University of Agriculture and Technology[101] (JKUAT is supporting "uptake of research results by industry" by implementing the **Nairobi Industrial and Technology Park** in partnership with **Ministry of Industrialization**.

iHub launched in March 2010 as a Tech pre-Incubation and Collaborative Working Space, has three types of membership: White (Virtual – limited physical access); Green (free shared space for up to twelve months for 150 – 200 individuals) and Red (paid dedicated space for 12 months) members registered. Regular community events are hosted to encourage sharing of experiences. Over 50 companies have been established since its launch. iHub activities include iHub Research (March 2011), m:lab (June 2011), Pivot25/Pivot East (mobile app competition), UX Lab and Supercomputing Cluster (2012).

m:lab East Africa was launched in June 2011 as a mobile technology incubation centre by a consortium (eMobilis, World Wide Web Foundation, School of Computing and Informatics - University of Nairobi, iHub), with $725,000 seed funding from InfoDev (www.infodev.org). Services include business incubation, training, research and application testing. Up to June 2014 [24] m:lab supported over 60 startups through its four-month Mobile Application Development and Entrepreneurship Programme and office space for up to 24 months to five past and five current incubatees and Savannah Fund. m:lab supporters include Nokia, Samsung, Microsoft and SEACOM. m:lab is an implementing partner in InfoDev two year East Africa Virtual Incubation pilot ($180,000 funding from UKAid) running in Kenya, Rwanda, Tanzania and Uganda.

NaiLab is a Business Incubator supporting entrepreneurial teams with mobile/web space innovations. Launched in August 2011 with support from Accenture and 1% Club, it provides collaborative working space, Internet access and mentoring. NaiLab takes a 3% - 10% equity stake in return for incubation of three to twelve months. Nine start-ups have been incubated to date, with five more currently being incubated. NaiLab was awarded the $1.6 million Kenya ICT Incubation Program contract in January 2013 under which it is contracted to incubate 30 startups by 2016 and is an implementing partner in the InfoDev East Africa Virtual Incubation pilot.

GrowthHub is an incubator and accelerator targeting Clean and Green-Tech, Mobile and IT, Agro-processing, Professional services and Essential Services (health, education, water and sanitation). Launched by GrowthAfrica, a Danish consulting company in May 2012, services include shared

[101] http://www.jkuat.ac.ke

desk and meeting space, wireless internet, peer to peer learning, advisory services, workshops, training, access to seed funding and monthly pitch meetings. The GrowthHub partnered with Village Capital to provide a three month Accelerator Programme for start-ups with prototypes (18 in 2012, 14 in 2013). GrowthHub is supporting 25 start-ups in two programmes (Agribusiness Accelerator Cohort, Agribusiness for Innovation Incubation Cohort) and has supported 24 startups since 2012.

88 mph rebranded its Kenyan accelerator as Nairobi Startup Garage in June 2014. Offering seed capital ($1.7 million invested in 19 startups) and accelerator programmes targeting mobile and web start-ups, 88mph was launched by Danish investors in August 2011. Start up Garage co-working space was launched in February 2012 by 88mph and Human IPO. To date 88mph / IPO48 has invested in 10 start-ups and started 5 companies. 88mph takes 15% - 35% equity stake for investment of up to $24,000. In August 2012, 88mph partnered with Google to provide extended support to local start-ups.

Tanzania

Innovation Spaces include Dar Teknohama Business Incubator[102] (DTBi); Buni Hub[103], KINU[104], and University of Dar es Salaam ICT Incubator[105] (UDICTI) (Cunningham et al 2014). Innovation Spaces are focused on Pre-Incubation (Buni Hub, KINU), and Incubation (DTBi, UDICTI). Some of these are profiled below. The Mara Launchpad Incubator opened in Q1 2013 was closed by 2014.

Established in October 2011, **Buni Hub** is currently hosting 15 pre-incubation teams (three months to develop a prototype and further six months for startup support).

Launched in July 2012, **KINU** provides dedicated and co-working space, application testing facilities, workshops and training with a focus on technology start-ups and women. KINU cooperate in ICT entrepreneurship activities (e.g. hackathons) with TANZICT[106] and DTBi and are now diversifying their revenue streams to achieve sustainability (e.g. hot-desks with mentoring and faster internet for a fee, setting up briefing sessions for clients with key stakeholders from specific sectors, recruitment services, sensitizing high school students). KINU recently finalized an agreement with Vocational Education and Training Authority[107] (VETA) to certify entrepreneurship training programmes nationally in several entrepreneurship related areas. Community members are mainly students and startups during the day and professionals during evenings and weekends.

DTBi was established in June 2011 as a Public Private Partnership between InfoDev[108] and COSTECH. Hosted by COSTECH with initial funding provided by InfoDev, DTBi is currently

[102] http://www.teknohama.or.tz
[103] http://www.buni.or.tz
[104] http://www.kinu.co.tz
[105] http://udicti.coict.udsm.ac.tz/
[106] http://www.tanzict.or.tz - bilateral project between the Ministry of Communications, Science and Technology, Tanzania and Ministry of Foreign Affairs of Finland 2011 – 2014 which supports the Buni Hub, training for women entrepreneurs (FEMTANZ Program), community events and hands-on support to emerging Living Labs outside Dar es Salaam (in Iringa, Kigamboni, Mwanza, Mbeya, Zanzibar and Arusha).
[107] http:// www.veta.go.tz
[108] http:// www.infodev.org

supporting 4 pre-incubatees (1 resident, 3 virtual), 8 startups (4 resident, 4 virtual) and 8 companies (2 resident, 6 virtual). DTBi collaborates with the Buni Hub. DTBi provides loan guarantees for incubated companies with signed private or public sector contracts who need working capital. DBTi is implementing partner for the InfoDev East Africa Virtual Incubation pilot launched January 2013. In June 2014, Tigo Tanzania signed a partnership with DTBi and COSTECH which will support 10 scholarships per year for Masters students, an internship program and employment opportunities.

Uganda

Uganda experienced a rapid growth in Innovation Spaces supporting entrepreneurs from 2010 to include: *Hive CoLabs*[109]; *Microsoft Innovation Cen*tre[110] and iLab@MAK[111] hosted by College of Computing and Information Science, Makerere University; *Outbox*[112] focused on mobile and web entrepreneurs; *Angels Hub*[113] (which took over Mara LaunchPad incubation space in September 2013). The Innovation Spaces are focused on providing Pre-Incubation (Hive CoLab, Outbox), Incubation (Angels Hub, FinAfrica[114]), Co-working spaces (Hive CoLab, Outbox, The Hub[115]), Entrepreneurial Training (FinAfrica) and commercialisation of apps (*Grameen Foundation AppLab*[116]) (Cunningham et al 2014). Some of these are profiled below.

Makerere University is supporting Technology Entrepreneurship through the **Microsoft Innovation Centre** established November 2011 and **Global Business Labs Uganda**[117] established in March 2013 (both co-located in the College of Computing and Information Science), and **iLab@MAK**, established in the College of Engineering, Design, Art and Technology in 2005.

Launched in July 2010 and supported by Indigo Trust and Hivos, **iHive Colab** targets university graduate startups and web and mobile technology entrepreneurs. A founding member of **AfriLabs**[118], Hive Colab undertakes research, collaborates with local universities and is an implementation partner for InfoDev East Africa Virtual Incubation pilot [14].

Outbox (member of AfriLabs) was launched in July 2012 as a technology incubator and collaborative working space for mobile and web entrepreneurs, supported by Google and Deloitte.

The founders of **Angels Hub** took over Mara Launchpad Incubator when it closed in September 2013, having been involved in its launch in January 2012.

Established in April 2011, **The Hub Kampala** rents collaborative and dedicated working space for freelancers, consultants and entrepreneurs, and collaborates with **FinAfrica** for training and **Mara Foundation** for mentoring.

[109] http://hivecolab.org/
[110] http://www.micuganda.com
[111] http://cedat.mak.ac.ug/research/ilabs.html
[112] http://www.outbox.co.ug/
[113] http://angelshub.org/
[114] http://www.finafrica.org/
[115] http://thehubkampala.com/
[116] http://www.grameenfoundation.applab.org
[117] http://globalbusinesslabs.com/office/uganda/
[118] http://afrilabs.com/labs

FinAfrica was founded in 2009 as a not-for-profit training, enterprise incubation and advisory centre. A Cisco Entrepreneur Institute, it can also host up to 20 incubatees.

Grameen Foundation AppLab Uganda develops applications and information services tailored to the needs of the poor. Launched in 2009, the Community Knowledge Worker (CWK) Initiative has over 1,000 ICT-enabled agriculture extension workers trained as data enumerators. Organisations providing services to farmers have access to rural community data. The AppLab Money Accelerator has Gates Foundation funding to expand the mobile money ecosystem and deliver appropriate products and services to the poor. Grameen collaborates with Makerere and Victoria Universities.

3.3 Innovation Spaces in Southern Africa

Angola

Launched in June 2014, funded by the government and managed by the National Institute of Small and Medium-Sized Companies (INAPEM), Angola's first business incubator is located in Viana municipality, Luanda-Bengo Special Economic Zone to support innovative early stage SMEs. Companies can stay for up to three years and will receive training and business management consultancy. The first companies to join are winners of the INAPEM "Ideia Brilhante" contest. Another INAPEM ICT-oriented business incubator will be established with support from Chevron, providing technical and management training and access to a network of partners for mentoring.

Botswana

The Government of Botswana decided at an early stage that it is necessary to actively support entrepreneurship. The *Local Enterprise Authority* was established in 2004 to support SMEs, provide training, mentoring, technology adaptation and support services.

The *Botswana Innovation Hub* (BIH)[119] was conceived in 2008 within the Botswana Excellence Strategy to support economic diversification, job creation and transition towards a knowledge-economy by encouraging inward investment, research and training in the areas of ICT, Bio-Technology, Energy and Mineral Technology. Programmes include the First Steps Venture Centre, Microsoft Innovation Centre, Cleantech and KitsoWorks. The development of the National Science Park is due for completion during 2016.

BIH is receiving support through the Southern African Innovation Support (SAIS)[120] Programme to establish a Global Business Lab[121] and Technology Transfer Office within the University of Botswana; develop a Demand Driven Supply Chain Business Incubation Model; and address youth unemployment and local communities through Living Labs and Training (RLabs Botswana).

[119] http://www.bih.co.bw/
[120] http://www.saisprogramme.com/overview/
[121] http://globalbusinesslabs.com/office/botswana/

Lesotho

Innovation Spaces are gradually emerging focused primarily around the *Basotho Enterprises Development Corporation*[122] *(BEDCO)* and the *School Technology Innovation Centre (STIC)*.

Established in 1980, **BEDCO** is a parastatal of the Government of Lesotho, with a mandate to support entrepreneurial capacity building programmes and delivery of business advisory and support services and business and technical training. BEDCO provides incubation space for start-up businesses as well as virtual incubation services, and in November 2014 launched an ICT-led business enterprise project, which it is hoped will lead to greater local entrepreneurial activity.

Established in May 2008, **STIC** is hosted by the Lesotho College of Education and targets in-service and pre-service teachers, learners and school principals. The objective is to inculcate basic scientific and technological literary, visual and cultural literacy skills of student and promote adoption of new methods of teaching.

Malawi

There are ongoing discussions in relation to the possibility of UNICEF setting up an Innovation Hub in cooperation with University of Malawi Polytechnic in Blantyre.

In early 2014, the Global Center for Food Systems Innovation[123] at Michigan State University, established a regional innovation hub in partnership with the Lilongwe University of Agriculture and Natural Resources, with financial support from USAID. This innovation hub will focus on agricultural and food systems innovation, starting with developing and introducing multi-purpose legumes, which produce both food for humans and fodder for animals and will supplement growing of maize.

Mauritius

Innovation Spaces supported by the Government of Mauritius include: Mauritius Research Council *Business Research Incubator Center*[124] (MRC-BRIC March 2011); *NCB Technopreneurship Programme*[125] (2011); and *Ebene Accelerator Ltd*[126] (July 2013). These Innovation spaces offer a mix of Pre-Incubation, Incubation (physical and virtual) and Accelerator services.

Established in March 2011, the **MRC-BRIC** supports recent graduates and final year students, with office space, a monthly stipend under the MRC Traineeship scheme, access to mentors and exposure to business angels via a Business Angels For a organised by MRC.

The National Computer Board (NCB) is supporting entrepreneurship through the **Technopreneurship Programme**, Microsoft BizSpark Program and NCB/MICT **TechIdeaSpace Programme** launched in November 2014. Targeting secondary and university student, university graduates, young technology professionals and aspiring startups, it will use a competition based

[122] http://www.bedco.org.ls
[123] http://gcfsi.isp.msu.edu/
[124] http://www.mrc.org.mu/mrc_centres/business_research_incubator_centre
[125] http://technopreneur.ncb.mu
[126] http://ebeneaccelerator.mu/

approach to shortlist team based proposals to participate in the Bootcamp programme to prepare a business plan, marketing plan, financial budgeting and enjoy access to one-one-one mentoring.

Launched in July 2013, **Ebene Accelerator** aims to support technology entrepreneurs to create, test and market innovative IT solutions and provide a framework to support commercialisation of research based projects at local universities. It currently hosts 15 start-up teams.

Mozambique

Even though a Business Incubator Strategy is being developed through IPEME, traditionally there has been limited tech entrepreneurship support in Mozambique.

Mozambique Information and Communication Technology Institute (MICTI) was initially established within the University of Eduardo Mondlane to provide an Institute for Research and Learning and a Business and Technology Incubator. Mozambique is a beneficiary through the Southern African Innovation Support (SAIS)[127] Programme and STIFIMO Finnish Programme, both of which aims to strengthen the national Innovation ecosystem. Recent players include: MOZDEVZ[128] (2013) as a community of Application Developers; IDEARIO[129], which was launched in Summer 2014 as a tech hub and co-working space offering Pre-Incubation and a 30 day Acceleration Programme. IdeiaLab[130] is cooperating with the FemTech SAIS Programme in Mozambique.

Namibia

Innovation Spaces include *Bokamoso Entrepreneurial Centre*[131] which provides Incubation services and cooperates with FemTech Programme supported by SAIS Programme; *FABlab Namibia Technology Centre*[132], which was established as a Centre of Excellence within the Polytechnic of Namibia in 2014; and *Global Business Labs Namibia*[133] which is supported by the Finnish SAIS Programme since 2013 to provide Acceleration services.

Global Business Labs Namibia was established in February 2013 in partnership with the University of Namibia. Primarily targeted at students and alumni, following screening four times a year, entrepreneurial teams are accepted in to the GBL accelerator program which provides access to co-working space, coaching and training, mentoring, networking and professional services from knowledge partners for 8 – 12 months. Regular lectures and networking events are organised.

Founded in 2003, the **Bokamoso Entrepreneurial Centre** in Windhoek provides incubation and co-working space for startups and early stage companies in the fields of crafts and jewellery making, clothing manufacturing, joinery and carpentry and innovative/solar businesses. The incubation programme includes counselling, ongoing mentoring, facilitation of business linkages, training and business seminars and access to IT. Discounted work space is provided for a maximum of 3 years.

[127] http://www.saisprogramme.com/overview/
[128] http://mozdevz.idear.io/sobre-nos/
[129] http://idear.io/
[130] http://www.ideialab.biz/
[131] http://www.cityofwindhoekcc.org.na
[132] http://www.fablabnamibia.org/
[133] http:// www.globalbusinesslabs.com/office/namibia/

South Africa

South Africa has experienced a growth in Innovation Spaces support technology entrepreneurs across the country including: The Innovation Hub[134] (Pretoria), mLab Southern Africa[135] hosted within the Innovation Hub since 2011; Bandwidth Barn[136] (Cape Town); Eastern Cape Information Technology Initiative (ECITI)[137] Incubation programme (East London); Invo Tech Incubator,[138] Durban University of Technology; JoziHub[139] (Johannesburg); Softstart BTI[140] (Midrand, Johannesburg); StartUp 90[141]; Start-Up Garage[142] (Cape Town); LaunchLab[143] (University of Stellenbosch) and Impact Hub Johannesburg[144]. These Innovation Spaces collectively support Pre-Incubation (Bandwidth Barn), Incubation (The Innovation Hub; ECITI; InvoTech; Softstart BTI; LaunchLab), Co-working Spaces (Bandwidth Barn; JoziHub; Start-Up Garage; LaunchLab; Impact Hub Johannesburg) and Acceleration Services (mLab SA; StartUp 90). Some are profiled below.

Funded by the Gauteng Provincial Government and established in 2001, **The Innovation Hub** is located close to the CSIR and Department of Science and Technology (DST). Africa's first internationally accredited Science and Technology Park, and a member of International Association of Science Parks (IASP), The Innovation Hub hosts mLab Southern Africa, Maxum Business Incubator (co-working and dedicated space), the Climate Innovation Centre (providing access to finance and facilities and technical, business and policy advisory services) and BioPark (promoting health, agriculture and environment industries) which are all focused on enterprise development. Skills development programmes include CoachLab (nine month skills and leadership development programme preparing postgraduate students for industry), and FabLab, the eKasi Labs and Kusile Mobile Science Labs (focused on youth empowerment). OpenIX (like Demola) focuses on Open Innovation bringing together stakeholder challenges with solution providers, while Gap Biosciences, Gap Green, Gap Medical and Gap ICT are competitions for seed funding and incubation services.

mLab Southern Africa is a mobile solutions laboratory and startup accelerator focused on the development of innovative mobile applications and services. Based in The Innovation Hub in Tshwane, South Africa, and a member of AfriLabs, it also has virtual programs in Southern Africa.

Launched in 2000 as the Telkom Bandwidth Barn (**TheBarn**), provides co-working space and professional services as well as an online and workshop based pre-incubation programmes and on-site incubation and accelerator programmes for entrepreneurs at different stages of development.

134 http://www.theinnovationhub.com/
135 http://www.mlab.co.za
136 http://www.bandwidthbarn.org/
137 http://www.eciti.co.za/
138 http://www.invotech.dut.ac.za/
139 http://jozihub.org/
140 http://www.softstartbti.co.za/
141 http://www.startup90.com/
142 http://www.capetowngarage.com/
143 http://www.launchlab.co.za/
144 http://johannesburg.impacthub.net/

Established in East London by the Eastern Cape Provincial Government in 2004, ECITI provides incubation services (Launch pad, Seed, eGrowth) to ICT and film oriented entrepreneurs.

InvoTech offers a ten week entrepreneurship programme based at Durban University of Technology, focused on the Green Technology, Digital Creative Industry, Software or Mobile Application Sectors. Launched in August 2011, the incubator is co-funded by the Small Enterprise Development Agency (Seda) and is currently providing services to over 75 client companies. InvoTech provides access to a Seed Fund in partnership with the Technology Innovation Agency, focused on Energy, Transportation, Advanced Materials, Environment & Waste related innovation.

Launched in February 2013, **JoziHub** is a Johannesburg based technology incubator supported by the Praekelt Foundation, IS Labs, Google Entrepreneur programme, Indigo Trust and the Omidyar Network, offering co-working space, mentoring, community events and conference facilitates.

Based in Midrand, Gauteng and launched in 2005, **Softstart Business and Technology Incubator (Softstart BTI)** is focused on ICT and electronics related startups, providing services including: co-working space; mentoring and training; human resource and payroll; communications and marketing; strategy, policy and research and development; legal support and fund raising.

Startup 90 in Capetown offers a three-month accelerator programme (primarily focused on the education, finance, healthcare and agriculture sectors) with mentoring and co-working space.

Launched in October 2012, **Capetown Garage** offers co-working and meeting space.

Hosted by the University of Stellenbosch and launched in August 2013, **LaunchLab** is a business incubator that uses an Ideas Programme with workshops and Pitching Den before selecting the top ten ideas for seed funding, mentoring and coaching and incubation space. This innovative programme is open to university students (not limited to Stellenbosch) and external entrepreneurs.

Part of ImpactHub Network, **Impact Hub Johannesburg** offers co-working space in Braamfontein, and offers a fee based three month Social Impact Accelerator Programme.

Swaziland

The Government of Swaziland is developing a **Royal Science and Technology Park** with funding from Taiwan, which will incorporate entrepreneurship Support Services and attract FDI.

4. LIVING LABS

4.1 Living Labs Definitions

It seems clear that the concept of Living Labs falls within the overall definition of Open Innovation. Cunningham, P. (2013) defines Innovation as "*the improvement of products, services, processes, business models, policies and concepts in an existing context (whether social or economic) or their* adaptation *from one context to another, with the goal of increasing performance or achieving another desired impacts"*. Adaptation is defined as "*necessary changes required to achieve desired outcomes"*. Increased performance or other desired impacts can be measured through Return on Investment (ROI), increased productivity, increased engagement and/or Return on Objective (ROO).

While this proposed definition is more inclusive of other Innovation Stakeholders than the primary corporate innovation focus of work by Enkel et al (2009)[145], its underlying premise is supported when they suggest that an "*important source of innovation will be companies from other industries, because we know that* ***most innovation is based on a recombination of existing knowledge, concepts, and technology. Established solutions from other industries will enrich corporate product development*** *while reducing the related risks through reducing uncertainty.*" That is why multi-stakeholder engagement across different sectors is so critically important. Living Labs can be totally independent or can have either weak or strong relationships with other Living Labs.

This section outlines a variety of Living Lab descriptions and definitions from different sources.

DG Information Society and Media, European Commission, 2009[146] defined Living Labs as "*open innovation environments in real-life settings, in which user-driven innovation is fully integrated within the co-creation process of new services, products and societal infrastructures*". It stated that Living Labs bring users into the creative process at an earlier stage of innovation "*to better discover new and emerging behaviours and user patterns, bridging the innovation gap between technology development and the uptake of new products and services involving all relevant players of the value network … [and] allowing for early assessment of the socio-economic implications of new technological solutions by demonstrating the validity of innovative services and business models*".

The European Commission report also identifies benefit statements for the stakeholder groups. "*The benefits for the different types of stakeholders to deploy user-driven open innovation and Living Lab methodologies can be summarised as follows:*

- *For the users in their role as citizens and … community [representatives]: To be empowered to influence the development of services and products which serve real needs, and to jointly*

[145] Enkel, E., Gassmann, O. and Chesbrough, H. (2009), Open R&D and open innovation: exploring the phenomenon. R&D Management, 39: 311–316

[146] European Commission, DG Information Society and Media, *Unit F4 New Infrastructure Paradigms and Experimental Facilities. Living Labs for User-driven Open Innovation. An Overview of the Living Labs Methodology, Activities and Achievements.* January 2009.

contribute to savings and improved processes through active participation in the R&D and innovation lifecycle.

- *For the SMEs, incl. micro-entrepreneurs as providers: developing, validating and integrating new ideas and rapidly scaling-up their local services and products to other markets.*
- *For the larger company: making the innovation process more effective by partnering with other companies as well as end-users, which are rooted in active user experiences, increasing 'right the first time'.*
- *For research actors, the economy and the society: Stimulating business-citizens-government partnerships as flexible service and technology innovation ecosystems; integrating technological and social innovation in an innovative 'beta culture'; increasing returns on investments in ICT R&D and innovation*".

Figure 2, extracted from this 2009 European Commission Report, positions the Action Space for Living Labs in relation to three key Lifecycles - Technology Adoption (Orange), Research (Green) & Funding (Blue). In a developing country context, there are challenges associated with all three of these Lifecycles which must be recognised, assessed and addressed, while taking account of national or regional socio-economic, socio-cultural and policy context.

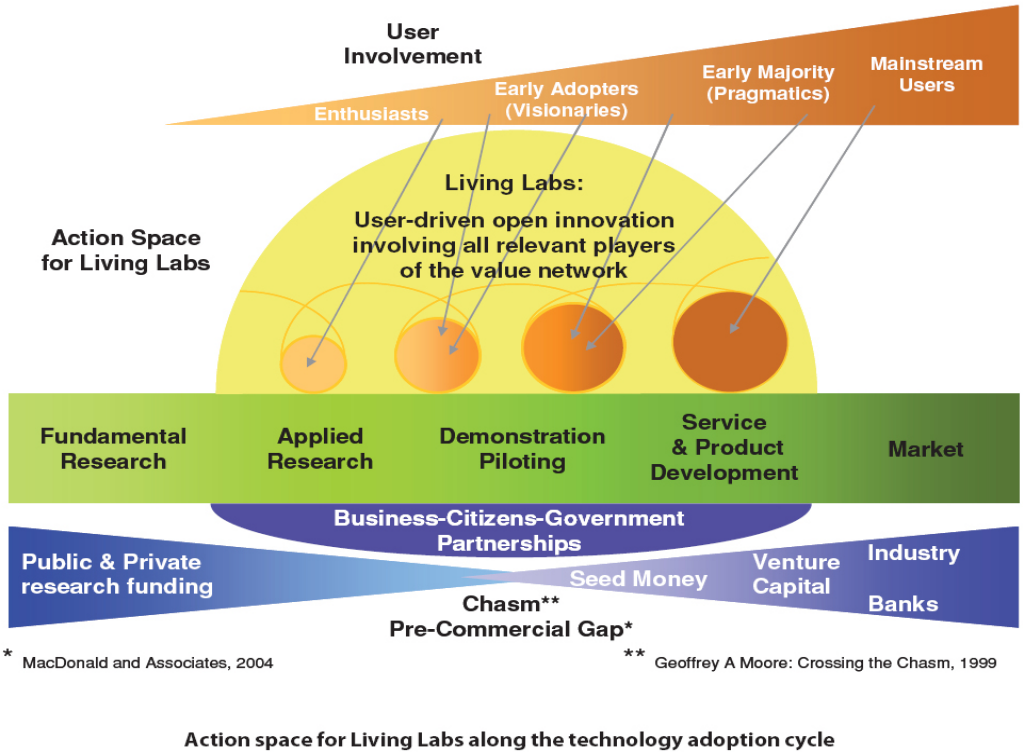


Figure 2 – Intersection of Living Labs with Technology Adoption, Research and Funding Lifecycles

Within the **Technology Adoption Lifecycle**, Living Labs can be a very effective mechanism to engage with what the European Commission classify as *Enthusiasts* (who could also be inventors or Lead Users), *Early Adopters* and the *Early Majority*, whose input can be critical to the successful evolution of a new product or service with mass market or niche market appeal.

Within the **Research Lifecycle**, Living Labs are clearly aligned with the phases after Fundamental Research and before Market Deployment: *Applied Research; Demonstration and Piloting* (of new products, services, processes or business models); and *Early Stage Market Assessment of Service and Product Development*.

The primary challenge associated with the **Research Lifecycle** in a developing country context, is that what the concept of "research" is understood to mean. The nature, focus and intensity of research carried out by different public and private universities vary enormously, both between departments in the same institution as well as between institutions in different countries.

Within the **Funding Lifecyle**, Living Labs both enable and leverage Public-Private-Partnership funding mechanisms to address not just that window where research funding is no longer available, and risk capital is not yet available (known as both Macdonald and Associates, 2004 "Pre-Commercial Gap" and Moore's, 1990 "Chasm"), but also close-to-market research and seed and early-stage funding, traditionally only available from "Friends and Family".

In a developing country context, where income levels are low, bank debt is expensive and capital availability is limited, the potential impact of Living Labs that reduce associated innovation and implementation risks and maximise the likelihood of success, is high.

Just as Living Labs methodologies can be applied in very different contexts, both geographic (or territorial – e.g. urban, suburban or rural, local community or regional, national or cross-border) and thematic (e.g. eHealth, eServices in Rural or Developing Areas, eDemocracy and eGovernance, ICT for Energy Efficiency, Food Security), Living Labs have been defined in a variety of ways. A representative sample of definitions of Living Labs is presented below.

Living Labs were developed as a concept in 1990 (Lepik, Krigul & Terk, 2010:1090[147]) and is referred to by Eriksson, Niitamo & Kulkki (2005)[148], Bergvall-Kareborn, Ihlström Eriksson, Ståhlbröst and Svensson (2009)[149] and Holst, Ståhlbröst & Bergvall-Kåreborn (2010)[150] *as a system, an arena, environment and/or a systemic innovation approach*. They argue that a Living Lab is both a milieu (environment, arena) and an approach (methodology, innovation approach).

Eriksson *et al*. (2005) defined a Living Lab as "*a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts*" (p.

[147] Lepik, K-L., Krigul, M. & Terk, E. 2010. Introducing Living Lab's method as knowledge transfer from one socio-institutional context to another: Evidence from Helsinki-Tallinn cross-border region. Journal of Universal Computer Science, Vol 16 (8), 2010: 1089-1101.

[148] Eriksson, M., Niitamo, V.P., & Kulkki, S. 2005. State-of-the-Art in Utilizing Living Labs Approach to User-centric ICT innovation - a European approach. Centre of Distance Spanning Technology at Luleå University of Technology, Sweden, Nokia.

[149] Bergvall-Kareborn, B, Ihlström Eriksson C, Ståhlbröst A, Svensson J.: A Milieu for Innovation – Defining Living Labs. Proceedings of the 2nd ISPIM innovation symposium: Simulating recovery - the Role of innovation management, New York City, USA. 2009.

[150] Holst, M. Ståhlbröst, A. & Bergvall-Kareborn, B. 2010. Openness in Living Labs: Facilitating Innovation. Proceedings of the 33rd IRIS Seminar. 2010.

4). Ballon *et al*., (2005)[151] define a Living Lab as an experimentation environment in which technology is given shape in real-life contexts and in which (end) users are considered '*co-producers*'. Schumacher & Feurstein (2007)[152] describes a Living Lab as a systemic innovation approach in which all stakeholders in a product, service or application participate directly in the development process. Other concepts also evident from various definitions of Living Labs are open innovation ecosystems, territorial contexts, concurrent research and innovation processes, where users can play an active role in developing new services, products or processes (Følstad, 2008[153]).

According to Massachusetts Institute of Technology (MIT)[154] "*Living Labs brings together interdisciplinary experts to develop, deploy, and test* - in actual living environments - *new technologies and strategies for design that respond to this changing world*".

According to Bergvall-Kåreborn et al (2009) the key components of Living Labs are illustrated in **Figure 3** below, with Innovation at the Centre:

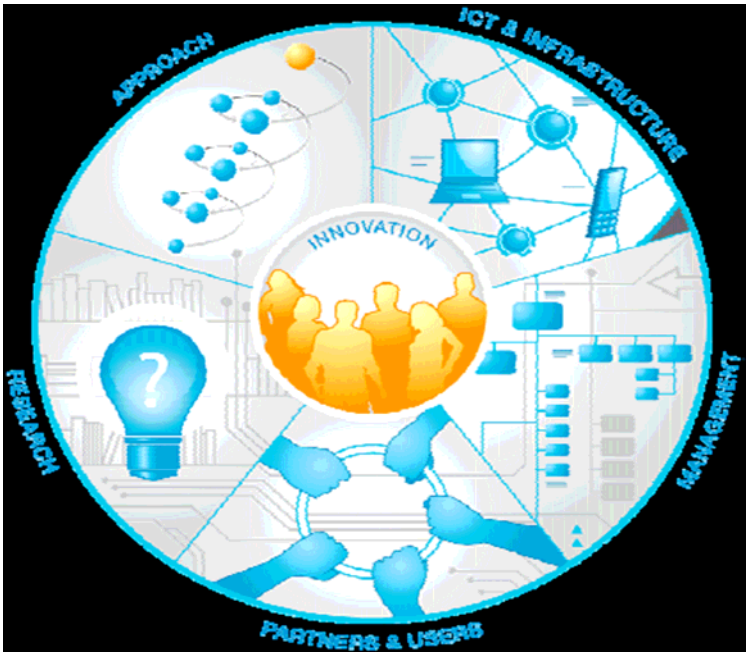


Figure 3 – Key Components of Living Labs

- *ICT & Infrastructure* outlines the role that new and existing ICT technology can play to facilitate new ways of cooperating and co-creating new innovations among stakeholders
- *Management* represents the ownership, organization, and policy aspects of a Living Lab, by which a Living Lab can be managed by e.g. consultants, companies or researchers

[151] Ballon, P., Pierson, J., & Delaere, S. 2005. *Open Innovation Platforms for Broadband Services: Benchmarking European Practices*. 16th European Regional Conference, 4-6 September, Porto, Portugal.

[152] Schumacher, J., & Feurstein, K. (2007). *Living labs - A New Multi-stakeholder Approach to User Integration*. Paper presented at the 3rd International Conference on Interoperability of Enterprise Systems and Applications (I-ESA'07), Funchal, Madeira, Portugal

[153] FØLSTAD, A. 2008. *Living Labs for Innovation and Development of Information and Communication Technology: A Literature Review*. The Electronic Journal for Virtual Organisations and Networks 10 (Special Issue on Living Labs,):100-131.

[154] http://livinglabs.mit.edu/

- The Living Lab *Partners & Users* bring their own specific wealth of knowledge and expertise to the collective, helping to achieve boundary spanning knowledge transfer
- *Research* symbolizes the collective learning and reflection that take place in a Living Lab, and should result in useful contributions to both theory and practice. *Technological research partners* can also provide direct access to research and research results that can benefit the outcome of a technological innovation
- Finally, *Approach* stands for methods and techniques that emerge as best practice within the Living Labs environment

Living Labs is a concept that refers to a Research and Development (R&D) methodology where innovations (services, products and application enhancements) are created and validated in collaborative, multi-contextual empirical real-world settings (Geerts, 2011[155]), and seen as a new character in the open innovation chain (Lepik et al., 2010:1091).

Tijus, Barcenilla and Vandi (2012)[156] define Living Labs as "*user-driven open innovation ecosystems based on a business-citizens-government partnership which enable users to take an active part in the research, development and innovation process*".

According to Living Labs Portfolio Leadership Group and the CORELABS project[157]; a "*Living Lab has one main role, and this is to engage and empower users to participate in the generation of valuable and sustainable assets towards objectives set-up by its partners and customers. Primarily, a Living Lab should have capability to;*

- *Form an appropriate organisation and partnership*
- *Motivate and empower large scale user engagement*
- *Establish adequate tools and infrastructure*
- *Form and execute case-dependent processes and manage IPR*
- *Disseminate a wide variety of results*"

ENoLL's (2011) definition of Living Labs identifies and qualifies five key dimensions of Living Labs, (1) innovation settings ("*open innovation environment*"), (2) operating environments ("*real-life settings*"), (3) affecting innovation processes ("*user-driven innovation"* and "*co-creation process*"), (4) related to user engagement and (5) from which innovation outcomes are expected ("*new services, products and societal infrastructures*").

[155] Geerts, G. 2011. A Design Science Research Methodology and its Application to Accounting Information Systems Research. International Journal of Accounting Information Systems. Retrieved from http://linkinghub.elsevier.com/retrieve/pii/S1467089511000200.

[156] Tijus, C, Barcenilla, J, Vandi, C (2012) Challenges and Ethical Issues in Living Labs for Open Innovation. eChallenges e-2012 Conference Proceedings. Paul Cunningham and Miriam Cunningham (Eds) IIMC International Information Management Corporation, 2012

[157] CORELABS, I. 2007. Building Sustainable Competitiveness - Living Labs Roadmap 2007 - 2010. Luleå University of Technology - Centre for Distance-spanning Technology.

Vandi, Tijus and Baccino (2010)[158] (**Figure 4**) have an interesting way of positioning Living Labs with relation to more traditional types of research (Research Studies, Research and Development Studies, Social Studies), based on the mutual roles of Users ("Citizens"), Researchers/Academic ("Scientist") and Industry ("Industrial"). While this is insightful, unfortunately, this perspective ignores the important role of the public sector ("Government") in the wider context of Living Labs.

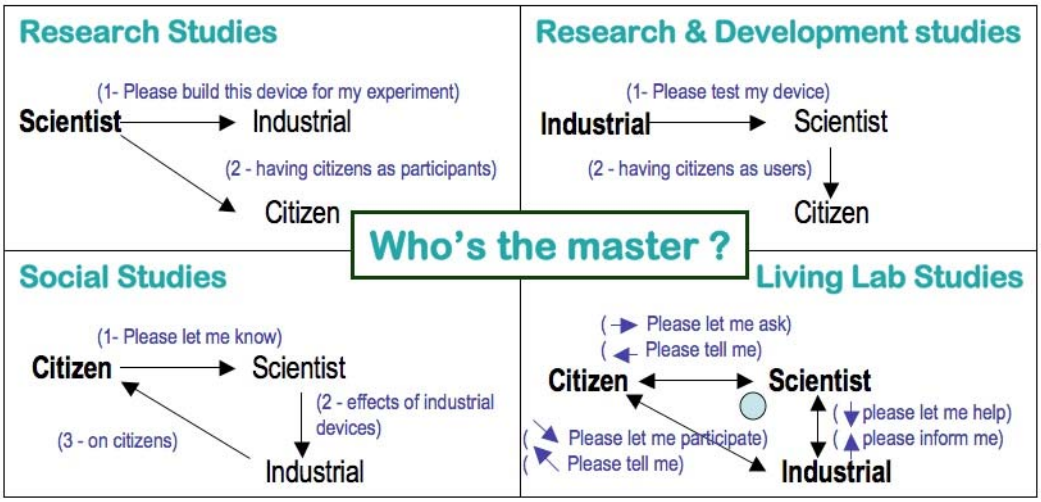


Figure 4: Roles of Participants in Different Types of Research (After Vandi, Tijus and Baccino, 2010)

Tijus, Barcenilla and Vandi (2012)[159] in their consideration of methodological and ethical constraints to be considered when involving users as early stage contributors and innovators, recognises that "*the innovation process needs governmental support for developing the future of technology and also the future of academic research, both fundamental and applied*".

While these definitions and proposed benefits are valid based on the development of Living Labs worldwide, there is a consensus (based on wide consultation during IST-Africa events) that in an African context, they are too focused on external tangible outputs of living labs (e.g. process, product or service) and not sufficiently focused on equally valuable but less easily quantifiable outputs and benefits at a community development, socio-cultural and socio-economic level.

One key dimension seen as critically important in an African context, is the rural community perspective and engagement, and proposed adaptation of the innovation concept and process, which is often misinterpreted as only tangible, ignoring knowledge or idea creation.

Based on the consensus of Members of the LLiSA Network who participated at the 3rd Annual LLiSA Workshop at Rhodes University, Eastern Cape, South Africa (20 - 21 June 2011), organised by the Siyakhula Living Lab, a successful Living Lab requires a strategic, mutually beneficial partnership between a minimum of two key stakeholders (e.g. government, industry/business,

[158] Vandi, C., Tijus, C., & Baccino, T. (2010). Serving three Masters: Citizen, Industrial and Scientific: a case study. Living Labs Summer School 2010 on Collaborative Innovation through Living Labs, 22-27th August, LUTIN, universcience, Cité des Sciences et de l'Industrie, France

[159] Tijus, C, Barcenilla, J, Vandi, C (2012) Challenges and Ethical Issues in Living Labs for Open Innovation. eChallenges e-2012 Conference Proceedings. Paul Cunningham and Miriam Cunningham (Eds) IIMC International Information Management Corporation, 2012

research/academia, community) with complementary expertise and experience, a common vested interest in the outcomes of enabling users (community) to actively participate in the research, development and innovation process, and at least one stakeholder ensuring the necessary methodological rigor is applied so that results are valid.

There was universal acceptance that the minimum requirement for a successful Living Lab in an African context includes a clear focus/vision, credible community champion(s), the potential for sustainable community development and a strong sense of community ownership.

Africa has particular challenges in relation to rural socio-economic development and sustainable quality of life, due to the current state of evolution of infrastructure, educational and employment opportunities and the resultant migration - particularly of youth, to urban environments and sometimes to other countries or even different continents. The multi-stakeholder partnerships on which Living Labs are based can provide the necessary foundation for addressing some of these challenges, but only when communities are fully engaged.

Cunningham, P. (2013) proposes that: "*Living Labs are environments, a methodology or an approach which caters for user-driven open innovation within real-life settings, where end-users collaborate with Innovation Stakeholders to become co-creators or co-designers of innovative products, services, processes, business models or policies. Successful deployments can be replicated (with necessary socio-cultural adaptation) to achieve wider socio-economic impact*".

Monitoring and Evaluation and the ability to replicate or scale a successful pilot is key to the concept of Living Labs, and why it is such a powerful concept in the field of Innovation.

The next section provides an overview of operational Living Labs in IST-Africa Partner countries.

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5. LIVING LABS IN IST-AFRICA PARTNER COUNTRIES

5.1 Living Labs in Northern, Central and West Africa

Senegal

While a Living Lab was established in UNIDAF in 2006 there is no information currently available on recent activities.

5.2 Living Labs in East Africa

Tanzania

As a result of IST-Africa Living Labs Workshops and IST-Africa Week 2012, Emerging Living Labs are being supported through the TANZICT Programme: Arusha Living Lab[160] (EcoLab); Elimu Living Lab[161] (Sengerema, Mwanza); Mbeya Living Lab[162]; Kigamboni Community Centre[163] (Dar es Salaam); RLabs Iringa and Tanzania Youth ICON (TAYI) Living Lab (Zanzibar).

Founded in 2012, **Arusha Living Lab (EcoLab)** is located 16km east of Arusha City Centre, focused on innovation and entrepreneurship in partnership with the Nelson Mandela African Institute of Science and Technology. EcoLab is focused on supporting local primary schools and SMEs.

Established in 2012, **Elimu Living Lab (Sengerema, Mwanza)** is focused on supporting education and vocational skills development, with a view to creating employment opportunities and capacity building. There is a strong focus on continuing education, ICT skills and social entrepreneurship for youth and women, and collaboration with Sengerema Informal Section Association for Agriculture and Food Security. Target communities include vulnerable youth, farmers and animal keepers. The strong focus on education and vocational training is due to 2009 – 2011 statistics showing 69.4% of Sengerema secondary student failing their final exams, and 86.1% of Sengerema primary students not having the opportunity to go to secondary school due to financial problems, lack of trust, early pregnancies and truancy. This has resulted in mass youth unemployment and social problems.

Established in 2012, **Mbeya Living Lab** is focused on youth empowerment and community development, with a focus on arts and crafts entrepreneurial opportunities leveraging digital media. Training focuses on leadership, entrepreneurship, ICT skills and social media. There is considerable interest in establishing an Innovation Space to support local entrepreneurs.

Kigamboni Community Centre in Dar es Salaam was established in 2007, with a focus on creating local employment opportunities, and facilitating arts and sports activities as well as education for children and vocational training for youth.

Established in 2012, the **Tanzania Youth ICON (TAYI) Living Lab** in Zanzibar is focused on youth empowerment, capacity building, creation of employment opportunities, ICT training and out-reach

[160] https://arushalivinglab.wordpress.com
[161] http://www.elabs.or.tz
[162] http://mbeyalivinglab.blogspot.co.uk/
[163] http://www.kccdar.com

programmes. TAYI is at the planning stage of establishing an Innovation Space Programme in cooperation with the State University of Zanzibar and a number of governmental agencies.

Established in 2012, the **Rlabs Iringa** follows the Rlabs model with its focus on capacity building, social entrepreneurship, use of ICT and creating employment opportunities. Local problems being addressed include high youth unemployment, poor nutrition, poor education and pollution. Programmes include GROW Leadership Academy focused on youth empowerment, entrepreneurship training, introductory computer and social media literacy skills and pre-incubation. There is initial collaboration being explored with Finnish and Danish universities to do local projects.

5.3 Living Labs in Southern Africa

Botswana

Botswana Innovation Hub[164] (BIH) is receiving support through the Southern African Innovation Support (SAIS)[165] Programme to address youth unemployment and local communities through Living Labs and Training (RLabs Botswana).

Lesotho

Founded in 2010 and supported by UNESCO, the **UNESCO-Science and Mathematics Educator's Federation (SMEF) Thakakhoali**[166] is focused on school skills capacity building and career awareness raising in the areas of Mathematics and Science. Using a Living Labs based approach, UNESCO-SMEF Thakakhoali promotes Science,. Engineering and Technology in secondary schools through the Edu-Reloaded Science Educational TV Program on LTV (supported by Vodacom), the PhET Simulation Product (DVD) of simulations across all sciences for Secondary and tertiary sciences (featured in Edu-Reloaded Episodes). In November 2014, funding was secured from UNESCO for a Science Clubs.pilot program in 5 primary and 10 secondary schools.

Mauritius

Mauritius is using a Living Labs approach within its **Community Empowerment Programme (CEP)**. CEP aims to build an Information Society by enabling and sharing of information and knowledge for community development and promote development of local content. This includes a community portal, establishing regional Computer Clubs in Mauritius, Learning Corners in Mauritius and Rodrigues (island part of Mauritius) and Public Internet Access Points to facilitate wider eAdoption.

Mozambique

The Maputo Living Lab[167] was established in 2011 as part of a three-year project funded by the Autonomous Province of Trento Italy, Bruno Kessler Foundation and University of Trento with the

[164] http://www.bih.co.bw
[165] http://www.saisprogramme.com/overview/
[166] http://sciencecapacitybuilding.weebly.com/
[167] Ciaghi A, Villafiorita A, Chemane L, Macueve G, *Stimulating Development through Transnational Living Labs: the Italo-Mozambican Vision*, In IST-Africa 2011 Conference Proceedings, Paul Cunningham and

Mozambique Ministry of Science and Technology. The focus is on building capacity by carrying out specialised ICT courses to students from universities of Mozambique and young professionals through Summer Schools, providing scholarships at the University of Trento, implementing research, developing ICT projects addressing local needs and supporting ICT enterprises. The objectives and activities were inspired by Government of Mozambique strategic priorities in the areas of higher education, science and technology, ICT, agriculture, health and empowerment.

Namibia

Stakeholders in Namibia are interested in setting up Living Labs following workshops organised by IST-Africa. An initial Living Lab has been supported as a project under the SAIS Programme since 2013 - RLabs Namibia - to provide training and community development in cooperation with Namibia Business Innovation Institute.

Established in April 2013, **RLabs Namibia** is hosted by the Namibia Business Innovation institute (NBII) and focused on training and development for youth empowerment, community development and social innovation. Through the RLabs Academy, free training on entrepreneurship and ICT skills are provided to the primary target community are unemployed youth (18 – 35), with tertiary training programmes accredited by the University of Cape Town offered at an additional cost. Community Workers execute assignments for clients at a cost through the Digital Factory, and support Community Development targeted at the needs of the local community. RLabs Namibia is currently funded by the Finnish Southern Innovation Support Programme (SAIS).

South Africa

A number of Living Labs were initially supported through the COFISA and SAFIPA Finnish Programmes, which are still making good progress. Some Living Labs were set up on a temporary basis as projects and some new Living Labs have been set established. The most active Living Labs include: Siyakhula Living Lab[168] which is operational since 2005 hosted by University of Fort Hare and Rhodes University (Eastern Cape); Reconstructed Living Lab[169] (RLabs), which has been operational since 2008 supporting community development and training (Cape Town) and Siyadala Living Labs[170], which has been operational since 2011 hosted by Centre for Community Technologies (CCT) in Nelson Mandela Mandela Metropolitan University, Port Elizabeth.

The **Siyakhula Living Lab** was established in 2005 by the University of Fort Hare and Rhodes University. The target community is the Desa-Cwebe Nature Reserve in deep rural Eastern Cape. To date SLL has established 17 communal, distributed Digital Access Nodes at schools. They share a fixed and mobile WiMAX broadband island and are connected to the internet through three shared satellite connections. Activities currently supported include computer training, a low-maintenance

Miriam Cunningham (Eds), IIMC International Information Management Corporation, 2011, ISBN: 978-1-905824-24-3

[168] http://siyakhulall.org/
[169] http://www.rlabs.org/
[170] http://sict.nmmu.ac.za/

service-oriented telecoms infrastructure, eService development for mobile devices and establishment of an ICT solution provider to commercialise software prototypes developed.

Reconstructed Living Lab (RLabs) was established in a disadvantaged part of Cape Town, Western Cape in 2007, which is plagued by gang activity and drug abuse and has very high levels of unemployment. RLabs now employs 18 people full-time and also has a team of 18 volunteers, working on a number of programs focused on community transformation, up-skilling and empowerment. RLabs uses a value-based model to develop and train people in disadvantaged communities in the use of ICT and social media (e.g. Facebook, Twitter and others), focusing on using innovative ICT solutions to address social problems in communities. RLabs carries out work in a number of distinct areas, with the RLabs Academy (20 week training course) at the core. The Innovation Incubator is currently primarily focused on internally generated ideas, but is open to incubating ideas generated by graduates of the RLabs Academy. The RLabs Research Institute is currently focused on providing access to grass roots communities by conducting research and development for government agencies, commercial businesses, foundations, academia and other organisations. RLabs Products and Services are currently selling social media consulting and online services, based on an internally created product, which is in the process of being commercialised.

The **Siyadala Living Labs** was founded in 2011 at the Centre for Community Technologies (CCT) in the Faculty of Engineering, the Built Environment and Information Technologies, Nelson Mandela Metropolitan University in Port Elizabeth, East Cape. Siyadala now incorporates four Living Labs located at Motherwell and Northern Areas, Port Elizabeth (urban), and Cofimvaba (rural) and Willowvale (deep rural – isolated with limited infrastructure). Focused on ICT4D, capacity building, skills and leadership development, thematic areas addressed include education and healthcare. Target communities include vulnerable women, children, youth, the disabled and elderly, community healthcare workers and school nurses in rural areas. A number of health and education related mobile applications have been developed and tested based on local needs.

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