



**UNIVERSITY OF NAIROBI**  
**SCHOOL OF COMPUTING AND INFORMATICS**

**AN ASSESSMENT OF SUSTAINABILITY  
OF LIVING LABS IN KENYA**

**BY**

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**P54/85760/2016**

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*A project report submitted in partial fulfillment of the requirements for the award of  
Master of Science in Information Technology Management of the University of Nairobi*

## DECLARATION

I declare that this project report is my original work except where due references are cited. To the best of my knowledge, it has not been submitted for any other award in any University.

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Date

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This project report has been submitted in partial fulfillment of the requirement of the Masters of Science Degree in Information Technology Management of the University of Nairobi with my approval as the University Supervisor.

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## **ABSTRACT**

Living lab is a research concept that was created by William J. Mitchel at MIT in the year 2003 (Mitchel, 2003); it was based on how the city dwellers would be actively involved in the urban planning and design. It is a user centered, open innovation ecosystem, operates in a territory in this case it can be region based, national or global. In Kenya we have 25 living labs; most of these labs are funded by the donors, however, there has been a high rate of failure, thereby expected outcomes are not fully realized. The aim of this research was to assess the sustainability of Living Labs in Kenya hence propose a model that can be generalized to other living labs in developing countries.

This research was based on a survey design. Data was collected through interviews and questionnaires from innovators, users and staff. The questionnaires and interview guides were created based on the Four Capital Method of Sustainable Development Evaluation Framework. The research was limited to Nairobi region. The findings were: Some innovators are not familiar with the living labs, the living labs are innovative and prepared to survive in future, some labs have strategic plans on how to pursue future environment and have developed ways of choosing right people to incubate, type of skills required and inability to get enough funding from the host organizations and limited knowledge on the supervision level of the operations. The study concludes by emphasizing on the of user involvement during innovation process.

The study finally recommends the living labs to expand their capacities to accommodate more people to ensure more innovations are supported at a time; the senior managers in charge of the living labs increase the level of supervision at every level to ensure that the labs are effective in their incubation efforts and institutionalize support of the host organization to the labs to ensure continued growth and expansion.

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## ABBREVIATIONS

ICT: Information Communication Technology

IT: Information Technology

LL: Living Labs

## DEFINITION OF TERMS

**Living Labs** – These are 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

**Innovation** - 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 (Cunningham & Cunningham, 2013).

**Innovators** – A person who introduces new methods, ideas or products

**Innovation Space** – This is physical or virtual environments that support entrepreneurs at different stages of development.

**Sustainability** – This is the extent to which outputs and results will be continued after end of programme

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

Living lab is a research concept that was created by William J. Mitchel at MIT in the year 2003 (Mitchel, 2003); it was based on how the city dwellers would be actively involved in the urban planning and design. It is a user centered, open innovation ecosystem, operates in a territory in this case it can be region based, national or global .Integrates concurrent research and innovation processes within a public and a people partnership (ENoLL, 2012), where a systematic user co-creation approach integrates research and innovation processes. The concept is guided by the principle of co-creation, exploration, experimentation and evaluation of innovative ideas, scenarios, concepts and related technological artifacts in real life user cases which involve user communities not only as observation subjects but also as a source of creation.

Cunningham (2016) discussed that the reality in a developing country context was that establishing and maintaining Living Labs was challenging and relatively expensive, explaining why many Living Labs have proven to be unsustainable once seed or donor funding was no longer available.

Larson (2010) illustrates a living lab as a place where experts work, deploy, develop and test in the living environment. According to that study, the living lab is basically used to test all the theories that are related to the environment and refers to it as a house of knowledge, because people go there and find the information they wanted, in which case they have added experience.

The key area that utilizes Living Labs include: thematic (e.g. eHealth, eServices in Rural or Developing Areas, eDemocracy and eGovernance, ICT for Energy Efficiency, Food Security), and geographic (e.g. urban, suburban or rural, local community or regional, national or cross-border) Living Labs have been defined in a variety of ways. It provides for an opportunity for all the stakeholders to concurrently consider both the global performance of a product or a service and its potential adoption by the users' .The consideration were made at an earlier stage of research and development and through the elements of the product life cycle right from design to recycling. The Living Labs were commonly used by policy makers/citizens for designing, exploring, experiencing and refining new policies and regulations in real life scenarios for evaluating their potential impacts before their implementation. There are six key markets in the

implementation of Living Labs right from ICT, health, and Media, Energy, Manufacturing and smart cities.

Geibler et.al. (2013) highlights the general potential and operationalization of Living Labs for sustainability as captured in the European design study where their goal was to integrate the expert knowledge of users within their action system into the development of socio-technical, transformative products and services, as well as to test, optimize these products and services together with users and other actors along the value chain. Thus, optimal and accepted framework conditions for transition processes towards resource- and energy efficiency. Living Labs create a platform on which different methods of user integration into the innovation process can be tested (e.g., ranging from observation to application testing and even co-creation). In Living Labs, various elements of the real-world surroundings can be configured in a way that enables the researcher to address and observe real utilization patterns. Living Labs for sustainable development, users are involved in the development of resource and energy efficient innovations. They are supposed to be included both in the definition of the problem and the development, testing, realization and dissemination of the solution. In experiments, product-service systems can be studied in a context that is close to reality and considers the specific cultural and social context. The goal was an alignment with the needs of the users and with sustainability criteria during the entire development process. Thereby the risks of undesirable developments and problems of acceptance can be reduced.

The research community and all stakeholders have done a lot in terms of research in Living Labs since the inception of the concept, both from Europe to developed countries (Pieter et al., 2015). Most of the studies are centered on ; impact of Living Labs, Living Labs as innovation centers, strategies of Living Labs, State-of-the-art in utilizing Living Labs approach to user-centric ICT innovation - a European approach by, Social Labs: Identifying Latin American Living Labs, An Action Research Approach to Rural Living Labs Innovation, Living Labs for Rural Development Results from the Integrated Project, Concurrent process coordination of new product development by Living Labs – an exploratory case study and frameworks .The focus on the implementation and establishment of the Living Labs has negated the critical component of development of any region, nation and the global community where development, research and

innovation have to be sustainable and be considerate to resource utilization thus need for Low resource products and services (Geibler et al. 2014).

## **1.2 Statement of the Problem**

Innovation spaces have gradually gained grip in African countries. This is as a result of emergence in technology and growth in ICT entrepreneurship. In Kenya we have 25 living labs (Cunningham, 2016); most of these labs are funded by the donors, however, there has been a high rate of failure, thereby expected outcomes are not fully realized. Living labs with high rate of failure is due to poor project design and management (Macapagal, 2010), (Cunningham, 2016) added that most living labs are not sustainable. This is evidenced in Kenya, where most living labs are started and immediately the project takes off, the project's purpose is not realized.

This research seeks to find out the challenges facing living labs in Kenya: high cost of services for the independent labs, high cost of bandwidth, lack of coordination among the management team, limited access to infrastructure, dependency heavily on foreign donors and inadequate ICT budget from the host organizations. The study aims to help investigate the living labs and identify the attributes that hinder the sustainability of the living labs in Kenya.

## **1.3 Research Objective**

The main objective of this research was to assess the sustainability of living labs in Kenya.

### **Specific Research Objectives**

- i. To identify attributes that define living labs in Kenya
- ii. To identify unique challenges facing living labs in Kenya
- iii. To propose a framework for assessing the sustainability of living labs in Kenya
- iv. To validate the proposed framework with other users in order to assessing the sustainability of living labs in Kenya.

## **1.4 Research Questions**

Every study should have some research questions that will guide to the accomplishment of the main goal. The following are the research questions;

- i. What attributes define the living labs in Kenya?
- ii. What are the challenges facing living labs in Kenya?
- iii. What framework is suitable for assessing sustainability of living labs in Kenya?
- iv. How will the framework be validated with the other users?

### **1.5 Scope of the Study**

This study focused on the sustainability of all the 25 living labs in Kenya. It considered the sustainability development of the living labs in which users as well as relevant actors of the chain and the utilization environment participated in, innovation outcome, and structure and innovation approach in living labs.

### **1.6 Significance of the Study**

The findings of this study are of value to research community, the decision and policy makers as it seeks to document the current status of the living labs in the Kenya. The proposed solutions to various challenges of living lab sustainability were of value in maintaining them. To the public it created awareness of projects in living labs and triggered government action in supporting those projects. The study benefited living lab innovators by knowing the characteristics of each type of living lab; this knowledge helped them to identify which actor drives the innovation, to anticipate likely outcomes, and to decide what kind of role they played while in living labs.

### **1.7 Limitation of the Study**

Considering most living labs in Kenya focus mainly on ICT products and services and the location of these living labs are in urban settings, making it inaccessible for the people who live in the rural areas. This limited the study to a few sectors of the economy and the population of the urban setting. To be specific, the study was in Nairobi where most of these labs are implemented. Most of the literature available is focused on developed economies, and the proposed frameworks.

# CHAPTER TWO: LITERATURE REVIEW

## 2.0 Introduction

This chapter reviewed literature considered relevant to this study. The literature reviewed gave sources of the information about Living Labs.

## 2.1 Sustainability of Living labs

A Living Lab for Sustainable Development (or Sustainability Living Lab) is a research approach aimed at open socio-technical innovation processes, in which users as well as relevant actors of the value chain and the utilization environment participate in the development and application of new products, services and system solutions (Julia et.al., 2012). The interactive innovation process takes place in the real environment of the users (e.g., user observation, field tests) and/or in laboratories that are configured for user interactions (e.g., for the development of prototypes). The innovation process is guided by sustainability criteria and aims to contribute to production and consumption patterns that can be applied on the global and long-term scale and are inter- and intra-generationally viable.

### Phases of Living Labs

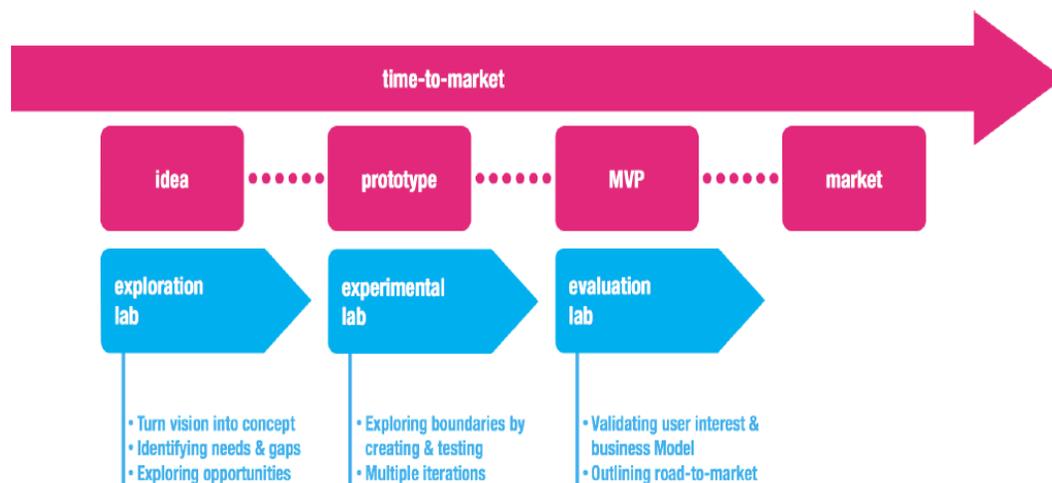


Figure 2. 1 Phases of Living Labs (Geibler et.al., 2012)

## **2.2 Living Labs in Kenya**

Vision 2030 (Kenya vision 2030, 2007) objective achievement acknowledges the importance of ICT and Innovation. There are five key policy documents guiding the ICT and Science, Technology and Innovation (STI) sector in Kenya. As much as Kenya is one of the best countries in Africa that have the best research background, it has 25 living labs in number. This is because the government is not very much concerned about it; there is lack of finance to build the Living Labs and also the lack of public support. If an establishment requires investment from the government and also lacks funding, definitely there will be no success. These two are the major things that a state must look at before setting up a living lab, because it is not very easy to establish it takes a lot of expenses, and legal documentation must be produced by the world scientific organization so that they can approve the setting up of the living lab. (Westerlund & Leminen, 2011)

There are different types of people that do work in this Living Labs; all of them must be well asserted with the conditions of the living lab. Kenya has a rich information background, and when it is used well, it can bear good fruits. Some Kenyan universities are suffering very much due to lack of Living Labs (Baccarne, et al., 2013). Kenya has experienced significant growth in Innovation Spaces (private, community driven and hosted by education and research institutions) since 2009, (Cunningham et al., 2014).

## List of living labs in Kenya and their locations (Cunningham et al., 2016)

Table 2.1: Living labs in Kenya

Living Lab Name	Location	Status
FabLab (2009)	University of Nairobi	Active
Computing for Development Lab (C4DLab, 2013)	University of Nairobi	Active
@iLabAfrica (January 2011)	Strathmore University	Active
@iBizAfrica	Strathmore University	Active
Chandaria BIIC (July 2011)	Kenyatta University	Active
JKUAT-CBI Nairobi Industrial and Technology Park	Jomo Kenyatta University of Agriculture and Technology	Active
IBM Research Lab, Nairobi (November 2013)	Catholic University of Eastern Africa	Active
iHub (March 2010)	Independent	Active
m:lab East Africa (June 2011)	Independent	Inactive
NaiLab (August 2011)	Independent	Active
88mph/Nairobi Startup Garage (August 2011)	Independent	Active
GrowthHub (May 2012)	Independent	Active
Kenya Country Business Incubator - KeKoBI	Independent	Active
GearBox (2012)	Independent	Active
Lakehub	Independent	Active
Eldohub	Independent	Active
Pawa254	Independent	Active
Growth africa	Independent	Active
The Kijijo	Independent	Active
Rift Valley Innovation Centre	Independent	Active
Botlab	Independent	Active
SwahiliPot	Independent	Active
Swahili Box	Independent	Active
Enterprise Kenya	Independent	Active
Seven Seas Innovation Afya Lab	Independent	Active
IUPS	Independent	Active
Kenya Industrial Research Development Institute (KIRDI)	Government of Kenya	Active

## Summary of competitors for innovation Parks

Table 2. 2: Summary of competitors for Innovation Parks

What are we competing with them on?	Why do customers go to them?	Why would customers not go to them and come to you?	Specific activities to be done to achieve this?
<b>iHub Lenana Road</b>			
<p>Innovation and technology that allows people to develop enterprises that creatively solve problems around them using technology</p>	<p>Mentorship, business support services, access to start up, product development related, workshop and events, venture funding</p> <p>Mix of creative work spaces and meeting rooms</p>	<p>Located on Lenana road that is complemented by diverse community facilities and other public amenities</p> <p>Access of a diverse range of highly qualified human resource</p> <p>Accessible office space and good road network</p> <p>Opportunity to network with companies in various clusters</p> <p>Access to a diverse network of clients, suppliers, government and the industry contracts located in the various park clusters</p> <p>NITA approved training provider</p>	<p>Collaboration and partnerships with key industry players</p> <p>Structured development of the park infrastructure and facilities</p> <p>Promote visibility and create awareness of the park through participation in expos, exhibitions, conventions</p> <p>Development of a competitive and attractive incentive package</p> <p>Creation of incubation programmes in the focused areas</p> <p>Development of the necessary telecommunication infrastructure for easier operations</p> <p>Stimulating the establishment and financing the new innovators</p>

<b>What are we competing with them on?</b>	<b>Why do customers go to them?</b>	<b>Why would customers not go to them and come to you?</b>	<b>Specific activities to be done to achieve this?</b>
<b>C4DLab University of Nairobi</b>			
A R&D and Startup Incubation hub, the lab aims at contributing towards building the Silicon Savannah, leveraging on the large University community.	<p>Incubation, and specialized acceleration</p> <p>Mentorship</p> <p>Access to start up, product development related, workshop and events</p> <p>Focus on entrepreneurship and innovative technology driven ideas</p> <p>Vibrant working space</p>	As captured in iHub	As captured in iHub
<b>Nailab Ngong Road</b>			
Comprehensive incubation service and an outreach service that provides a simplified platform for innovators to be found by venture capitalists and business angels and innovators for African profit and non-profit corporations	<p>Core incubation, and specialized acceleration</p> <p>Focus on entrepreneurship and innovative technology driven ideas. Vibrant working space</p> <p>Provision of seed fund to promising technology software and hardware start-ups in East Africa</p>	As captured in iHub	As captured in iHub

<b>What are we competing with them on?</b>	<b>Why do customers go to them?</b>	<b>Why would customers not go to them and come to you?</b>	<b>Specific activities to be done to achieve this?</b>
<b>Nairobi Garage Waiyaki Way</b>			
Provides space to businesses	Fully serviced affordable shared space to Kenya's top and local start-ups and established businesses	As captured in iHub	As captured in iHub
<b>KIRDI Popo Road, off Mombasa road</b>			
Enhance technology transfer and dissemination of the institute's findings that have a national impact on economic development. Focus areas are in ICT, food and chemicals	Incubatees are provided with the technology and technical support	As captured in iHub	As captured in iHub

### 2.3 Importance of Living Labs

Evaluation of ideas is an advantage of living lab (Astrom et.al., 2015). One can have many ideas, but when the ideas are manifested together and put into practice in the living lab, it will be better because the ideas will be shared broadly and can help other people that are doing the same thing.

Advantages or obligations of Living Labs:

- i. **Co-creation**- this is the first reason to why Living Labs are built in Kenya. They are responsible for bringing together information by using the technology. They can share knowledge and also some new concepts of the related artifacts.
- ii. **Exploration**- a group of researchers or innovators can arrange a tour and study different scenarios and also different environments.
- iii. **Experimentation**-. A lab as it is usually known they are used for experiments, and when we are dealing with Living Labs they are used for extensive operations and a large number of researchers can visit the lab at any time they want
- iv. **Evaluation**- assessing of new ideas, Living Labs are also very useful in getting new ideas because several activities are done in them.

## **2.4 Challenges of sustaining Living labs in Kenya**

Setting up and running living labs is a bottom-up approach and boosting experience for researchers. The active involvement of researchers in a setting with different cultures, lifestyle and design is a good training for openness and observable skills. The lifestyle of the community and how it relates to co-creation processes are key perception for design process.

Language barrier - Researcher language vis-a-vis everyday language, the researcher language of presenting to an audience, record data and get consent from the users are defined by the research practice, this does not fit to the everyday language (Ozge Subasiet al., 2016).

Coordination – A lot of human effort is needed to coordinate processes in the living labs. Some living lab administrators are not proactive on communicating with the innovators and other stakeholders.

Funding – Most of the living labs are funded by donors, unfortunately some donors pull out before the lab can sustain itself.

## **2.5 Project Management as a Contributing Factor to Living labs sustainability**

Project management has been featured in various research studies as being one that plays a very important role in the undertaking of projects thereby contributing towards the successful implementation, hence there sustainability. ICT projects are no exception and therefore Carnicero and Rojas (2010) define the success of ICT projects through project management which in their own words refer to it as “project management triangle”. They proceed to say that the project management triangle corresponds to the constraints that have an effect on the execution and delivery of projects; project scope, time (project life) and the cost of the project.

A good number of projects that focus on the effective use of ICT4D have emerged over the last 3 decades (Macapagal, 2010). Most of these projects have failed due to poor project design and management, which in most cases is usually as a result of not understanding the entire process of managing projects and also use of the wrong tools.

All projects are not the same; there are a number of things that need to be managed regardless of the type of project. ISMF (Institutional and Sector Modernization Facility) has broken down the

project management process in to 44 different processes with each one of them being based on a particular knowledge area. The knowledge areas as indicated by ISMF are as follows: integration management processes, scope management processes, time management processes, cost management processes, quality management processes, human resource management processes, communication management processes, procurement management processes and risk management processes.

## 2.6 Stages of financing

Venture capital is a source of financing for new businesses. Venture capital funds pool investors' cash and loan it to startup firms and small businesses with perceived, long-term growth potential. This is a very important source of funding startups that do not have access to other capital and it typically entails high risk (and potentially high returns) for the investor.

Venture firms will also provide start-ups with managerial or technical expertise. For entrepreneurs, venture capitalists are a vital source of financing, but the cash infusion often comes at a high price. Venture firms often take large equity positions in exchange for funding and may also require representation on the start-up's board (Cox business, 2017)

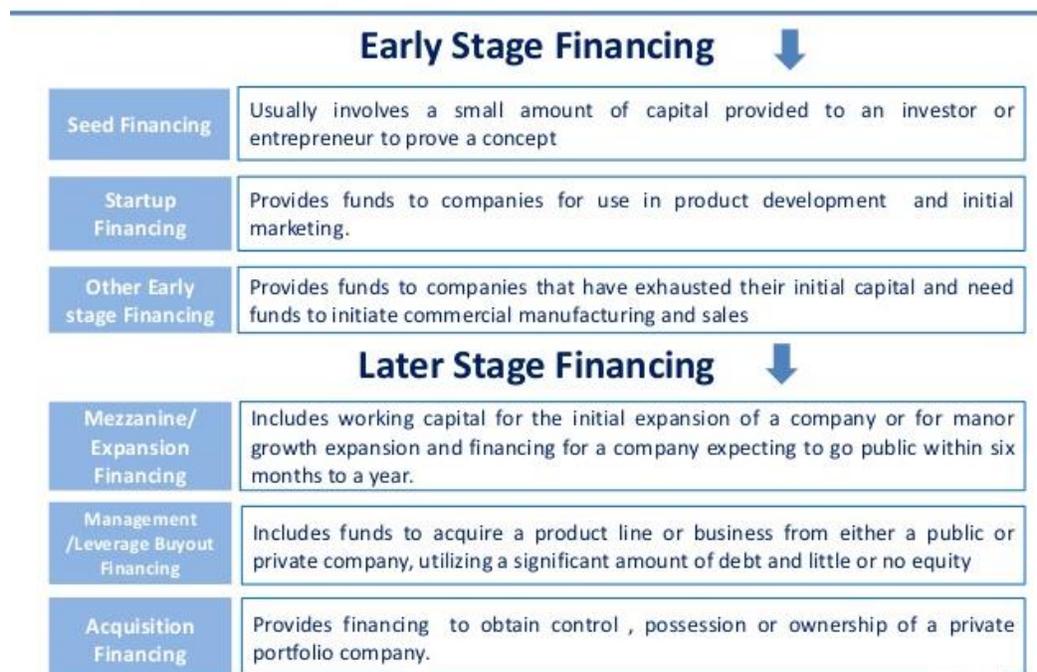


Figure 2. 2 Stages of financing

## **2.7 The four types of capital**

### ***Manufactured capital***

Manufactured (or human made) capital is traditionally considered as capital: produced assets that are used to produce other goods and services. Some examples are machines, tools, buildings and infrastructure.

### ***Natural capital***

In addition to traditional natural resources, such as timber, water, and energy and minerals reserves, natural capital includes natural assets that are not easily valued monetarily, such as biodiversity, endangered species and the ecosystems that perform ecological services. Natural capital can be considered as the components of nature that can be linked directly or indirectly with human welfare.

### ***Human capital***

Human capital generally refers to the health, well-being and productive potential of individual people. Types of human capital include mental and physical health, education, motivation and work skills. These elements not only contribute to a happy, healthy society, but also improve the opportunities for economic development through a productive workforce.

### ***Social capital***

Social capital, like human capital, is related to human well-being, but on a societal rather than individual level. It consists of social networks that support an efficient, cohesive society, and facilitate social and intellectual interactions among its members. Social capital refers to those stocks of social trust, norms and networks that people can draw upon to solve common problems and create social cohesion.

## **2.8 Successful projects**

### **i) FarmDrive ([www.farmdrive.co.ke](http://www.farmdrive.co.ke))**

This project was incubated at C4D lab, University of Nairobi. FarmDrive founded in 2014, is a social enterprise that connects unbanked and undeserved smallholder farmers to credit, while

helping financial institutions cost effectively increases their agricultural loan portfolios. Using simple mobile phone technology, alternative data sets, and sophisticated data analytics, FarmDrive is closing the critical information gap that keeps smallholder farmers from loans that would allow them to grow and diversify their businesses.

Farmers have access to a simple , powerful SMS/Android mobile app that allows farmers to apply for and receive loans via mobile money wherever they are, track their revenues and expenses, and view reports on their farming and economic activities. With this application, farmers can monitor their agri-businesses more efficiently, while becoming more credit worthy at the same time.

Factors that led to their success are: involving the end users, resilience, dedicated their time and worked extra hours, passion for the project, innovative and attended design thinking courses organized by C4D lab. They worked with Musoni Kenya, a tech driven Micro Finance Institution (MFI) which provided the loans to the farmers.

Some challenges they encountered were: these are students who just completed their studies; getting the database of farmers, they did not have funds to develop the system and run business. They kept sourcing for funds, approached investors and applied for grants. They got someone who bought equity in their company, this boosted their growth. In 2016, FarmDrive registered 3000 farmers throughout 16 counties, and facilitated over KES 15 million in loans. Farmers who received loans through Farm Drive are now on their second and third loans, increasing their incomes and productivity with each loan. The project was started by a group of 2 students who had just completed their studies; therefore they did not have any previous experience.

The working environment (infrastructure), C4D lab gave them working space, internet and mentorship from faculty and networking with people from the industry. However, all equipment required was provided by them.

C4D lab organizes Nairobi Innovation Week yearly for the innovators to showcase their products and services, gain experience for successful investors and also as a source of generating revenue to the lab, FarmDrive innovators usually give talks to the audience to share their experiences. However, they have not contributed to the sustainability of the labs.

This project was considered successful because it was commercialized and has grown within a short period of time.

## **ii) Chura ([www.chura.co.ke](http://www.chura.co.ke))**

This project was incubated at C4D lab, University of Nairobi. The services offered are simply “network interoperability “ which include: transfer of airtime across networks, buying airtime from any network using any mobile money service, converting airtime to mobile money, as well as sending airtime to multiple phone numbers at just the click of a button.

Factors that led to their success are: involving the end users, resilience, dedicated their time and worked extra hours, passion for the project, innovative, dynamic that is they started with airtime and currently doing Paypal. They also attended design thinking courses.

Some challenges they encountered were: they did not have funds as they were students; they kept sourcing for funds, approached investors and applied for grants. They got royal award which they used for expansion. Equity bank bought shares in the company, which boosted their growth. The project was started by a group of 5 students who had just completed their studies; therefore they did not have any previous experience.

The working environment (infrastructure), C4Dlab gave them working space, internet, mentorship from faculty and networking with people from the industry. However, all equipment required was their own.

C4D lab organizes Nairobi Innovation Week yearly for the innovators to showcase their products and services, gain experience for successful investors and also as a source of generating revenue to the lab, FarmDrive innovators usually give talk to the audience to share their experiences. However they have not contributed to the sustainability of the labs.

This project was considered successful because it was commercialized and has grown within a short period of time.

## **2.9 Failed Project**

### **Vospine**

This project was incubated at C4D lab, University of Nairobi. It was a social network platform for professionals. It was initiated in the year 2016 to 2017.

Factors that led to its failures were: There was no real value proposition for customers, they did not identify the real user needs, they did not dedicate their time on this project, they did it as a time project and the solution did not address the real life problems.

Their biggest challenge was funding. The working environment (infrastructure), C4Dlab gave them working space, internet, mentorship from faculty and networking with people from the industry. However, all equipment required was their own. This project was considered failed, because it was not commercialized.

## **2.10 Theoretical Frameworks**

### **2.10.1 Technological, Organizational and Environmental (TOE) Framework**

The technological, organizational and environmental context greatly influences the process by which organizations take on and roll out technological innovations (DePietro, Wiarda, & Fleischer, 2003). The technological context incorporates all the technologies in the organization. The technologies could be both equipment and processes. The organizational context implies the attributes and resources of the organization, including the organizations size, level of formalization, leadership structure, organizations human resources, and relationships among entrepreneurs. The environmental context comprises of the industry, the organization's competitors and the industry regulatory authorities (DePietro, Wiarda, & Fleischer, 2003). Therefore the three aspects affect the way an organization perceives, searches for and implements new technology.

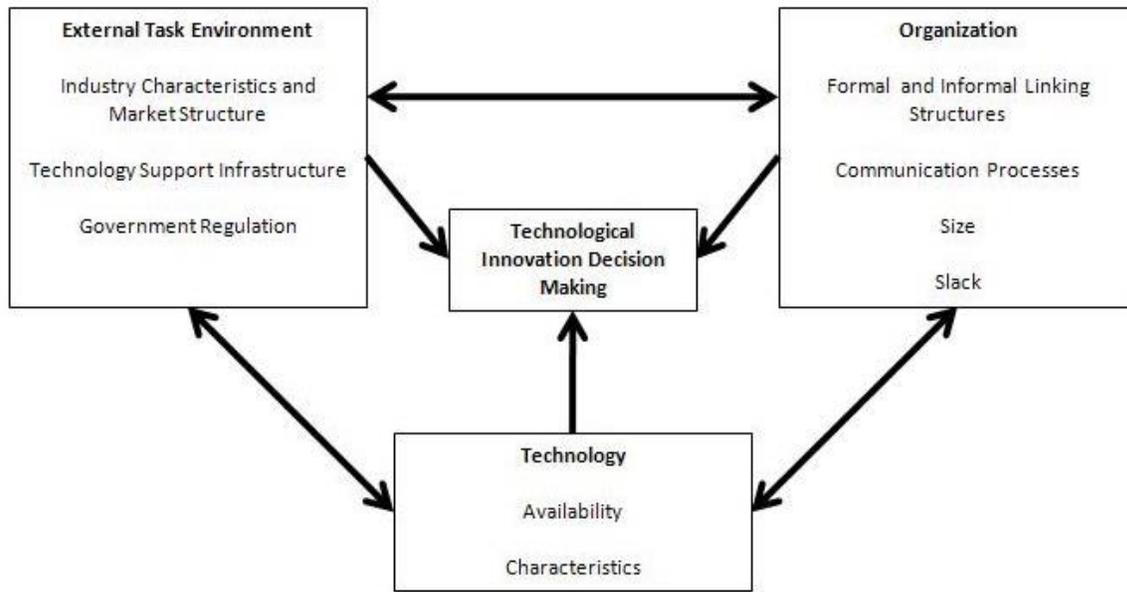


Figure 2. 3 TOE framework (DePietro, Wiarda, & Fleischer, 2003)

The TOE framework is regularly used to study the adoption of technology (Gibbs and Kraemer, 2004; Zhu et al., 2006). TOE framework is also used in assessing the factors of implementation success, technology use and assimilation (Zhu et al., 2006). The TOE framework therefore provides an ideal framework to assess the factors which determine the Living Labs implementation success. Zhu et al. (2009) developed an integrative model to examine Living Labs development on the TOE theory. They hypothesize that living labs implementation quality has the environmental aspect which focuses on external support. It also has project management and system configuration which are termed as technological aspects. The organizational aspect on the other hand consists of organizational fit and level of leadership involvement. The aspects positively affect the success of the living labs system implementation phase. They conducted an empirical test in the Chinese retail industry whose results displayed that both organizational readiness and the quality of living labs implementation affect the success of the living labs implementation as well as external support.

This model is regularly used to study the adoption of technological innovation; it is used in assessing the factors of implementation success and has not been used for assessing the sustainability of a project. It enriches the study as it looks at the innovation, management aspect, organizational operations and the environment which are crucial for sustainability.

### 2.10.2 The DeLone and McLean IS Success Model

The IS success model was reviewed by DeLone and McLean (2011) whereby they included a service quality dimension, coming up with a new net benefits dimension by integrating individual impact with organizational impact, they also added the dimension for intention to use. Inclusion of service quality to the model was advised by the organizational IS success research which found IS success quality dimensions system and information. Additionally, IS's were found to influence the organization, individual users and also organizational environment, society and consumers.

The use of net benefits dimension provides for incorporating the IS impacts and also for the simplification of the model. The updated version of the original IS success model, (Urbach and Muller, 2012) say that what makes the updated model different from the original model is the incorporation of service quality. Gichoya (2005) supports the DeLone and McLean model through a research framework which shows a causal relationship of how ICT infrastructure quality and IS quality are affected by successful ICT implementation thereby the perceived benefits being affected by the quality of ICT infrastructure and IS. Perceived benefits are used to evaluate and assess the sustainability of ICT projects.

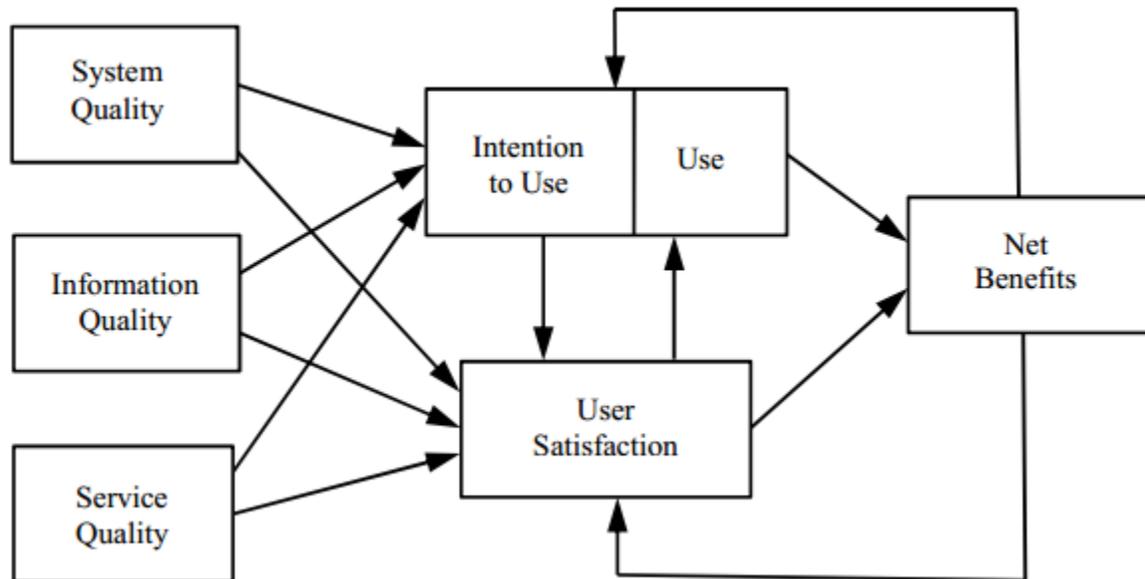


Figure 2.4 The revised DeLone and McLean : The DeLone and McLean Model of Information Systems Success: A Ten-Year Update (DeLone and McLean, 20011, p. 87)

This model has been used for assessing the implementation of living labs; it does not look at the needs of the users, operations. It contributes to this research as it entails system quality, service quality, user satisfaction and net benefits which are key when studying sustainability of a project.

### **2.10.3 Diffusion of Innovation (DOI)**

The DOI theory asserts that the adoption of an innovation is primarily the outcome of a learning or communications process. As a result, a fundamental step in examining the process of diffusion is to identify factors related to the flow of information and of the characteristics of the information flows, information reception and the resistance to adoption (Clarke 1999). DOI Theory is concerned with the manner in which a new technological idea, artifact or technique, or a new use of an old one, migrates from creation to use. According to DoI theory, technological innovation is communicated through particular channels, over time, among the members of a social system. The following major characteristics are proposed by (Rogers, 1995): (1) relative advantage, the degree to which an innovation can bring benefits to an organization; (2) compatibility, the degree to which an innovation is consistent with existing business processes, practices and value systems; (3) complexity, the degree to which an innovation is difficult to use; (4) observability, the degree to which the results of an innovation are visible to others; and (5) trial ability, the degree to which an innovation may be experimented with.

This model is mainly used to study the adoption of innovation and not its sustainability. It is important to this research because it looks at how innovations bring benefits to an organization.

### **2.10.4 Sustainable Livelihoods Framework**

The sustainable livelihoods approach is a way of thinking about the objectives, scope, and priorities for development activities. It is based on evolving thinking about the way the poor and vulnerable people live their lives and the importance of policies and institutions. It helps formulate development activities that are.

- i. People-centered
- ii. Responsive and participatory
- iii. Multilevel

- iv. Conducted in partnership with the public and private sectors
- v. Dynamic
- vi. Sustainable

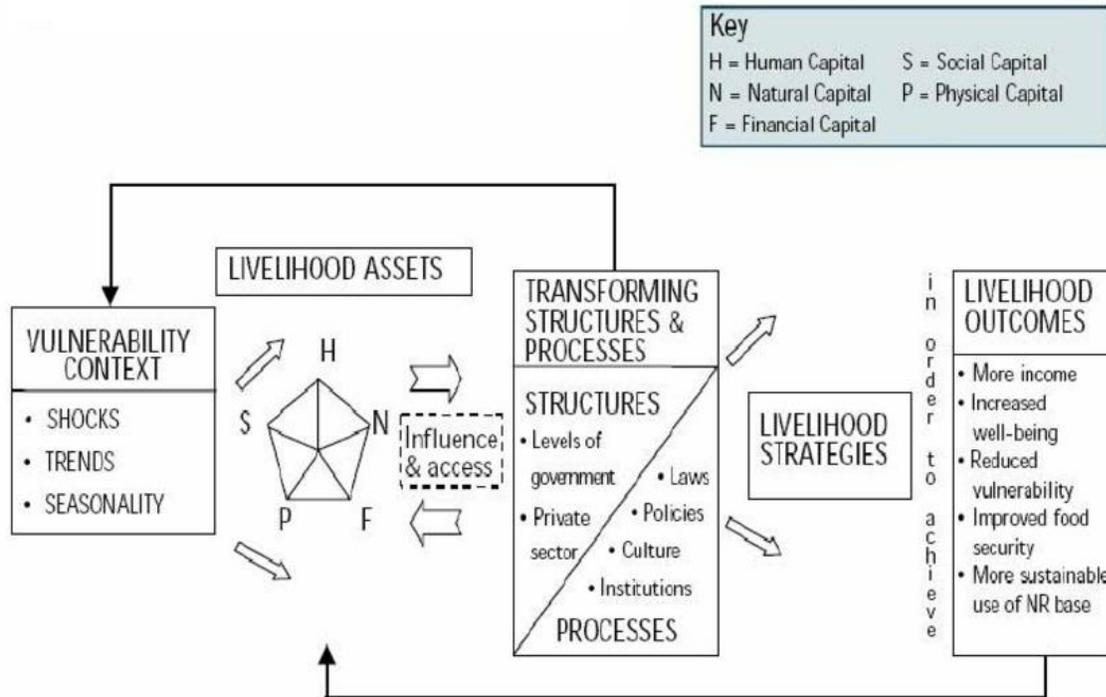


Figure 2. 5 Sustainable Livelihood framework, *Electronic Journal of Information Systems in Developing Countries*, July 2010

The major focus areas of this framework as pointed out by Arun et al. (2004) are;

1. Livelihood strategies –this entails strategies that contribute towards reduction of poverty, such as human capital, financial capital, social capital, natural capital and physical capital.
2. Vulnerability context –this considers various trends like shocks (conflicts, illness, floods, drought, diseases), seasonality’s (price, employment opportunities) and critical trends (demographic, environmental, economic and governance).
3. Policies, institutions and processes – Policies operate at all levels, structures are both private and public organizations that set and implement policy and legislation and deliver services that affect livelihoods., processes determine the way in which structures and individuals operate and interact.

4. Livelihood outcomes – These are the results achieved which include sustainable use of natural resources.

This model has been used to study how the poor and the vulnerable live their lives and the importance of policies and institution; for this reason it cannot be used to study the sustainability of living labs. This research borrows the livelihood strategies: human, financial, social and physical capitals.

### 2.10.5 Living Lab Triangle Framework

This is a framework that was established to analyze the link between the characteristics of living labs and their effects on the living labs end results (Veeckman et al., 2012). The Living lab triangle framework contains 3 pillars and eleven characteristics. Its foundation is based on (Folstad, 2008) characterization. The characteristics of Folstad were both inadequate to identify the main building blocks of living labs and not able to assess the impact of the living labs research and development activities. This made them have different end results. This led to the adjustment of Folstad’s characteristics to be combined with key principles of good practice by Erikson et al., 2005.

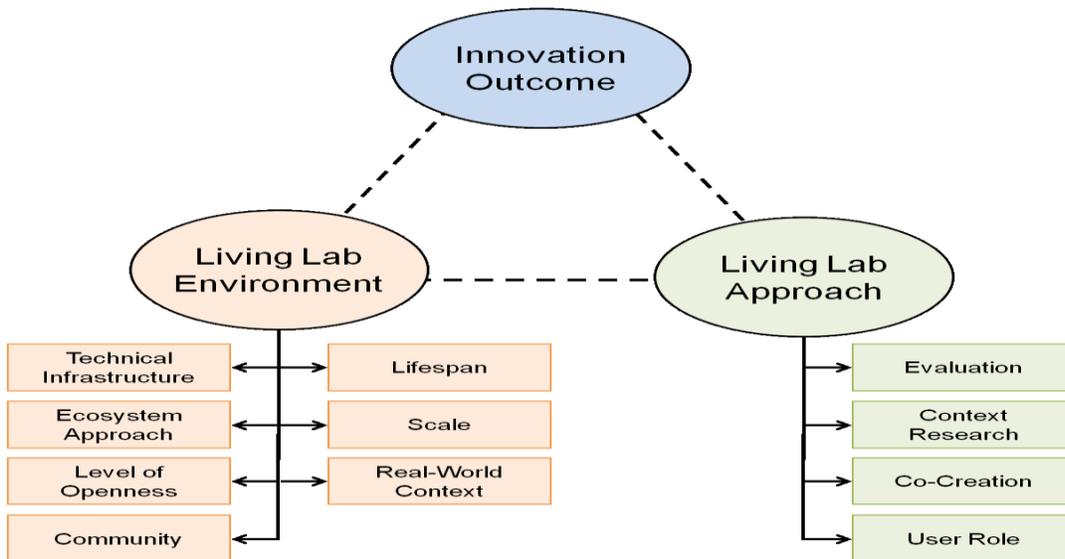


Figure 2. 6 The Living Lab Triangle framework: The triangulation between environment, approach and outcome in living labs, Veeckman et al., 2013

This model was used to analyze the link between the characteristics of the living labs and their effects on the end results of the living labs. The attributes are interlinked; we cannot categorize the independent and dependent variables. Therefore it cannot be used to assess the sustainability of the living labs. However the indicators in the variables like the infrastructure, community, user role are crucial for this study.

#### **2.10.6 Quantitative Model**

Quantitative Models From a policy-making perspective, describe six types of quantitative models, namely “macro-econometric models, computable general equilibrium models, optimization models, system dynamics models, probabilistic or Bayesian network models (this category also includes risk assessment models based on influence diagrams) and multi-agent simulation models” (Boulanger and Bréchet, 2005: p340–341). Economic models represent a special sub-class of the quantitative models. In fact, this area has been extremely active in academic pursuit generating models representing various economic concepts, ranging from neo-classical, evolutionary, ecological economics to neo-Ricardian (Faucheux et al., 1996). These models have attempted to find ways of embracing uncertainty and dealing to a various degree of success with long-range perspectives.

This model was used for policy making study and not sustainability. This study borrows the policy formulation strategy and quantitative analysis.

#### **2.10.7 The Four – Capital Method of Sustainable Development Evaluation**

Ekins (1992) put forward a ‘four-capital model’, relating manufactured, human, social and natural capital to the process of production and the generation of human welfare. This model was elaborated further by Ekins (2000). The same model seems to have commended itself to Serageldin and Steer (1994) of the World Bank, who write of the ‘need to recognize at least four categories of capital’. Other types of capital have also been suggested, principal among them financial capital. However, financial capital, and the financial system through which it acts, may better be seen as a type of social capital, a conventional way of allocating and representing the power to mobilize the other four kinds of capital, which have the real inherent power to deliver benefits.

An evaluation of the Structural Funds would seek to determine the extent to which they have been successful in the exercise of this power, and to recommend guidelines and procedures for their deployment in the future. These guidelines and procedures will themselves be further examples of social capital, if their effect is to enable the Structural Funds more effectively to achieve their objectives.

Sustainable development policy raises new challenges for evaluation. These challenges include the practical concern not to introduce a paralysis in policy-making by waiting to understand all possible direct and indirect effects, and the principal methodological challenge of comparing and weighting (explicitly or implicitly) disparate effects which may be expressed in different units. There is also the challenge of evaluating impacts, and their relation to policies, at different levels. Evaluation requires that all impacts of relevance both to the objectives of the project and its results, that are either projected *ex ante*, or that can be identified *ex post*, are assessed. Frequently used methods and techniques for evaluating contributions to Sustainable development include concept or issue mapping, cost–benefit analysis (CBA), use of secondary source data, multi-criterion analysis (MCA) and strategic environment assessment (SEA).

Economic sustainability, economists have long had guidelines as to whether economic growth and development should be regarded as sustainable. The rate of inflation, public sector net credit requirement and balance of payments, among others, are all considered to be important indicators of economic sustainability. Social sustainability is affected by such conditions as poverty, inequality, unemployment, social exclusion and the corruption or breakdown of social institutions, but the relationship between sustainability and these conditions is clearly very complex and quite different between different societies. Considerations of SD require that the traditional definition of capital must be expanded to include environmental and social, as well as economic, resources.

## **The four different types of capital**

### **i. Social Sustainability - Human Capital**

The human capital refers to resources that are related to humans and their capabilities. It is measured in terms of skills, knowledge, social networks, intelligence, trust, reputation, competency, influence and power. Effective management of these capitals and maintaining the balance among them creates social sustainability in the living labs. There is substantial evidence that human capital is positively related to non- economic social and personal well-being, which may in turn feed back into economic growth. There is a case for regarding health itself as an element of human capital, because it is clearly positively related to productivity.

### **ii. Financial Sustainability – Financial capital**

This capital is related to money and its related policies and instruments. It is measured in terms of cash, debt, investment and other monetary policies which maintain balance among them in the living lab, hence creating financial sustainability.

### **iii. Environmental sustainability - Natural Capital**

This refers to the ecosystems services in the labs in which their efficient management and utilization may result environmental sustainability. It is measured in terms of resources and ecosystem.

### **iv. Manufactured capital**

This capital is measured in terms of infrastructure and machines

## 2.11 Summary of assessment of sustainability of living labs frameworks

Table 2.3: Summary of assessment frameworks

Framework	Features
Technological, Organizational and Environmental (TOE) model	<ul style="list-style-type: none"> <li>i. Affects how an organization perceive, search for and implement new technology</li> <li>ii. Implementation quality has an environmental aspect which focuses on external factors</li> </ul>
DeLone and McLean IS success model	<ul style="list-style-type: none"> <li>i. Focuses on measuring the benefits of success of IS system</li> <li>ii. Consists of 7 dimensions of success: System quality, information quality, service quality, intention to use, use, user satisfaction, net benefits</li> </ul>
Diffusion of Innovation model	<ul style="list-style-type: none"> <li>i. Adoption of innovation is the outcome of learning</li> <li>ii. Consists of 5 main characteristics: Relative advantage, compatibility, complexity, observability, trial ability.</li> </ul>
Sustainable Livelihood model	<ul style="list-style-type: none"> <li>i. Discuss about poverty related issues and how ICT can be used to solve these issues</li> <li>ii. It has 4 focus area: Vulnerability context, livelihood assets, policies and processes, Livelihood outcomes</li> </ul>
Living Lab Triangle Model	<ul style="list-style-type: none"> <li>i. Analyzes the link between characteristics of the living labs and their effects on the outcome</li> <li>ii. Consists of 3 pillars: Innovation outcome, Living lab environment and living lab approach</li> </ul>
The four capital method of sustainable Development Evaluation	<ul style="list-style-type: none"> <li>i. Focuses on the needs, objectives, inputs, operations, outputs, results and impact.</li> <li>ii. Consists of four capitals: human, financial, environmental and manufactured.</li> </ul>

## 2.12 Conceptual Framework

The Four – Capital Method of Sustainable Development Evaluation framework puts emphasis on sustainability development. Ekins et al. (2007) employed this model in his research, which says that the model can be used to show a causal relationship of how sustainable development can be achieved. The success of a project is assessed and evaluated through the net benefits (results and impacts).

The proposed model depicts the relationship between the needs, objectives, inputs, operations and output, which are the independent variables. These dimensions would then have an impact on the results and impacts, which are the dependent variables.

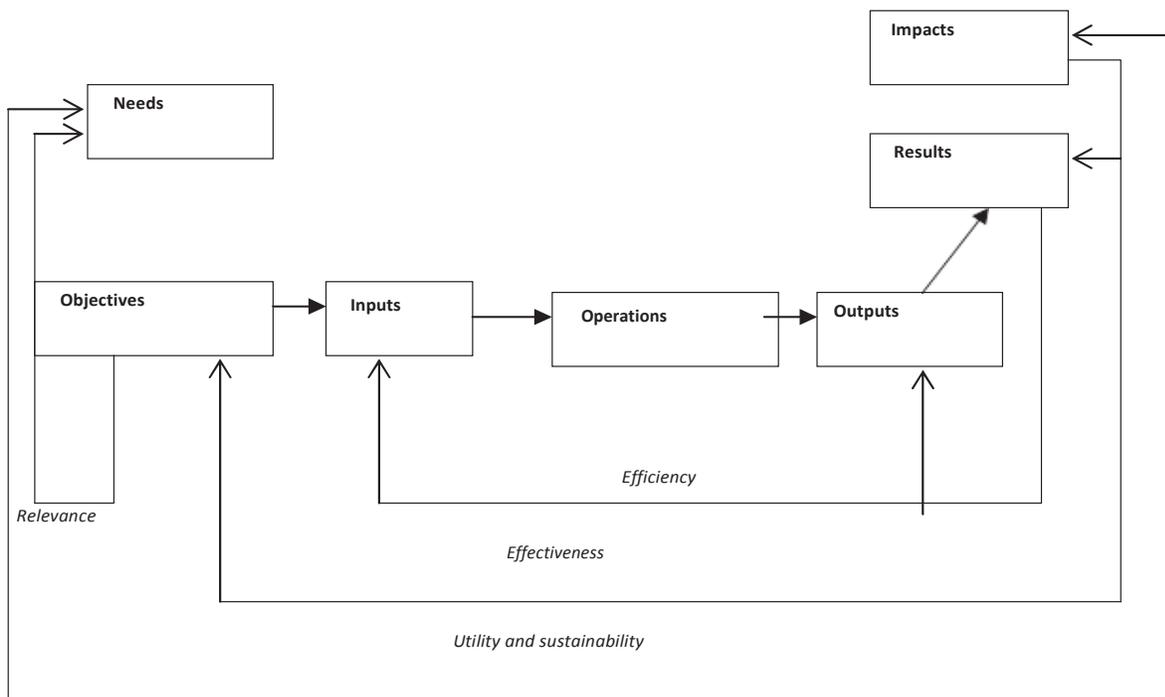


Figure 2. 7 Conceptual frameworks, Source P. Ekins et al., (2007)

The following kinds of variables were identified as relevant to an evaluation of the living lab, Ekins et al. (2007).

### Needs

This dimension looks at the customer requirements, that is: products or services required by the end users. It focuses on the trends, technology, accessibility, quality, and cost. The

needs should be relevant to the objectives of the project. The needs of the end users will determine whether or not users will use the system which in turn will have an effect on the results.

### **Objectives**

This dimension focuses on the aim or purpose of the lab. There are 3 different types of objectives: *Operational objectives*, expressed in terms of outputs (e.g. the provision of training courses to the long- term unemployed); *Specific objectives*, expressed in terms of results (e.g. the improvement, through training, of the employability of the long-term unemployed); *Global objectives*, expressed in terms of impacts (e.g. a reduction in unemployment among the previously long-term unemployed).

### **Inputs**

This dimension looks into the funding of the labs and sources of finances and the budget allocated to the living lab by the host organization. This dimension is measured in terms of Financial indicators are used to monitor progress in terms of the (annual) commitment and payment of the funds available for any operation, measure or project in relation to its eligible cost. These indicators are readily available but give little information about the effectiveness of the lab (Ekins et al., 2007).

### **Operations**

This dimension focuses on activities that are carried out in the living labs, the management of the labs, the staff who run the labs, the funding sources, users and infrastructure of the living labs. Operations is measured in terms of number of people who are in management of the lab, qualifications of the staff, number of staff who run the lab, number of funding organizations, resources supported by the funding organizations, the infrastructure of the labs and who supports it.

### **Output**

These relate to the activity engaged in through the application of the living labs projects. System output is measured in terms of accuracy, completeness, consistency, relevance, availability, understandability, usefulness and timeliness. This dimension has an effect on

decisions made by the user and the quality of work.

## **Results**

This is the direct and immediate effects of a project results. This dimension provides information on changes to, for example, the behavior, capacity or performance of direct beneficiaries. It is measured in terms of physical (number of innovators, number of success and failed projects etc.) or financial (leverage of host resources, decrease in operational cost). Results can be measured in terms of time savings, awareness, individual productivity, effectiveness, task performance, usefulness, business process change, cost savings, enhancement of communication and collaboration, enhanced reputation, improved decision making and quality improvement.

## **Impacts**

These refer to the project's consequences beyond its immediate effects. Specific impacts are those effects occurring after some time but which can be directly linked to the action taken. Global impacts are longer-term effects affecting a wider population of living labs. The impacts that are of interest are those that either support, or are in conflict with, the achievement of other policy objectives. Impact can be measured in terms of physical (number of innovators, number of success and failed projects etc.) or financial (leverage of host resources, decrease in operational cost), other measures are time savings, awareness, individual productivity, effectiveness, task performance, usefulness, business process change, cost savings, enhancement of communication and collaboration, enhanced reputation, improved decision making and quality improvement.

There are a number of issues that any evaluation of the living lab would need to address EKins et al., (2007)

- *Relevance*- To what extent are the projects objectives relevant in relation to the evolving needs and priorities of the users?
- *Efficiency*- How were the resources (inputs) turned into outputs or results? Efficiency analysis looks at the ratio between the outputs, net benefits and the inputs (particularly financial resources) used to achieve them.

- *Effectiveness*- How far has the project contributed to achieving its specific and global objectives? Effectiveness analysis compares what has been done with what was originally planned; that is, it compares actual with expected or estimated outputs, results and/or impacts.
- *Utility*- Did the project have an impact on the target groups or populations in relation to their needs?
- *Sustainability*- To what extent can the changes (or benefits) be expected to last after the project has been completed?

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.0 Introduction**

This chapter outlines the research design, target population, sample size and sampling procedures, data collection tools and methods, data analysis techniques and data presentation procedures.

### **3.1 Research Design**

Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Kothari, 2008). This study adopted descriptive research design, to obtain views from innovators, users and stakeholders in regards to sustainability of Kenyan Living Labs for development of resource products and services.

A survey design was adopted for this study in order to obtain information that described a phenomenon that existed. This was achieved through enquiring and observing various innovators and users opinions, perceptions, attitudes and values in regards to this topic. This helped in coming up with an appropriate conceptual framework for the assessment of sustainability of living labs.

The respondent's questionnaires and interview guides feedback was transcribed and coded, this was analyzed to determine the level of sustainability of living labs in Kenya.

### **3.2 Target Population**

Population is the total collection of elements which we wish to make some inferences. (Mugenda & Mugenda, 2003), explained the target population as generally a large collection of individuals or objects that are the focus of a scientific query. The target population in this study constitutes all innovators, users and staff of all living labs in Kenya. The justification of the population is that: these respondents are the majority users of Living Labs and are affected by the sustainability of the living labs. The questionnaire captures the age, gender, level of education and experience of the respondents.

The respondents' breakdown was as follows:

1. General Users – questionnaires were administered to this category of users of the products / services from the living labs, whose questions revolved around the living labs i.e. in terms of product offering and services. Here we were interested in knowing the experience of the users, challenges and their opinions regarding the labs. These users have no knowledge of labs being made up of various systems from various organizations hence view it as one system which provides all the services that they can access.
2. Innovators – questionnaires were administered to this group of people who introduce new methods or ideas of a product. Questions were about living labs in general, the system(s) developed, challenges and funding streams. Interviews were also conducted to this category of people.
3. Staff – these are basically the individuals who man the labs. Questionnaires were administered and interviews conducted for this category. The questions revolved around the operations of the lab, strategies to ensure the labs will be sustainable in future, the management of the labs and funding streams.

### **3.3 Sample size and sampling procedures**

A sample is the number of items to be selected from a population. A sample is a finite part of a statistical population whose properties are studied to gain information, about the whole (Orodho and Kombo, 2002). Samples of innovators and users were drawn through purposive and random sampling methods. Purposive sampling was selected based on the characteristics and objectives of the study. Justification for using purposive sampling is that it provides a wide range of non-probability sampling for the researcher to draw. Random sampling was also used as it eliminates systematic bias, hence giving all individuals an equal chance to be chosen. All living labs were identified; this allowed most innovators and users a chance to be included in the sample. 150 participants were sampled.

To determine the sample size, a statistical formula suggested by Mugenda and Mugenda (2003) was used. The formula is argued to be suitable in cases where the sample is not known.

$$n = p (1 - p) (Z/d)^2$$

Where:

$n$  is the sample size

$Z$  is the area under the normal curve as per the table of normal curve. Given the confidence level of 90% = 1.645, 95% = 1.96, 99% = 2.58.

$d$  is the margin of error = 0.08

$p$  is the proportion in the target population estimated to have characteristics being measured

Mugenda and Mugenda (2003) recommend that if value of  $p$  is unknown, then assume

$P = 0.5$

The sample size (assuming 95% = 1.96 level of confidence) was therefore given by;

$$n = 0.5 (1 - 0.5)(1.96 / 0.08)^2 = 150$$

### Respondents Summary

*Table 3.1: Respondents Summary*

User Category	Role of User	No
Innovators	A person who introduces new methods, ideas or products	80
Users	A person who consumes the product or service from the lab	55
Staff	The employees manning the lab	15

### 3.4 Data Collection Tools and Methods

Data was collected from all the living labs in Kenya. Questionnaires and interview guides were administered to respondents. Interview guides and questionnaires were constructed based on the objectives of the study. Both online and hard copies questionnaires were used in order to target more respondents, and also to increase the response rate. Questionnaires collected quantitative data, with both closed and open-ended questions. Open-ended questions were used to provide respondents with an opportunity to give their independent views about the subject of the study unlike in closed questions. (Mugenda & Mugenda, 2003), each question was designed to address the objectives and research questions under study. One major advantage of the questionnaire was that it allowed the researcher to control and focus responses to research objectives. Individuals

who spearheaded projects in the various labs were interviewed using an interview guide. However, most of the data was collected through questionnaires as they provide an opportunity for anonymity hence high response rate.

Data was collected twice. First was at the beginning of the study and second was at the end of the study. The first data collection was done in 5 days. Data was collected from all living labs at the Nairobi Innovation Week 2018 which took place at University of Nairobi. Second data collection was done in 3 living labs for a period of 3 days. Namely C4D lab, iHub and Nailab.

### **3.5 Validity and Reliability**

Validity is the accuracy and meaningfulness of inferences, which are based on the research results Mugenda and Mugenda (1999). Reliability is a measure of the degree to which a research instrument yields consistent results after repeated trials. An interview guide and questionnaire were developed, and both were scrutinized before they could be administered. The test-retest method of assessing reliability was employed in this study where the same instrument was administered twice to the same group. They were 10 questionnaires that were administered the very first time, all of them were returned.

All the questionnaires that were administered the second time had the same response as those administered the first time. This proved that the questionnaires were reliable hence fit for use in the study. A five point Likert scale where 1=Strongly disagree 2=Disagree 3=Don't know 4=Agree 5 = Strongly agree was employed in the questionnaires. A 5 - point Likert-type scale was used because it increases response rate and response quality along with reducing respondents' "frustration level" (Babakus & Mangold, 1992). With a Five - point scale, it is quite simple for the interviewer to read out the complete list of scale (Dawes, J. G. (2008). The raw data collected from the various respondents was categorized and coded. The data was then organized systematically by grouping the responses in different categories. The data was then captured into SPSS and analyzed.

### **3.6 Ethical Considerations**

Apart from the letter issued by the university to allow collection of data, respondents were verbally explained to about what the study was all about and its aim. Participation

in the study was purely voluntary hence participants were free to withdraw anytime they wished to without any form of intimidation. Anonymity and confidentiality was maintained throughout the study and therefore no participant was required to disclose their name.

### 3.7 Data Analysis

Data analysis consists of examining, categorizing, tabulating and or combining the evidence to address the initial proposition of a study. Data collected from participants was coded and organized into themes. The quantitative data collected from the questionnaire was analyzed using SPSS. Descriptive statistics was used for quantitative data. Descriptive statistic is a measure of central tendency, measures of association and dispersion. Qualitative data was also analyzed.

#### 3.7.1 Correlation Analysis

The findings of the study were subjected to a correlation analysis to determine whether any relationship exist between independent variable and the dependent variables. The strength of the relationship between the variables will be established too.

### 3.8 Mapping objectives to Methodology

*Table 3.2: Objectives and Methodology*

<b>Research Objectives</b>	<b>Methodology</b>
To identify attributes that define living labs in Kenya	Literature review
To identify unique challenges facing living labs in Kenya	Survey (questionnaires, interviews )
To propose a framework for assessing the sustainability of living labs in Kenya	Four-Capital method of sustainable Development Evaluation to assess sustainability of Living Labs in Kenya

### 3.9 Operationalization of the variables

The variables were operationalized through the use of questionnaires and interview guides.

Table 3.3: Operationalization of the variables

<b>Variable</b>	<b>Definition</b>	<b>Metrics</b>
Needs	These are customer requirements, that is: products and services required by the end users.	Number of successful projects in a living lab
Objectives	This refers to the aim intention of the living lab.	Number of operational, specific and global objectives of the lab
Inputs	This refers to the budget allocated to the living lab and the funding received by the lab. Either from the host organization, donations from kind and venture capitals.	Financial Budget of the lab Funds received from other sources
Operations	This dimension focuses on activities that are carried out in the living labs, the management of the labs, the staff who run the labs, the funding sources, users and infrastructure of the labs.	Number of people in the management team Number of staff Staff qualifications Number of funding organizations Infrastructure in place
Outputs	These relate to the activity engaged in through the application of the living labs projects, for example: System output	Accuracy Completeness Consistency Relevance

Results	This is the direct and immediate effects of a project results. This dimension provides information on changes to, for example, the behavior, capacity or performance of direct beneficiaries.	Number of innovators Number of successful projects Number of failed projects Decrease in operational costs Time saving, productivity, cost saving Improved quality
Impacts	These refer to the project’s consequences beyond its immediate effects. Specific impacts are those effects occurring after some time but which can be directly linked to the action taken. Global impacts are longer-term effects affecting a wider population of living labs. The impacts that are of interest are those that either support, or are in conflict with, the achievement of other policy objectives.	Number of innovators Number of successful projects Number of failed projects Decrease in operational costs Cost saving Improved quality

## CHAPTER FOUR: RESULTS AND DISCUSSION

### 4.1 Introduction

This chapter presents the analysis and discussion of the data collected. The chapter shows the test performed, the results and an interpretation of the results on living lab attributes: need, objectives, inputs, operations, outputs, results and impacts.

#### 4.1.1 Response rate

A total of 150 questionnaires were distributed in the field out of which 107 were filled representing a response rate of 75%. The users and innovators registered a total response rate of 70% while staff had a response rate of 80%. The aggregate response rate was more than half the sample targeted and was deemed enough and reliable for a study.

*Table 4. 1: Response rate*

Category	Total distributed	Filled	Unfilled	Response
Users & Innovators	135	95	40	70%
Staff	15	12	3	80%
Total	150	107	43	75%

### 4.2 Background information of the respondents

The respondents who participated in this study were drawn from selected incubation labs in Nairobi, Kenya.

The respondents chose the living labs for different reasons. From the results some chose the labs based on its affordability, reliability, convenience and accessibility. This shows that the labs are highly influenced by the location of the center and also pocket friendliness of the charged fees. Others chose their centers due to resourcefulness of the center. The study shows some of the users chose their labs due to expertise in computing, activities such as field testing, and innovative business models among others. Another reason which attracted users was existence of funding programs in the lab and lastly mentorship approaches of the lab. This shows that choice of the labs was influenced by several reasons mentioned above.

From the respondents, 89.9% of the staff respondents were male respondents while 11.1% were female respondents while for users and innovators, majority (56.3%) were male respondents and

43.8% were female respondents indicating that the views expressed in this study were dominated by those of males for users, innovators and staff members.

In terms of age, majority of the users and innovators (62.5%) were aged between 21-30 years. For the staff members who participated, 50% fell under the same age bracket of between 21-30 years of age. This shows high presence of youthful respondents in this study, perhaps reflecting their high participation in the living labs activities. This shows that projects could be failing because of age and gender.

On education level, majority of the users (56.3%) who participated in this study had post graduate qualification. Similarly, 66.7% of the staff members who participated in this study had post graduate qualification. This shows that most of those who took part had a professional training.

Lastly, approximately 72.7% of the users had one year experience with the living labs they were attached to at the time of the study. This shows probably most of them were one year with the labs. For the staff members, 55.6% of the ones who took part in this study had worked with their centers for a period between 2-5 years.

*Table 4. 2: Background information of the respondents*

Characteristic	Classification	Users & Innovators		Staff	
		Frequency	%	Frequency	%
Gender	Male	45	56.3	8	89.9
	Female	35	43.8	1	11.1
Age	20 & < 20 years				
	21-30 years	50	62.5	4	50
	31-40 years	30	37.5	4	50
	41-50 years				
	Over 50 years				
Education Level	Primary				
	Secondary	5	6.3	2	22.2
	Diploma/higher diploma				
	Graduate	5	6.3		
	Post graduate	45	56.3	6	66.7
	Other	25	31.3	1	11.1
Experience with the centre	1 year or less	40	72.7	2	22.2
	2- 5 years	15	27.3	5	55.6
	> 5 years			2	22.2

### **4.3 Attributes that define living labs in Kenya**

The study collected data on the attributes of the living labs whose staff, users and innovators took place. The attributes are discussed in the following sections.

#### **4.3.1 Lab capacity and type of innovators targeted by the labs**

Various labs had varying lab capacities. Some had capacities of between 10 and 250 innovators. The labs whose staff, users and innovators participated in this study targeted various innovators. Some targeted inventive solution based innovators such as Agri-tech, gaming, Fashion-tech, Medi-tech among others. Others targeted innovators in disciplines such as health, agriculture, governance, transport, finance and education among others.

#### **4.3.2 Establishment of the lab**

The labs are mostly located in Nairobi. Most of the labs whose data and information was used in this study were established in the recent years such as 2010, 2012, 2013 and 2015. Thus they had varying experiences since their inception and probability, different abilities to support innovators and users. At the time of the study, the labs had different staff establishment ranging from 6-15 staff members perhaps based on the year of establishment and expansion growth of the lab.

#### **4.3.3 Lab independence and funding**

In terms of ownership, some of the labs were hosted by other organizations while others were stand alone. Thus shareholders of the labs were different based on the type of ownership and the design. Those labs which were hosted by other mother organizations benefited from funding, human resource, infrastructure, office space among other operational resources.

Type of the ownership also determined the source of funding of the labs. Some of the labs were fully funded by their host organizations and offered opportunities for innovators for free while others offered the innovation spaces at a cost. This shows that some of the labs were established with a sole purpose of supporting innovation while others had a profit motive. Other sources of funding streams for the labs included aid from donors, private sponsors and partners, government, income generating projects, research, co-working, events, programs and consultancy and membership fees.

## 4.4 Challenges facing living labs in Kenya

### 4.4.1 Challenges mentioned

The progress of the living labs is affected by various challenges. From table 6.3, the most occurring challenges facing the living labs in Kenya included challenges dealing with changing technologies, insufficient funding, lack of strong and up-to-date equipment translating into to slow connections among others challenges.

*Table 4. 3: Challenges mentioned*

<b>Challenges mentioned</b>
<b>Funding</b>
Lack of funding
<b>Infrastructural challenges</b>
Inadequate infrastructure
Slow system operations
Poor maintenance
Limited inputs
<b>IT related challenges</b>
Big gap between technology and education
Changing technology/insufficient technology
Slow internet connections
<b>Design related challenges</b>
Poor communication, inefficiency, incredibility
Different criteria that do not use innovators profile
Lack of programs for entrepreneurs
<b>Low government support and outside interference</b>
Little government support
Lack of awareness
Interference from organizations

Data from the interviews shows that there were challenges reaching more people to join the labs while other had only limited space to accommodate small number of people. There were other

labs which had challenges connected to inadequate human resources to support the running of the operations of the labs. Also some organizations faced challenges pertaining to lack of good will from some of the organizations.

#### 4.4.2 Addressing challenges

To address the above related challenges, several measures had been put in place: Flexible budget, has funders that replace the equipment and redesign the lab, incorporating the most recent technology, introduction of other sustainable projects to run the operations, joint programs, policy activation, fund raising, outreach and programs, looking for more funding, assist startups to articulate their ideas, provide additional expertise, faster internet, having seed fund, hire skilled and qualified personnel, proper advertising, get more people to support the projects, improving technology, more focus on the entrepreneurial skills, proper marketing strategies, sourcing funds, outreach programs and events to reach more people, making strategic partnerships

#### 4.5 Adopted framework for assessing the sustainability of living labs in Kenya

The study adopted the following framework for assessing sustainability of the living labs in Kenya.

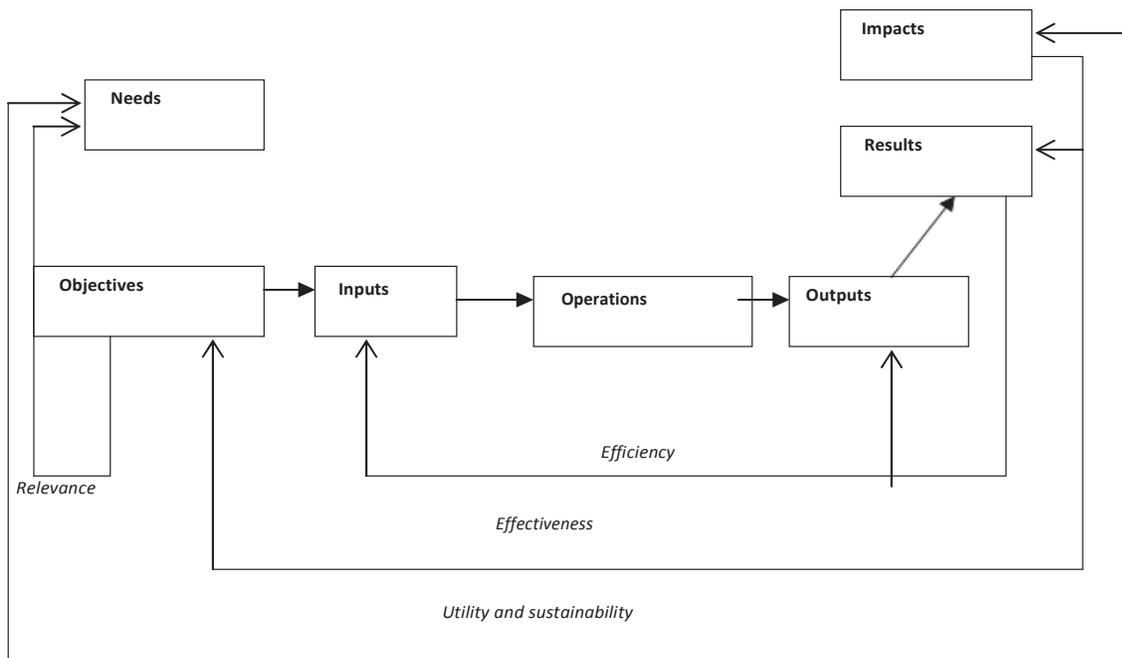


Figure 4.1 Conceptual framework, Source P. Ekins et al., (2007)

To assess the sustainability of the living labs, several aspects of sustainability of projects were studied as identified by Ekins et al (2007). The aspects include: needs of the project, the objectives of the project, the inputs, and operations of the project, the output of the project, results and the impacts. It is through such information where the study studied the relevance of the projects, efficiency, effectiveness, utility and sustainability.

#### 4.5.1 Needs of the users/innovators

Table 7.4 shows rating from staff and users on how best the living labs captured the need of the users. The study shows that all staff members agreed that their living labs had strategic plans and the staff understood the need of innovators, users had knowledge and skills for running the labs. According to majority of the respondents (73.4%) users and innovators, the objectives of the labs were relevant to current needs of the users. A substantial proportion of the users (85.7%) also agreed that the needs of the labs were attainable and realistic. This shows that the needs of the labs were current, realistic and attainable to served users and innovators.

*Table 4. 4: Needs of the users/innovators*

<b>Statements</b>	<b>Disagree</b>	<b>Don't know</b>	<b>Agree</b>
<b>Staff</b>			
Living labs has strategic/business plan	0	0	100
living lab staff understand the needs of the innovators	0	0	100
Living lab staff understand the needs of the users	0	0	100
The living lab staff have knowledge and skills for running the lab	0	0	100
<b>Users &amp; Innovators</b>			
Living lab objectives are relevant to current needs of the users	13.4	13.3	73.4
Living lab needs are realistic and attainable	7.1	7.1	85.7
The living lab users have knowledge and skills for products of innovation	14.2	21.4	64.3

#### 4.5.2 Objectives of the lab

The objectives of the lab were also assessed to help in determination of the sustainability of the labs. Table 7.5 shows that all the staff members (100%) who participated in this study agreed that they understood the objectives of the lab and that those objectives were relevant to the needs of the lab. They also agreed that the labs provided training /mentorship to their innovators. Majority of the users agreed that innovators understood the objectives of the lab (64.3%), that the

labs provided training and mentorship to innovators (85.7%) and that the objectives of the labs were realistic and attainable (80%). The results show that the objectives of the labs were well known to both the staff members and the users and that they were attainable and realistic.

*Table 4. 5: Objectives of the lab*

	Disagree	Don't know	Agree
<b>Staff</b>			
The staff understand the objectives of the lab	0	0	100
The objectives of the lab are relevant to its needs	0	0	100
The living lab provide training/mentorship to innovators	0	0	100
<b>Users &amp; Innovators</b>			
The innovators understand the objectives of the lab	7.1	28.6	64.3
The living lab provide training/mentorship to innovators	7.1	7.1	85.7
The objectives of the lab are realistic and attainable	13.3	6.7	80

### **4.5.3 Inputs into the operations of the lab**

In terms of the inputs, the half of the staff members (50%) did not know whether successful innovators supported the upcoming unlike most of the users (56.3%) who affirmed that successful innovators supported their upcoming counter parts. In terms of funding, 62.5% of the staff members and 57.2% of the users indicated that the labs received funding from funders. Further, 37.5% of the staff members indicated that the funding was done in a timely manner. Another proportion of 37.5% of staff members were indifferent on the timeliness of the funding. When the same information was sought from the users, 40% affirmed that the labs received funding in timely manner. Similarly, same proportion of users (40%) was indifferent on whether funding to the labs was done in a timely manner. This shows that more than half of the staff members and lab users either disagreed or could not affirm whether funding was done timely in their labs. In terms of fee amount charged by the labs, 62.5% of the staff and 76.9% of the lab users affirmed that lab services in their labs were affordable. On support to the labs, 87.5% of the staff members agreed that stakeholders supported their labs and 75% confirmed having received support from their host organizations. The results shows that in terms of inputs, the labs seem to have reliable inputs to sustain future operations from successful innovators, from funders, shareholders and host organizations for those labs which were hosted by other organizations. Also the fees paid were affordable and thus it could be afforded by most people in future and that fees could not hinder enrolment of more innovators into the labs.

Table 4. 6: Inputs into the operations of the lab

	Disagree	Don't know	Agree
<b>Staff</b>			
The successful innovators support the upcoming innovators	12.5	50	37.5
The living labs receive funding from other funders	12.5	25	62.5
The funders release funds on a timely manner to run the labs	25	37.5	37.5
The lab receives support from the successful innovators	12.5	37.5	50
The lab services are affordable	25	12.5	62.5
The shareholders support the labs	12.5	0	87.5
The lab receives support from host organization	12.5	12.5	75
<b>Users &amp; Innovators</b>			
The successful innovators support the upcoming innovators	12.5	31.3	56.3
The living labs receive funding from other funders	7.1	35.7	57.2
The funders release funds on a timely manner to run the labs	20	40	40
The lab services are affordable	0	23.1	76.9

#### 4.5.4 Outputs of the lab

Information on the output of the labs was collected to ascertain the sustainability of the labs from the perspective of the outputs. According to most of the staff members (77.8%), innovations from the labs met user requirements. However, only 43.8% of the users indicated that the labs met their expectations. In this case, results from users were preferred. Thus, the innovations in the labs whose data was captured did not meet user requirements. Further government policies and regulations affected the output of the labs according to 55.5% of staff members and 46.6% of the users implying that the labs could not deliver properly due to the influence from the governments. Most of the staff members (66.6%) and a proportion of 46.7% of the users affirmed that there was high success rate of inputs to outputs in their labs. Lastly a proportion of 77.8% of the staff members indicated that the lab outputs were aligned to current trends. In a summary, the results show that conversion of inputs to outputs was very good. However, the final innovations did not meet requirements of most users and were highly influenced by government policies and regulations.

Table 4. 7: Outputs of the lab

	Disagree	Don't know	Agree
<b>Staff</b>			
The innovations from the lab meet user requirements	11.1	11.1	77.8
Government policies and regulations affect the output of the lab	22.2	22.2	55.5
There is high success rate of inputs to outputs of the innovations	0	33.3	66.6
The lab output is aligned to current trends	11.1	11.1	77.8
<b>Users &amp; Innovators</b>			
The innovations from the lab meet user requirements	12.6	43.8	43.8
Government policies and regulations affect the output of the lab	26.6	26.7	46.6
There is high success rate of inputs to outputs of the innovations	20	33.3	46.7

#### 4.5.5 Operations of the lab

Majority of staff members (77.7%) and 46.7% of the users indicated that labs were highly automated and technologically advanced. Majority of the staff (88.9%) indicated products and services in the labs were evaluated at every phase of development. This compares with 53.3% of users who did not know such evaluations occurred. According to 77.8% of the staff members, test users interacted with the innovators in the labs while 50% of the users could not confirm the same. This shows that most of the labs did evaluations of products and services at every phase of development and there were little interactions between test users and innovators.

In terms of skills, staff members (88.9%) indicated that the labs had highly skilled staff resources. However, majority of the users (60%) did not confirm that the staff were highly skilled implying that skills of the staff were not very sharp to the users. The study further shows that both staff (100%) and lab users (80%) agreed that the labs had good infrastructure. Further details from the staff members indicated that labs trained their staff on upcoming technological trends and provided good supervisions of the lab activities.

Table 4.8: Operations of the lab

	Disagree	Don't know	Agree
<b>Staff</b>			
The lab operations are highly automated and technologically advanced	11.1	11.1	77.7
Products/services in the lab evaluated at every phase of development	0	11.1	88.9
The test users interact with the innovators in the living labs	11.1	11.1	77.8
The lab enjoys highly skilled staff resources	11.1	0	88.9
The living labs has good infrastructure	0	0	100
The living staff are trained on upcoming technology trends	0	11.1	88.8
There is good supervision of the activities of the lab	22.2	0	77.8
<b>Users &amp; Innovators</b>			
The lab operations are highly automated and technologically advanced	26.6	26.7	46.7
Products/services in the lab evaluated at every phase of development	13.3	53.3	33.3
The test users interact with the innovators in the living labs	12.6	50	37.5
The lab enjoys highly skilled staff resources	0	60	40
The living labs has good infrastructure	0	20	80

#### 4.5.6 Results of the lab activities

According to table 7.9, 62.5% of the staff and 46.6% of the lab users indicated that the number of successful projects had increased and the number of innovators had increased. Most of the staff members (62.5%) indicated that, the number of failed projects had decreased. This proportion however was less under the category of the lab users with only 28.6% of the same opinion and a half (50%) being unable to tell whether the number of failed projects had decreased. The results show that there was consensus on the increase in the number of innovators but not on the issue of the increase in the number of successful projects between the staff and the users. The staff however indicated that they received awards for innovations of the labs.

Table 4. 9: Results of the lab activities

	Disagree	Don't know	Agree
<b>Staff</b>			
The number of successful projects have increased	0	37.5	62.5
The number of failed projects have decreased	0	37.5	62.5
There is increase in number of innovators	0	12.5	87.5
Living lab receive awards for innovation	0	12.5	87.5
<b>Users &amp; Innovators</b>			
The number of successful projects have increased	20	33.3	46.6
The number of failed projects have decreased	21.4	50	28.6
There is increase in number of innovators	0	33.3	66.7

#### 4.5.7 Impacts of the lab activities

The usefulness of the labs was also assessed through the end term results of the projects. According to most of the staff and lab users, the long term effects of the labs were noticeable and there was assurance of innovators for the labs in future. This sort showed that the labs were assured of some inputs in terms innovators and the end result which were easily recognized.

Table 4. 10: Impacts of the lab activities

	Disagree	Don't know	Agree
<b>Staff</b>			
Living lab long term effects are noticeable	0	0	100
The lab is assured of innovators in future	0	14.3	85.7
<b>Users &amp; Innovators</b>			
Living lab long term effects are noticeable	0	33.3	66.6
The lab is assured of innovators in future	0	35.7	64.3

#### 4.6 Validating the adopted framework by assessing the sustainability of living labs in Kenya

To validate the adopted framework for assessing the sustainability of the living labs in Kenya, the study checked some aspects of sustainability of the labs such as relevance of the labs, efficiency of operations, effectiveness, utility and sustainability of the labs.

#### 4.6.1 Relevance of the labs

One of the qualities of sustainable projects was the relevance of the project. Relevance means how well the objectives of the labs meet the needs of the people or users. Therefore, for the labs to be relevant, the objectives of the labs and the needs should be positively correlated. To assess this quality a correlation test was done between objectives and the needs of the labs. The results show that there existed a strong and significant positive correlation between the needs and the objectives of the labs. Therefore, it could easily be deduced that the labs were relevant to the needs of the users.

*Table 4. 11: Correlation between objectives and the needs*

		Need	Objective
Need	Pearson Correlation	1	.738**
	Sig. (2-tailed)		.000
Objective	Pearson Correlation	.738**	1
	Sig. (2-tailed)	.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

#### 4.6.2 Efficiency of the labs

The other quality of assessing the sustainability is efficiency of the operations and how well could the labs convert inputs into outputs. This aims at reducing losses and maximizing the output given limited input resources. To assess the efficiency of the labs, the study did a test on the relationship between inputs and outputs. Table 7.12 shows that inputs and outputs had a strong positive and significant correlation. This shows that increase in inputs had a corresponding increase in the amount of output produced.

*Table 4. 12: Efficiency of the labs*

		Inputs	Outputs
Inputs	Pearson Correlation	1	.724**
	Sig. (2-tailed)		.000
Outputs	Pearson Correlation	.724**	1
	Sig. (2-tailed)	.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

### 4.6.3 Effectiveness of the labs

Another aspect of sustainability is the effectiveness of the labs. This tested the rate in which the labs achieved the expected results. The study found that some of the operations had been automated to increase the effectiveness. Other activities aimed at increasing the effectiveness of the labs include evaluation of products at different stages of development, building the infrastructure of the labs, supervision of the innovation and use of skilled labour to enhance quality.

### 4.6.4 Utility of the labs

The utility of the lab to the users is another critical factor which determines the sustainability of living labs. The labs have to serve the needs of the users and also the operations of the labs have to be felt. Therefore the needs and the impacts have to be positive. To test for utility of the living labs in Kenya, a correlation test between the needs and the impacts was done to establish the strength and direction of the relationship between the needs and the impacts of the living labs. The results shows that needs and the impacts of the lab were strongly significantly and positively correlated. This shows that the impacts of the labs and the needs were almost tied together.

*Table 4.13 Utility of the labs of the labs*

		Need	impacts
Need	Pearson Correlation	1	.651**
	Sig. (2-tailed)		.000
Impacts	Pearson Correlation	.651**	1
	Sig. (2-tailed)	.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

### 4.6.5 Sustainability of the labs

To sustain the labs, labs had initiated several strategies such as engaging many stakeholders as well as entering into more partnership to secure financial sustainability. Other initiatives reported include events, training and mentorship, expansion of office space and infrastructure among others. The labs also seek to invest more on networking and marketing the labs. Some labs are also pursuing meeting new organizations to create new collaborations and forge ways of working jointly.

The respondents also cited that advanced security was required to ensure that the operations of the labs were not interfered with or innovations leaked to third parties. Also the respondents cited that building on managerial skills, encouraging idea factories, seeking for more funding as well as good will were key in providing sustainable living labs in Kenya.

# CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

## 5.1 Introduction

This study was motivated by the need to assess sustainability of the living labs in Kenya. The study examined three factors which were thought to have an influence on the sustainability of the living labs in Kenya. This chapter presents the summary of the findings in chapter four, conclusion and the recommendations of the study.

## 5.2 Linking study findings to the objectives

### *Objective 1: Attributes that define living labs in Kenya*

The living labs had varying capacities. Some had capacities of between 10-250 innovators. The labs targeted inventive solution based innovators in disciplines such as health, agriculture, governance, transport, finance and education among others. In terms of staff establishment, staff members were between 5 and 15 implying that the labs were still in their early stages of development. Most of labs were established recently and may have not the necessary stability to hold into the future.

In terms of ownership and independence of the labs, several living labs were hosted by parent organizations and others were stand alone. Those labs which were hosted by other mother organizations benefited from funding, human resource, infrastructure, office space among other operational resources.

Funding of the living labs was influenced by the ownership and independence. Those labs which were hosted by other parent organizations received funding from their hosts as well as opportunities for innovation. The stand-alone living labs were mostly profit making and got their funding from fees they charged to offer the services they offered. Labs also got financial resources from other initiatives such as aid from donors, income generating projects, sponsors and partners, government, consultancy and membership fees among other initiatives.

### ***Objective 2: Challenges facing living labs in Kenya***

The sustainability of the living labs in Kenya today is threatened by existence of several challenges. The commonest challenge cited was insufficient funding to run the living labs innovational activities.

The other challenge cited affecting the operations of the labs were infrastructural in nature. The study found that the labs suffered from inefficiencies caused by old internet and electricity equipment, poor maintenance of the equipment and lack of other infrastructural space such as offices, rooms and related furniture.

The labs were also experiencing IT related challenges. These challenges affected the smooth running of operations in the labs. Such challenges included changing technologies which rendered the existing technologies obsolete within a short period of time. Other challenges included insufficient technologies of operations and slow internet connections.

The other challenges noted during the study were design related challenges. These were associated with the way labs used to function on a daily basis. Some of the labs had no clear communication framework among the stakeholders and other lacked programs for entrepreneurs but only focused on the innovations. Some labs also had inefficient selection criteria for selecting innovators which proved unproductive in the long run.

Lastly, labs experienced low government support and interference from other organizations. Some of the respondents cited that they received little support from the government which limited their capacities to offer opportunities for innovation. Interference from other organizations also worked against the spirit and efforts of the living labs.

### ***Objective 3: Adopted framework by assessing the sustainability of living labs in Kenya***

The study adopted model of assessing sustainability of the living labs which covered several aspects of the projects. The first aspect was to assess whether the labs addressed the needs of the

users. The study noted that most of the labs had strategic plans, catered for the need of the users and even understood their needs. The objectives of the labs were current, realistic and attainable.

The other aspect was the objectives of the living labs. The study found that objectives of the labs were relevant to the needs of the users. The objectives of the labs were realistic and attainable according to the respondents who participated in the study.

On the inputs and resources required by the labs. The study found that the labs got funding from the funders. However, the timeliness of the funding was not guaranteed which exposed and limited the capacity of the living labs to operate efficiently. The study also noted that shareholders and host organizations also provided support to the living labs.

The labs operations according to most of the respondents had been automated and were technologically advanced. The study found that products evaluations during development were not quite emphasized. Also the level of interaction between users and innovators was not prioritized. The users could not confirm that the labs had highly skilled staff resources.

On the results of the living labs, the study found that number of successful projects had increased. Also the numbers of innovators had increased which was partly meeting the objective of the labs of increasing the number of the innovators to incubate their ideas in the labs. The staff and users who participated in the study also pointed out that the long term effects of the labs were noticeable and that the labs were assured of innovators in future.

***Objective 4: Validating the adopted framework by assessing the sustainability of living labs in Kenya***

To assess the sustainability of the living labs using the proposed model; several aspects such as relevance, efficiency, effectiveness and utility of the lab projects were assessed. The first test was on the relevance of the living labs to the needs of the users. The study found that the needs and the objectives of the labs were relevant to the users. However, the innovations were not meeting all the needs of the users.

On efficiency of the labs operations, the study looked at the relationship between the inputs and outputs. The operations of the labs were however not very efficient and there was low emphasis

interaction of the users and the innovators. However, the correlation between the input and outputs was positive.

The other aspect of the living labs was the effectiveness of the lab projects. The study found that some of the operations had been automated to increase the effectiveness of the lab operations. The utility of the lab innovation products was also a concern. The study found that the impacts and the needs of the users had a common correlation. Thus the labs met the needs of the users which had a lasting impact.

### **5.3 Limitations of the study**

The research was limited to Nairobi region hence the respondents from other parts of the country especially the rural area were left out. Some innovators were not familiar with the living labs. Acquiring all data considered important to the study was also challenging leading to more time wastage during data collection exercise.

### **5.4 Conclusions**

The study concludes that living labs in Kenya are viable. However, several measures have to be taken to contain the likely deteriorating capability of their growth and future sustainability. The study concludes that living labs are innovative and prepared to survive in future. This is evident as some of the labs have strategic plans on how to pursue future environment, have developed ways of choosing right people to incubate, type of skills required, variety of innovations such labs support and their location to ease accessibility. The type of innovations and strategies put in place by the labs to ensure their sustainability significantly influences the sustainability of the labs. However, the study revealed that the living labs do not have big capacities to accommodate large number of incubators.

One of the weaknesses noted in most of the living labs in Kenya was the inability to get enough funding from the host organizations and had limited knowledge on the supervision level of the operations. The government policies and regulations were not seen to have any effect on their operations which means they were not enforced or they were not supportive or were irrelevant.

The study notes that the approach used by the living labs also matters a lot. A good approach ensures smooth running of the activities. The study found that most of the labs evaluated their innovations, products and services regularly to ensure they deliver as expected. Others have employed highly skilled staff and created interactions between consumers and the innovators. These approaches used by the labs have been found to have a significant effect on the sustainability of the labs.

## **5.5 Recommendations**

The living labs have a limited capacity to accommodate many innovators at a time. This in turn limits the number of innovations which can be supported at a time by the labs. It is desirable that the living labs expand their capacities to accommodate more people to ensure more innovations are supported at a time.

There is need to institutionalize support of the host organization to the labs to ensure continued growth and expansion. This will ensure that the living labs have the capacity to accommodate more innovators and also widen the various types of innovation being supported.

As a way of strengthening the internal processes of the living labs, it is suggested that the senior managers in charge of the living labs increase the level of supervision at every level to ensure that the labs are effective in their incubation efforts.

## **5.6 Suggestions for Further areas of Research**

To enhance more understanding of the sustainability of the living labs in Kenya, it is suggested that a similar study be done for all living labs in Kenya to get the full understanding of the sustainability of the labs in Kenya. This will help to make good policy decision on how to manage the living labs in Kenya and also how to support them.

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## APPENDICES

### SURVEY COVERING LETTER AND QUESTIONNAIRE

#### Appendix A: Survey covering letter

Mary Auma Ondiek

P.O Box 24291 -00100

Nairobi

Tel: 0720821548

Email: [ondiekmary@gmail.com](mailto:ondiekmary@gmail.com)

Date: .....

Dear respondent,

My name is Mary Auma Ondiek, I am a student undertaking a Master of Science in Information Technology Management at the University of Nairobi, Nairobi Campus. To accomplish this course, am carrying out a research titled, “An Assessment of Sustainability of Living Labs in Kenya”. I am kindly inviting you to participate in this research study by completing the attached questionnaire and sincerely giving information as per each question.

If you choose to participate in this research, please answer all questions as honestly as possible. Participation is strictly voluntary and you may decline to participate at any time. Please note that you do not have to indicate your name, for confidentiality of information. The data collected will be for academic purposes only.

Thank you very much for your time and response.

Yours

Sincerely,

Mary Auma Ondiek

MSc. Student. Registration No. P54/85760/2016

## SURVEY QUESTIONNAIRE (Staff)

### LIVING LABS RESEARCH SURVEY

This questionnaire seeks to find out the sustainability of living labs in Kenya. This survey targets the opinions and perceptions of various categories of stakeholders in living labs

### INSTRUCTIONS

Please respond to all items, indicate by way of ticking in the right column, the extent, to which you agree/disagree with the statement provided in relation to Living lab, where:

1= Strongly disagree 2=Disagree 3=Don't know 4=Agree 5 = Strongly agree

Please tick  only one of the options that most closely fits your opinion for each statement.

### Section A: Demographic Information

1. Which of these categories are you?

Innovator

User

Funder

Employee

2. Gender

a) Male

b) Female

3. Age of respondents (Years)

a) 20 years and below

b) d) 21-30

c) 31-40

d) 41-50

e) Above 50

4. What is your level of education?

a) Primary

b) Secondary

c) Diploma

d) Degree

e) Post graduate

f) Others ( please specify)

5. Which incubation center (if any) are you affiliated to \_\_\_\_\_

6. For how long have you worked with the center?

a) Less than 1 years

- b) 2-5 years [ ]
- c) More than 5 years [ ]

		1= Strongly disagree 2= Disagree 3= Don't know 4= Agree 5= Strongly agree				
<b>Section B: Need</b>		1	2	3	4	5
N1	The living lab has strategic/business plan					
N2	The living lab staff understand the needs of the innovators					
N3	The living lab staff understand the needs of the users					
N4	The living lab staff have knowledge and skills for running the lab					
<b>Section C: Objectives</b>		1	2	3	4	5
O1	The staff understand the objectives of the lab					
O2	The objectives of the lab are relevant to its needs					
O2	The Living lab provide training / mentorship to innovators					
<b>Section D: Inputs</b>		1	2	3	4	5
I1	The successful innovators support the upcoming innovators					
I2	The lab receives support from the successful innovators					
I3	The shareholders support the labs					
I4	The living labs receive funding from other funders					
I5	The funders release funds on a timely manner to run the labs					
I6	The lab services are affordable (if chargeable)					
I7	The lab receives support from host organization					
<b>Section E: Outputs</b>		1	2	3	4	5
O1	The innovations from the lab meet user requirements					
O2	Government policies and regulations affect the output of the lab					
O3	There is high success rate of inputs to outputs of the innovations					
O4	The lab output is aligned to current trends					

		1	2	3	4	5
<b>Section F: Operations</b>		1	2	3	4	5
O1	The lab operations are highly automated and technologically advanced					
O2	Products /services in the lab evaluated at every phase of development					
O3	The test users interact with the innovators in the living labs					
O4	The lab enjoys highly skilled staff resources					
O5	The living labs has good infrastructure					
O6	The living staff are trained on upcoming technology trends					
O7	There is good supervision of the activities of the lab					
<b>Subsection G: Results</b>		1	2	3	4	5
R1	The number of successful projects have increased					
R2	The number of failed projects have increased					
R3	There is increase in number of innovators					
R4	The lab receives awards for innovation					
<b>Section H: Impacts</b>						
I1	Living labs long term effects are noticeable					
I1	The lab is assured of innovators in future					

What are the challenges facing the labs

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How were these challenges addressed?

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What strategies are you putting in place for the labs future growth and expansion?

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Please indicate any other comments that will be useful in sustainability of the living labs

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*Thank you for your time and response*

## SURVEY QUESTIONNAIRE (Innovators & Users)

### LIVING LABS RESEARCH SURVEY

This questionnaire seeks to find out the sustainability of living labs in Kenya. This survey targets the opinions and perceptions of various categories of stakeholders in living labs

### INSTRUCTIONS

Please respond to all items, indicate by way of ticking in the right column, the extent, to which you agree/disagree with the statement provided in relation to Living lab, where:

1= Strongly disagree 2=Disagree 3=Don't know 4=Agree 5 = Strongly agree

Please tick  only one of the options that most closely fits your opinion for each statement.

### Section A: Demographic Information

4. Which of these categories are you?

Innovator

User

Employee

5. Gender

c) Male

d) Female

6. Age of respondents (Years)

f) 20 years and below

g) d) 21-30

h) 31-40

i) 41-50

j) Above 50

4. What is your level of education?

d) Primary

e) Secondary

f) Diploma

d) Degree

g) Post graduate

h) Others ( please specify)

5. Which incubation center (if any) are you affiliated to \_\_\_\_\_

6. Why did you choose this center? \_\_\_\_\_

7. For how long have you worked with the center?

a) Less than 1 years [ ]

b) 2-5 years [ ]

c) More than 5 years [ ]

		1= Strongly disagree 2= Disagree 3= Don't know 4= Agree 5= Strongly agree				
<b>Section B: Need</b>		1	2	3	4	5
N1	The living lab objectives are relevant to current needs of the users					
N2	The living lab needs are realistic and attainable					
N3	The living lab users have knowledge and skills for products of innovation					
<b>Section C: Objectives</b>		1	2	3	4	5
O1	The innovators understand objectives of the lab					
O2	The Living lab provide training / mentorship to innovators					
O3	The living lab objectives are realistic and attainable					
<b>Section D: Inputs</b>		1	2	3	4	5
I1	The successful innovators support the upcoming innovators					
I2	The living labs receive funding from other funders					
I3	The funders release funds on a timely manner to run the labs					
I4	The lab services are affordable (if chargeable)					
<b>Section E: Outputs</b>		1	2	3	4	5
O1	The innovations from the lab meet user requirements					
O2	Government policies and regulations affect the output of the lab					
O3	There is high success rate of inputs to outputs of the innovations					
<b>Section F: Operations</b>		1	2	3	4	5
O1	The lab operations are highly automated and technologically advanced					
O2	Products /services in the lab evaluated at every phase of development					
O3	The test users interact with the innovators in the living labs					
O4	The lab enjoys highly skilled staff resources					
O5	The living labs has good infrastructure					

<b>Subsection G: Results</b>		1	2	3	4	5
R1	The number of successful projects have increased					
R2	The number of failed projects have increased					
R3	Number of innovators have increased					
<b>Section H: Impacts</b>						
I1	Living labs long term effects are noticeable					
I1	The lab is assured of innovators in future					

What are the challenges facing the labs?

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How were these challenges addressed?

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Please indicate any other comments that will be useful in sustainability of the living labs

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*Thank you for your time and response*

## **INTERVIEW GUIDE**

1. What type of innovators does your lab target?
2. When was this lab established?
3. Where is your Lab located?
4. Is the lab hosted by another organization?
5. What contribution does the lab get from the host organization?
6. What are other funding streams?
7. What has the lab put in place to ensure it will maintain itself for the years to come?
8. What are the challenges facing the lab?
9. How were these challenges addressed?
10. Apart from incubation, what else does the lab do to generate funds?
11. Who are the shareholders of the lab?

12. What are their contributions?
13. What is the capacity of the lab?
14. How many staff does it have?
15. What is the infrastructure of lab?
16. What is the model of the lab?
17. Do innovators pay for the services?
18. How easily can the lab adapt to change in trend or line of innovation support?
19. What do you think should be done to guarantee sustainability of the labs in future?
20. Any other suggestions or information about the labs which may be relevant?

*Thank you for your time and response*