Doctoral Dissertation of Philosophy in Education

Innovation in East Africa: An Exploration of Open Development Approaches

August 2018

Global Education Cooperation Major
Graduate School of Education
Seoul National University

Bethel Ghebru

교육학 박사학위논문

Innovation in East Africa: An Exploration of Open Development Approaches

동아프리카의 혁신: 개방형 개발 접근에 대해서 탐색

2018년 8월

서울대학교 대학원
협동과정 글로벌교육협력

베 텔

Doctoral Dissertation of Philosophy in Education

Innovation in East Africa: An Exploration of Open Development Approaches

Submitting a Ph.D. Dissertation of Education

August 2018

A Dissertation Submitted to the Graduate School of Education in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Education (Global Education Cooperation) at Seoul National University

Confirming the Ph.D. Dissertation written by
Bethel Ghebru

Chair	David Wright
Vice Chair	Kim Taekyoon
Committee	Yoo Sungsang
	Chang Yongkyu
	Suh Soonshik

ACKNOWLEDGMENTS

I would like to express my deepest appreciation to all the people who in one way or another contributed to the completion of this study. I am greatly indebted to Prof. Lynn Ilon, Prof. David Wright and Prof. Yoo Sungsang. I am also grateful to Dr. Mildred Lodiaga and all the staff at Kenyatta University's department of gender and development studies, and all the staff members at the ECX as well as the Ushahidi. My special thanks to my friend Mark Lloyd.

Table of Contents

List of Figures

List of Tables

Abbreviations

ADLI	Agricultural Development Led Industrialization
CDN	content delivery network
CI	Conservation International
CRECO	Constitution and Reform Education Consortium
DfID	Department for International Development
DI	Development Initiatives
EACWSE	Ethiopian Agricultural Commodities Warehousing Service Enterprise
ECEA	Ethiopia Commodity Exchange Authority
ECX	Ethiopian Commodity Exchange
ETB	Ethiopian Birr
IATI	International Aid Transparency Initiative
ICT4D	Information and Communication Technologies for Development
ICTs	Information and Communications Technologies
IFPRI	International Food Policy Research Institute
IIEC	Interim Independent Election Commission
IMF	International Monetary Fund
KES	Kenyan Shillings
KIEMS	Kenya Integrated Election Management System
OKI	Open Knowledge Initiative
Open AIR	Open African Innovation Research
SNNPR	Southern Peoples and Nationalities Region
TVET	Technical and vocational education and training
UNCTAD	United Nations Conference on Trade and Development

Abstract

Innovation in East Africa: An Exploration of Open Development Approaches

Bethel Ghebru
Global Education Cooperation
The Graduate School of Education
Seoul National University

The main purpose of this study is first to determine the core concepts of open development approach that set the theoretical open development model by putting forward better future open development plans and practices in comparison to traditional developmental approaches. This study took three case studies which appeared to be built around an open development approach and attempts to test and critically analyze, within the limits of three case studies, the efficacy of this approach. The cases are emerging innovative entrepreneurial enterprises at work in the East African developing countries of Kenya and Ethiopia.

The study first examines the theoretical underpinnings of the approach and how the theory supports the application of open development approach. From there, the open development approach was conceived intellectually, and scholars tried to lay out characteristics of the approach (even as projects/cases were already underway or in use). The open development approach is about innovative initiatives that employ knowledge which is built and shared collectively and networked in design with a locally-derived idea to be applied to local context and needs. The key characteristics of the approach reveals that ideas have evolved out of the opportunities afforded by emerging technologies, networks and learning and provided the opportunity to solve local

problems. They are also networked in design and grow extensively within the networks. In addition, knowledge is built and shared collectively which eventually results in societal benefits. This helps provide for favorable conditions for people to bring the solutions themselves and adequately satisfy their needs while protecting their wellbeing.

The analysis of the outcomes of this societal development ranges from whether the communities or societies benefit from the use of this approach through the impacts on their lifestyle, to increasing the openness of access to knowledge and information. The impacts of the open development approach as discovered from the study indicates that services provided by the cases are diversified; and they provide secure and enhanced efficiency by being inclusive to marginalized groups and promoting social cohesion. Even though the provision of expanded resources analyzed from their impact on economical livelihood and mitigation of poverty of the beneficiaries has shown difference for the cases, overall the analysis shows an important social change in the lives of the beneficiaries.

Keywords: open development, endogenous growth theory, networks, learning theory, M-PESA, ECX, Ushahidi

Chapter I. Introduction to the Study

In an ever globalized and rapidly changing world, knowledge and technology play a significant role in everyday life, and the field of international development is changing in response. Viewing the world as interlinked, integrated and networked where the changes in one part of the world affect changes in another, international development can now be seen, not as how "rich" worlds contribute to the development of "poor" worlds. But it is seen as how linkages can sometimes serve to create links that improve the lives of those who have been generally marginalized. "Open development," is a term now in common use that encompasses components of an integrated world, sustainability, the value of knowledge, learning and equity. This study attempts to answer the question about whether individual programs which appear to use the open development approach, actually produce societal advances.

Open development refers to the newly developing set of possibilities to accelerate progressive changes through open information networked activities. This includes the ways in which new Information and Communications Technologies (ICTs) transform modes of participation and production, human development processes and access to knowledge resources (Bentley, 2014). More comprehensive and renovating development outcomes can be produced under these new models of technology assisted networked activities. The global linkage is constantly expanding in knowledge, driven by innovation and learning occurs through networks. Open Development uses knowledge as a resource that can be built, shared and distributed on networks in ways that it benefits individuals and groups. Smith and Reilly (2013) define open development in the following way:

> [W]e inhabit a world rapidly on its way to becoming a network society, which poses significant opportunities and threats for international development …[T]hese changing conditions and new opportunities are becoming increasingly central to development processes. …[networked] increasing diffusion, interconnection, and integration across all levels and societies around the world is significantly changing how people can and do organize themselves to accomplish shared goals. …thus affecting the ways in which we share knowledge, coordinate, organize, collaborate, make decisions, and so on. We refer to the application of these open models and to the logic behind their use in international development as [O]*pen [D]evelopment* (p.3)

Even though the emphasis here is on a networked world that is interconnected, the authors also emphasize the importance of basing the problem-solving on local contexts:

> …openness is conceived of and applied in a variety of ways. This is particularly true given that the idea of development is itself contested terrain, and development issues are themselves highly localized. …we need to pay careful attention to working through local contexts when pursuing new [O]pen [D]evelopment initiatives (Smith & Reilly, 2013, p. 6).

Therefore, open development is about access to information and knowledge that is built and shared collectively and networked in design with a locally-derived idea to be applied to local context and needs.

This study takes three case studies which appeared to be built around an open development approach and attempts to test and critically analyze, within the limits of three case studies, the efficacy of this approach. The study first examines the theoretical underpinnings of the approach and how the theory supports the application of open development approach. From there, the open development approach was conceived intellectually, and scholars tried to lay out characteristics of the approach (even as projects/cases were already underway or in use). Open development is described below along with its assumed characteristics. The cases are then examined to see whether they, in fact, fit these characteristics.

The study then proceeds to examine what impact the cases had on the lives of the people impacted. First, is there macro evidence of changed lives that follow a rather traditional definition of societal advances? Second, how do people describe the changes in more contextual circumstances? How can these impacts be categorized and also be examined through the cases in contrast with the literature at hand?

Finally, in the discussion, the study tries to take a broader look at the following questions, which are pertinent to the study: 'Does open development yield societal advances that might not otherwise be gained? If so, what might the evidence be? There is some notion of this in the open development literature. What is the evidence derived from studying the processes of the cases and the outcomes for the people impacted?'

1.1. Background of the Study

The open development approach is an application of a new theory of economic growth. The theory was suggested in 1990[1] (Romer, 1990). The theory proposed an alternative view of how societies grow economically. Knowledge was considered a major contributor or economic growth. Romer showed how knowledge worked differently than physical inputs to help a society grow. Paul Romer, proposed a new theory of development which recognized the creativity of human intelligence and added it to the equation of how nations (families, individuals and communities) made gains in their well-being. He agreed with the traditional theory of economic growth that said that materials, investments and labor were components of progress. But, he said that

[1] Although, that work derives from the Nobel Prize winning work of Robert Solow in 1957 (Solow, 1957).

knowledge was missing from the traditional view, and knowledge was in fact more important. It was the ability of people to think of ways to combine their resources creatively which made societies progress. Because knowledge is generated *within* a country (community, family) rather than physically obtained, generated through capital investments, or requiring hiring labor, he deemed it "endogenous", meaning "from within." Because new and innovative ideas involved changing the *mix* of these traditional resources (materials, labor, capital), he called it "technological change." The article that proposed the theory was called "endogenous technological change" (Romer, 1990).

As a resource, ideas worked in ways that other resources did not. Once developed, ideas are cheaply shared and can be used simultaneously by many people (unlike, for example, a pencil or the labor of a plumber) (Romer, 1990). When Romer said that knowledge as an important resource, he also explored how knowledge would work for a society. He also called this knowledge, "ideas." Ideas have special qualities as economic resources. Knowledge is an infinitely expanding resource, cheaply distributed and usable by many people at once. This is really different from physical resources, which are used in traditional economic development theory and used in growth models. If ideas can grow, be shared and expand through networks, then they are not a scarce resource. Expanding the resources, opening it for public use, making it available for countries, industry, people and communities expands the resource (Stiglitz, 1999).

The application of this theory, known as "open development" derives directly from endogenous growth theory and the concepts of knowledge as a resource. Open source, open networked, open learning concepts that help poor countries build, spread and use knowledge to improve their own lives, it is now a rapidly growing view of development

(Ilon, 2015; Lundvall, Joseph, Chaminade, & Vang, 2011; Stiglitz, 1987). Hence, the underlying principles of open development methods includes putting into practice social networks for collaboration. This helps provide for favorable conditions for people to bring the solutions themselves and adequately satisfy their needs while protecting their wellbeing. This application is new, and the academic work that corresponds to it appears under the titles of "Development 2.0," and "open development." Because open development is an application of the theory, it is sometimes referred to as the open development approach.

1.2. Purpose of the Research

The main purpose of this study is to put forward better future open development plans and practices in comparison to traditional developmental approaches. Specifically, for example, local problems are identified by members of the local community, rather than by development experts from elsewhere; the spread of knowledge is understood to be networked, as opposed to controlled and regulated; and, in terms of outcomes, benefits are viewed as changes in opportunities and expanded methods of operating in a given environment on the part of members of the local community, rather than social benefits being expected usually on the basis of monetary measures, an approach that has proven highly unsatisfactory on the whole. With regard to the agents and institutions involved in development, and the ways in which the open development model might change them for the better, development practitioners could benefit by getting a comparison of the processes and outcomes of open models and those of traditional approaches. Furthermore, policy makers might infer good practices and bring this vision more directly into their programs. The outcomes could be evaluated in terms of the

knowledge that grew collectively through networks and whether the communities or societies benefit by increasing their learning capabilities and knowledge access. It is expected that these open models will continue to be transformative so that the outcomes contribute in initiating positive change. Since major development organizations are clearly embracing this approach, the significance of a clear comparative project study can add value to the understanding of its importance.

1.3. Research Question

The main research question to be answered is: Does the open development approach foster the envisioned societal advances?

In order to answer this question, the following specific sub-questions are addressed.

1. What are the key characteristics of open development approach and how well do the activities fit the key characteristics?

2. What are the local impacts of the cases under study outlined by the open development approach?

The first sub-question will be answered within the literature review but will also be addressed as part of the research process when project documents can be analyzed. The second sub-question will be addressed through the analysis of interviews as well as field observation by using qualitative research techniques. As such, in total, this research employs a mixed-methods research design. Then, it will be attempted to find a way to document this in quantitative terms including trends over time. Within this design, three development cases will be used.

The research questions posed above are going to be analyzed through a thorough analysis of the existing literature and through information that is going to be collected through interviews and observations with development practitioners. In addition, the sources of data could include government and private enterprise reports and unofficial documents; mixed methods design is used to analyze data through the application of appropriate instruments as, explained later in this dissertation.

This study first determines the core concepts of open development. Then the expected outcomes are pointed out and discussed. Open development is an application of a theory that has not yet been examined carefully in its application. Therefore, this study took three examples of development activities or emerging innovative entrepreneurial enterprises at work in East African countries; two cases in Kenya and one in Ethiopia and try to examine whether they fit the open development model. The cases under exploration are assessed based on the theoretically expected results whether they are successful in benefiting communities in the ways that the open development approach is intended to do. The study attempted to examine whether the cases under examination can lead to development processes and outcomes that are derived by local ideas, networked and beneficial.

For this, interviews with practitioners and designers of the case studies were conducted. The interviews focused on the impact of the network on everyday lives, transactions and lifestyles and get a sense of how it changed behaviors or actions. Then, it attempted to find a way to document this in quantitative terms, including trends over time. Relevant literature and archival documents were also reviewed and analyzed along with the analysis of any applicable data that comes across through the interview scripts of practitioners and other parties involved. In so doing, the study begins by examining

and discussing in detail the theoretical background and linkages, the use of terms and how they evolved.

1.4. Significance of the Study

The long-term development prospects from open development are primarily the equitable and sustainable well-being of the community members. The emergence of this approach has already begun to demonstrate its potential for initiating positive changes (Smith & Reilly, 2013). Open approaches describe the distinct configurations of content, people and processes that connect them together. This can be facilitated effectively, that is, open development models can succeed, to the extent that all knowledge creation and sharing is becoming more network-oriented in general (Benkler, 2006). Benkler (2006) further explains that "the availability of free information resources makes participating in the economy less dependent on surmounting access barriers to financing and social-transactional networks that made working out of poverty difficult in industrial economies. These resources and tools thus improve equality of opportunity."

As a result of this, the open development approach empowers local groups to facilitate political and societal change with less unwanted interference from external organizations. It is therefore open development in the sense that it is inclusive. However, established development agencies would obviously be expected to continue to have a big role to play. Now that development agencies such as the World Bank are employing this open development approach, more countries and institutions might be encouraged by analysis of cases which appear to use an open development approach. In other words,

some of the institutions that have historically been associated with traditional approaches to development are now transitioning to the open approach.

In this context, the significance of the present study is that the locally-derived idea based initiatives analyzed and discussed in the research have been connected with existing theoretical work on open development, and in so doing, the study has proved the effectiveness of this approach in facilitating societal benefits in contrast with traditional approaches to development. In other words, in showing how the open development approach was pursued in the cases described in the research, and the impacts that have been achieved, the study shows specifically how the open development approach changes people's lives. It demonstrates that that the open development approach provides diversified functions, enhanced efficiency, expanded resources, and strengthened social interaction.

Chapter II. Theoretical Model

According to (Bellù, 2011), development could have various dimensions in the aspects of economic, human (such as health, education, capabilities, empowerment etc.) and territorial (which is socio-economic, environmental and institutional development of an area). Development can be conceptualized as a process of structural societal change. Thomas (2000) refers to this meaning of development as 'a process of historical change'. According to (Gore, 2000), this view of structural transformation and long-term transformations of economies and societies is one that dominated in the 1950s and 1960s in particular. The key characteristics of this perspective are that it is focused on processes of structural societal change, it is historical, and it has a long-term outlook. This means that a major societal shift in one dimension, for example from a rural or agriculture based society to an urban or industrial-based society (what is sometimes called the shift from 'traditional' to 'modern' characteristics), would also have radical implications in another dimension, such as societal structural changes in the respective positions of classes and groups within the relations of production for example (by which we mean the relationship between the owners of capital and labor). This means that development involves changes to socio-economic structures – including ownership, the organization of production, technology, the institutional structure and laws (Deane, 1979).

2.1. Neo-classical (Exogenous) Development Theory

Traditional development theory is built on an older model of economic growth known as neo-classical theory (Arndt, 1987). This traditional model, which is also

known as the neo-classical growth model or top-down development model, says that social progress comes through the accumulation and growth of money and physical resources. These are built from materials, labor, and investments of money. “The primary goal of development economics has been to achieve economic growth. The implicit reasoning is that increases in GDP increases the nation’s welfare.” (Islam & Clarke, 2002, p. 203). Markets, accompanied by competitions for comparative advantages among individuals and corporations are supposed to enhance economic efficiency to bring about developmental growth (Friedman & Friedman, 1990). The wealth created by the more successful parts of the economy and more successful people is expected to naturally trickle down and benefit everyone. Therefore, countries are expected to focus on ensuring the right environment for the rich and the larger companies to thrive.

The process of development was viewed as a series of successive stages of economic growth through which all countries must pass. Countries are thought to progress by the lessons taken from the behaviors of financially successful individuals, corporations or other nations. It was primarily an economic theory of development in which the right quantity and mixture of saving, investment, and foreign aid were all that was necessary to enable developing nations to proceed along an economic growth path that historically had been followed by the more developed countries (Todaro & Smith, 2003). Development thus became synonymous with rapid, aggregate economic growth.

This theory and its practices, however, have resulted in development policies that are uneven. The consequences of all this process have revealed rather a widening inequality among countries (Birdsall, Ross, & Sabot, 1995). The economies of countries with lesser comparative advantage and unbalanced trade flows are forced to face decline

making them to entirely depend on the development assistance of others. Developing countries are then opted for loans from Western nations and their financial institutions which have been left as debt burdens unpaid for decades. Preconditions offered in exchange to development aid, which continued to make empty promises rather than offer a better reality, debatably, later led to a downturn in the economic growth of many developing countries. However, despite all development assistance efforts, poverty and hunger in the developing world is still as wide as it was several decades ago. The life quality of people fundamentally worsened regardless of aid flows from the West and the efforts of developing country governments.

The idea that the well-being of people is based upon economic growth and wealth has problems that are well recognized by people who study the field. Aside from growing inequality, natural resources are limited, and the entire world cannot use as a model the lifestyle and capital accumulation of the wealthiest people in the world. Pollution, ecological damage and natural resource exhaustion is unsustainable (Costanza, Hart, Talberth, & Posner, 2009). The traditional development model, based on the principle of infinite economic growth that is measured by GDP, has turned out results in the destructive challenge to use the earth's limited resources to satisfy unlimited needs (Stiglitz, Sen, & Fitoussi, 2010).

In sum, the main shortcoming of the predominant approach to development is that its emphasis on the growth of money and the use of physical resources has actually resulted in greater inequality between nations. Consequently, as the present study will demonstrate, the greater emphasis on locally driven initiatives to solve local problems through the spread of knowledge via networks is providing a better alternative in terms

of societal benefits. In what follows, the theoretical basis for the open development approach and for the analysis in the present study is described and shows why the open development approach might produce greater societal benefits.

2.2. The Logic of Endogenous Growth Theory

This study uses the concept of the "open development" approach based on the endogenous growth theory which derives, initially from the work of Robert Solow. His work laid the foundation for a new economics of development which has since been broadened. Since the theory is still evolving, as several theorists work on it from many fields, it has various names. I trace, first, the main theoretical components of the theory.

Endogenous Growth Theory

The endogenous growth theory was developed as a reaction to omissions and deficiencies in the Solow neoclassical growth model. It is a new theory which explains the long-run growth rate of an economy on the basis of endogenous factors as against exogenous factors of the neoclassical growth theory. The major concepts of development in the Solow model have remained rather stable throughout time although there is some thought now, that, with globalization, the concept of development is merging with the overall concept of social development and macroeconomics (Mansell, 2014; Solow, 2000). In 1987, Robert Solow was awarded the Nobel Prize in Economics for his work on Economic Growth and began, what is recognized as a revolution in economic theory. His Nobel prize speech was called "Growth Theory and After"

(Nobelprize.org, 1987). Solow began by saying that "knowledge" was important as an explanation of growth and he added this element to the traditional growth model. Solow said that labor (skill, unskilled, etc.) was important but "knowledge" was a separate category[2]. Years later, Paul Romer (1991) is credited with first introducing a new model of the theory by building up from the previous work of Robert Solow (Solow, 1957). Romer said that knowledge had economic qualities that made it operate differently than other economic resources (such as materials, capital and labor).

Early theorists in knowledge economics, therefore, made a clear distinction between the old concept of human capital and the new view of collective and public knowledge.

> A distinction that may be worth clarifying is that between "embodied human capital" (i.e., the skills and abilities possessed by people) and "knowledge" - the accumulated stock of ideas themselves, which may be embodied in people, physical capital, blueprints, scientific texts etc. Both are important for growth, but knowledge is arguably more important for driving long-run growth, and is the main focus of this paper. Although knowledge and human capital can be distinguished conceptually, clearly there are important links and complementarities between them. For one, human capital is an important input into the creation, acquisition and application of knowledge a more educated workforce is more likely to identify, understand, develop and implement useful new ideas (see Dowrick 2002). Secondly, possession and understanding of knowledge is one of the defining features of human capital - although not the only feature. (Blakeley, Lewis, & Mills, 2005, p. 7)

Romer's version of the theory was first called "endogenous technological change." It is "endogenous" because the production of ideas grew *within* the country (endogenous). He referred to "technological change" as the *ideas* that change the mix of resources. Technological progress is endogenous, in the sense that new ideas are

[2] This deviates from the human capital view that labor is a continuum of "quality," running from uneducated to education.

embossed in new products which bring about new ideas as well as new habits. As the long-run growth rate depended on exogenous factors, the neoclassical theory had few policy implications. Romer (1986) pointed out that in models with exogenous technical change and exogenous population growth, it never really mattered what the government did. Generally, older theories and the new theory are distinguished by whether or not they explain societal progress through "exogenous" or "endogenous" means. According to Robin Mansell (2014), models aligned with the former term often are employed to justify interventions aimed at using new technologies to stimulate economic growth in the developing world. For instance, investments in ICTs, in the form of the Internet and the World Wide Web and, more recently, mobile telephony, are seen as 'exogenous' interventions that can close technology gaps between the rich and the poor. Endogenous models have been developed to provide insight into the factors such as those associated with learning and the local context that influence the development processes (Mansell, 2014).

The Openness of Knowledge

Romer (1990) noted that ideas or *knowledge* operates differently than the production of physical goods. While ideas may be expensive to develop (requiring considerable time and energy – often from the brightest minds), ideas are cheap to reproduce, spread and share. The non-rival (meaning that once an idea has been developed, others can use the idea at no additional cost) and non-excludable (the owner cannot prevent others from using it) characteristics of knowledge as a public good can make nations or communities benefit from using it.

When knowledge has these characteristics, it can expand infinitely without using up precious or infinite sources within a society. Given these characteristics and the fact that, under endogenous theory, it is a valuable resource for any society, the ground was laid for exploring the *openness* of knowledge. Unlike other resources which had to be used efficiently (in order to preserve their expendability), knowledge, might best be used *openly* as an expanding resource for society.

The book by Harvard University's David Weinberger (2011) "Too Big to Know" discusses how knowledge itself changes in the age of the internet -- what it means to know something when there are billions of "things" at our fingertips, when everyone who might disagree can find and rebut assertions, and when the ability to be heard is not tightly bound to credentials or public reputation for expertise (Weinberger, 2011). He talks about the new shapes of knowledge that knowledge can be crowd-sourced, distributed and sought from "the crowd" of internet users who develop it. Knowledge is boundary-free not only in the hands of "experts" any more and one doesn't have to have credentials to be an expert. Amateurs can offer solutions and ideas as well. Knowledge is also unsettled that experts used to have decisive answers but now knowledge keeps being developed.

Armstrong and Hagel (2000) indicate that the Internet presents a social and economic opportunity for a collective creation of knowledge. Norgaard (2004) demonstrated how experts in a number of epistemic communities use a variety of models and approaches working together to understand climate change, biodiversity loss, and other large-scale phenomena stemming from how people interact with the environment. Human beings have ability to learn from each other, a capacity that

dramatically lowers the cost of acquiring information necessary for local, contingent adaptations. This capacity enables humans to gradually accumulate information across generations and develop well-adapted tools, beliefs, and practices that no individual could invent on their own (Boyd, Richerson, & Henrich, 2011).

The Role of Networks

One of the most important distinguishing factors of open development approach from the endogenous growth theory is the application of open information-networked activities and knowledge exchanges. Social network theory studies how people, organizations or groups interact with others inside their network and it focuses on the role of social relationships in transmitting information, channeling personal or media influence, and enabling attitudinal or behavioral change (Liu, Sidhu, Beacom, & Valente, 2017). It provides guidelines for the development and appraisal of particular theories of knowledge creation, diffusion and utilization. The concept of social networks could be interrelated by implying how people combine their knowledge to build new knowledge, especially to solve complex problems in an interlinked world (Nieves & Osorio, 2013). Social networks allow their members to access new knowledge. Knowledge creation results from the exchange and combination of knowledge that networks provide through the different dimensions of their social capital influencing innovative performance.

Siemens (2006) argues that knowledge does not only reside in the mind of an individual, knowledge resides in a distributed manner across a network and that learning is the act of recognizing patterns shaped by complex networks. New networks are emerging whereby people begin to learn through technology networks. The emergent

and self-organizing characteristics of networks make them different to institutional hierarchies such as schools (S. Chan, 2001). Moreover, technologically complex, global and knowledge based society requires a new education order (Bereiter, 2002; Drucker, 1993). One good example of the role of networks is crowdsourcing, which is the process of harnessing human intelligence, ingenuity, and capital through large-scale networks and it has become ubiquitous within the development, academic and the business world (Sangster, 2014). Crowdsourcing is an evolving phenomenon and can refine complex development issues by closing the feedback loop and including those most affected by the development or aid work in decision making processes. It serves as a powerful tool in international development in transforming the way that international aid work is conducted in many locations around the world. Inherent in this approach is the theoretical notion that broad democratic participation increases accountably and corrects poor performance.

The learning of knowledge is distributive, that is, not located in any given place (and therefore not 'transferred' or 'transacted' per se) but rather consists of the network of connections formed from experience and interactions with a knowing community (Downes, 2010). Learning networks such as the 'e-learning 2.0' are the approaches to learning that are based on conversation and interaction, on sharing, creation and participation, on learning not as a separate activity.

When knowledge is viewed as a collective good, then networks can play a large role in building such knowledge. Networks play a crucial enabling infrastructural role for the future societal progress within four of Sen’s (1999) five developmental indicators: economic opportunities, political freedoms, social facilities, and

transparency guarantees – and in the development of 'knowledge societies' as a key accelerator for development (Sen, 1999). According to Thompson (2008), ICT viewed as an 'architecture of participation', becomes an opportunity for generating, mediating and moderating a particular conception of social life; which in turn poses a direct challenge to much of the way in which 'development', with its associated visions for social life and supporting infrastructure, has been conceptualized and delivered to date. Cooperative behavior can be transmitted across social network ties in sequence to others who were not part of the original interaction (Fowler & Christakis, 2010).

The creativity of human beings who can think of new ways of using their physical resources and new services creates the stimulus for a society to progress forward or to manage in a threatening situation. If the society can collectively and freely discuss major issues facing the society, thus building new collective understanding and act on this new understanding, the society will be able to avoid or mitigate major disasters (Sen, 1995). Smith and Reilly (2013, p.22) explains this in terms of the advent of the network society in which the benefits (or challenges) of greater flexibility are available to everyone in the information age, not just corporations, as a result of the ways in which ICTs enable open spaces of interaction.

Open Development and Societal Benefits

There is no suggestion in the relevant literature that the open development approach can or ought to replace those methods that are proven to be effective, as Smith and Reilly (2013) point out:

> [O]penness offers clear potential benefits in the realization of development objectives. (p.5) …open models are layered on top of existing structures…[I]t is important to point out since [O]pen [D]evelopment is best understood as an evolution, not a disjuncture… [W]e should not abandon the growing set of lessons learned from disciplines such as information and communication technologies for development (ICT4D). (p.6.)

However, the most important difference between traditional approaches to development and the open development approach is the way in which these societal benefits are to be achieved. Among the vast literature, there seem to be about four categories that might best describe these potential benefits. These are: social development, human development, human security and capability. Apart from this, open development has also knowledge benefits viewed as changes in opportunities and expanded methods of operating in a given environment. People will have access to ICTs in a restructured and improved way of educational environment so that they will be enabled to take advantage of the benefits of informational capitalism and create the conditions necessary for social development (Smith & Reilly, 2013, p. 17).

Social development focuses on the need to "put people first" in development processes. The main point of most social development seems to be inclusiveness and cohesion (World Bank, 2005b). Inclusive institutions promote equal access to opportunities, enabling everyone to contribute to social and economic progress and share in its rewards. Cohesive societies enable women and men to work together to address common needs, overcome constraints and consider diverse interests. They resolve differences in a civil, non-confrontational way, promoting peace and security. Accountable institutions are transparent and respond to the public interest in an effective, efficient and fair way. Social development is also about improving the well-being of every individual in the society, so they can reach their full potential and it involves

learning the values, knowledge and skills enabling individuals to relate to others effectively and to contribute in positive ways to the community (World Bank, 2005b).

Human development deals with improving the lives people lead, rather than assuming that economic growth will automatically lead to greater opportunities for all. Income growth is an important means to development, rather than an end in itself (UNDP, 2017). Human development is about giving people more freedom and opportunities to live lives they value. In effect this means developing people's abilities and giving them a chance to use them. Basic foundations for human development are to live a healthy and creative life, to be knowledgeable, and to have access to resources needed for a decent standard of living.

Human security is about protecting "the vital core of all human lives in ways that enhance human freedoms and human fulfillment. Human security means protecting fundamental freedoms – freedoms that are the essence of life. It means protecting people from critical (severe) and pervasive (widespread) threats and situations. It means using processes that build on people's strengths and aspirations. It means creating political, social, environmental, economic, military and cultural systems that together give people the building blocks of survival, livelihood and dignity." (CHS, 2003, p. 4). The UN Commission on Human Security[3] re-conceptualizes security as moving away from traditional, state-centric conceptions of security that focused primarily on the safety of states from military aggression, to one that concentrates on the security of the individuals, their protection and empowerment; and drawing attention to a multitude of threats that cut across different aspects of human life and thus highlighting the interface

[3] Commission on Human Security was established in 2001 in response to the UN Secretary-General's call at the 2000 Millennium Summit.

between security, development and human rights; and promoting a new integrated, coordinated and people-centered approach to advancing peace, security and development within and across nations (United Nations, 2009).

Capabilities are what Amartya Sen labelled "doings and beings". Essentially, they are the skills, aptitudes, endowments and potentials that individuals have to make choices in their lives, and in consequence live the life of their choosing. Capabilities are bound by freedom and represent the essence of a person's potential in life, what they can achieve under their current circumstances, whether those limitations are inherent or imposed (Sen, 2009). As Sen (2009: 5) states, “Capability reflects a person's freedom to choose between different ways of living.” Social arrangements should be primarily evaluated according to the extent of freedom people have to promote or achieve ‘functionings’ they value, i.e. various things a person may value and have reason to value doing or being (Sen, 2009). For example, information that is shared through technology such as ICTs can become capability enhancers, allowing people to make better judgments by virtue of having access to knowledge that was once not available to them (Hamel, 2010). Capability can be applied at two distinct levels of evaluation – namely, assessment of an individual’s wellbeing or more generally personal advantage and assessment of the goodness of a social action or a social arrangement – in terms of its attributes such as justice at any point in time or progress over time, i.e., development in the broadest sense (Osmani, 2017).

Based on the preceding discussion, a general theme emerges, that of societal benefits being related to individual as well as group aspects of development, including

security and capability. However, open development appears to have other benefits as well. Smith and Reilly (2013) puts it in the following way,

> [O]pen models can bring about redistribution in the benefits of developmental gains. As a result, open models …influence the allocation of resources and, therefore, power. They will also imply new… models of knowledge production that adjust patterns of participation, decision making, or construction of meaning… (p.8)

In other words, the great merit of open development is that it empowers regular citizens due to the ways in which it connects and brings about the allocation of resources. Generally, we could think of development goals as working toward these aims. For the purposes of this dissertation, this kind of development goal, encompassing these sorts of benefits, will be referred to as "societal advances." In this context, knowledge production and inclusion that alters patterns of participation is extremely significant, and in this respect open development clearly differs from previous traditional approaches.

The characteristics of traditional and new approaches to development are represented in Table 1 below. Specifically, various factors are revealed in development work, and the differences between the two approaches on this basis. The two theories under consideration are neo-classical development theory and endogenous growth theory, and the two developmental applications that correspond to these are the traditional approach and the open development approach. In other words, from the perspective of the findings sought in the present study, the aim was to determine the relative effectiveness of the open development approach. The comparison between the two approaches makes clear that they have characteristics that are different.

Table 1. Comparison between traditional and new approaches to development

	Traditional (neo-classical growth model)	New (Open development)
Source of problem identification	development experts	local problem identification
Use of local contextual knowledge	brought in later	centralized
Use of outside expertise	centralized	brought in later
Spread of knowledge	controlled, regulated	networked, open
Sustainability	length of project; possible residuals	built into design
Source of ownership or funding	usually governments or NGOs	any sector
Outcomes	social benefits usually linked to monetary measures of poverty reduction	knowledge benefits viewed as changes in opportunities and expanded methods of operating in environment
Measurement of outcomes	usually monetary; often quantifiable	linkages and expanded opportunities, resilience

Traditional development approach, which is the neo-classical growth model, is centered on experts from outside the context in question; local people with relevant knowledge are brought in only once a project has begun; and finally, social benefits to participants are only experienced for the duration of the research in question. However, the new approach (which is the open development approach in this study) uses local ways of problem identification within local contexts as solutions to the problem, whereas previously one of the central pillars of development was global expertise brought in the at the later part of the process. It seems clear that the open development approach is more sustainable given that projects can potentially continue for as long as the members of the local community are there, whereas in the case of projects designed by experts from outside the results often last only for the duration of the project. However, in the case of the open developmental model, there is usually a high degree of

ownership on the part of members of the local community, and that makes this approach sustainable. On the other hand, there are circumstances in which a specific open development project may not be sustainable, for example, if a nation's government makes a policy change that somehow prevents this project from becoming self-sustaining.

In addition, the new approach is networked and open in the manner that knowledge is spread trying to build sustainability into the design, and the major players could be either government, the private sector or non-government bodies, as in the cases under consideration in this study. As governments, NGOs, or other change activists increasingly and more effectively tap into the benefits of shared knowledge and collective intelligence to accomplish their goals, the trend continues to increase and spread, sharing and collaboration also spread, further propelling the shift to the new approach.

Outcomes expected in classical models of development are often benefits linked to economic measures of poverty reduction that are quantifiable. However, the new approach goes beyond this to provide knowledge related benefits seen as changes in opportunities and expanded methods of operating in challenging environment. In sum, what has been witnessed is a clear progression from traditional approaches to new open approaches to development. In what follows, the link between the endogenous growth theory and the open development approach is described.

One way to consider the relative effectiveness of the open and traditional approaches is through the use of a null-hypothesis. With regard to the research, the projects (cases for purposes of this study) are not based on a *model* (that is, open

development), they are *presumed* to follow the characteristics of the model, but cannot be *assumed* to follow the model until carefully studied. Therefore, we cannot assume that the cases are based on an open development approach unless we study them very carefully. On this basis, the following null-hypothesis is offered: 1) what appear to be 'new models' of development do not, upon closer examination, seem to fit the open development model or (2) the new models do in fact fit the open development model, but there are no discernible social benefits.

Development and Endogenous Theory

Endogenous growth theory stresses the importance of knowledge for societies in economic growth, noting that discoveries differ from other inputs because they are 'non-rivalrous' (i.e. their consumption by one consumer prevents simultaneous consumption by other consumers) and fuel further innovation. It underlies a new thinking about how people's ideas operate within society and how knowledge contributes more as knowledge is opened and shared (Romer, 1992). The theory argues that innovation and new technologies do not occur simply by random chance. Rather, it depends on the number of people seeking out new innovations or technologies and how hard they are looking for them. In addition, people also have control over their knowledge capital.

Endogenous growth theory is rapidly being embraced as a theory which is leading the way that development is being planned and implemented. Major development organizations are embracing the approach. World Bank President Jim Young Kim stated, "The World Bank sees openness and transparency as key to delivering better

development results and strengthening accountability" (Hickey, 2013). USAID has declared "open development" has a primary approach to development (Rucker, 2013). The President of a major world think tank on development, "One.org" states that the Millennium Development Goals (MDGs) ought to be planned with open development philosophies and guidelines in mind (Githongo & Drummond, 2010). Although the approach emerges from a convergence of many theories, it makes sense to do a project study where particular cases can be compared on specific criteria as to processes and outcomes.

Columbia University's Stiglitz, J. E., & Greenwald, B. C. (2014) in their book "Creating a Learning Society: A New approach to Growth, Development, and Social Progress" discusses the case that economic growth is no longer a question of efficient allocation of resources, specifically labor and capital (aka static efficiency) but the creation, dissemination and utilization of knowledge (or innovation) (Stiglitz & Greenwald, 2014).

In 1999 the World Development Report on Knowledge for development analyzed the risks and opportunities that the global information revolution is creating for developing countries (World Bank, 2011). It concluded that knowledge, not financial capital, is the key to sustained economic growth and improvements in human well-being. Three years before, the World Bank had already begun to position itself as a knowledge institution, not just a lending bank, by creating, sharing, and applying knowledge for development. Soon afterward the World Bank launched the Open Knowledge Initiative (OKI) with the aim of making its knowledge work more accessible to a broad base of interested parties, covering both state and non-state actors.

The promotion of wider access to knowledge leads to the achievement of broad economic benefits to the society. Shared knowledge could serve as a way to unlock trapped economic value, which will inevitably lead to new and expanded business opportunities and it can help to innovate the solutions humanity needs most— such as low-cost health interventions and improved seeds suited to environmental conditions in the global South (Shaver, 2009). Chichilnisky stated that knowledge puts humans rather than land or machines at the center of economic growth (Chichilnisky, 1998). It was found that knowledge shared through information systems made a substantial and statistically significant contribution to firm output (Brynjolfsson & Hitt, 1993).

The diffusion and additive properties of knowledge through effective information networks which are facilitated by modern telecommunication technologies (frequently based on public-private partnerships) are designed to encourage cooperation among firms, universities, and government research centers. Societies are moved forward by the production of ideas, creativity and innovations (Cortright, 2001; Romer, 1992). Because knowledge is an ever-expanding resource, cheaply available and accessible, the challenge increasingly becomes the ability to learn (Araya & Peters, 2010; Archibugi & Lundvall, 2002).

Knowledge can spill over to those who did not create it, resulting in a social return to knowledge creation that is greater than the private return (Blakeley et al., 2005). The fact that knowledge or ideas are have different economic characteristics than other economic goods leads to a profound change in the way social growth is understood. In technical economic terms, the non-rivalry of ideas implies that increasing returns to

scale is likely to characterize production possibilities which serve as a source of long run growth (Jones, 2004)[4].

At the University of London, Archibugi & Lundvall in their book "The Globalizing Learning Economy" discuss about knowledge as it becoming increasingly important in contemporary economic systems, and economic growth and welfare depend on how promptly economic agents are able to exploit the benefits derived from technological innovations (Archibugi & Lundvall, 2002).

Former World Bank Chief Economist and Nobel Prize winner Joseph Stiglitz has been working on the theory of knowledge economics throughout his career (e.g., Stiglitz, 1987). He argues that that improvements in knowledge are a primary source of growth is even more compelling for developing countries (Stiglitz, 2011). He elaborated that creating a learning society, focusing on absorbing and adapting, and eventually producing knowledge, provides markedly different perspectives on development strategies leading for the well-being of a society.

2.3. "Open development" and its application

Romer's initial work set the stage for many other fields to begin work on the various aspects of knowledge - fields of communications, IT and education which indicate that ideas are best built using networks. There is even a new field that studies the changing nature of knowledge (Shirky, 2009; Weinberger, 2011) One concept that

[4] It is these characteristics that, ultimately, have made the model difficult to fit into the neo-classical growth model and, thus caused controversy within the Economics profession and caused theory to be viewed as an "Economic Revolution" (Chichilnisky, 1998; Temple, 1999).

has emerged is that ideas that solve complex problems are often best solved collectively through networks that allow for many people to combine their skills and perspectives (Sawyer, 2008).

Many fields are beginning to study this as it involves learning, networks, technology, development, economics, and communication. The primary link seems to be the research into the dynamics of learning and knowledge (Foray & Lundvall, 1996; Weinberger, 2011). Siemens states that the changing nature and context of knowledge influences everything: scholarship, teaching, research, corporate structure, leadership, marketing (Siemens, 2006).

Whereas endogenous growth theory is being rapidly built, its application is just beginning to be measured. ICTs can cut across these historical barriers and help connect the world's poor who have historically been excluded and disconnected from information, and from potential suppliers and customers (Heeks, 2010; Thompson, 2008). People who were no longer in the network became marginalized or switched off. Castells (2000) stated that access to ICTs is fundamental to inclusion in the network society, and inclusion in the network society is now a fundamental prerequisite for development. Expanding on this work, many authors suggest that the digital divide excludes regions or groups from participation in the network society (Castells, 2000).

Smith & Reilly (2013) stated that the ability of a given group to develop in the information age will not entirely depend on their access to ICTs, but rather on their ability to craft and/or take advantage of the new, more open networked social forms made possible by ICTs—the networked social morphologies that we call open approaches. Accordingly, open approaches are open networked structures and activities

which are made possible by the rapid spread of increasingly low-cost forms of networked communications infrastructure. This communications infrastructure and lower cost of entry enable to exploit free distribution of content and processes that leverage the power of people, to generate social change (Smith & Reilly, 2013). An open approach is not always sufficient for open development to happen, but the assumption is that decentralized collaboration and sharing can be harnessed to benefit greater numbers of people in more effective ways than through traditional development practices alone (Bentley & Chib, 2016). The use of the term "open development" seems to be adopted when the theory of Knowledge Economics (often combined with networks, learning, communication and other allied theories) are put into practice.

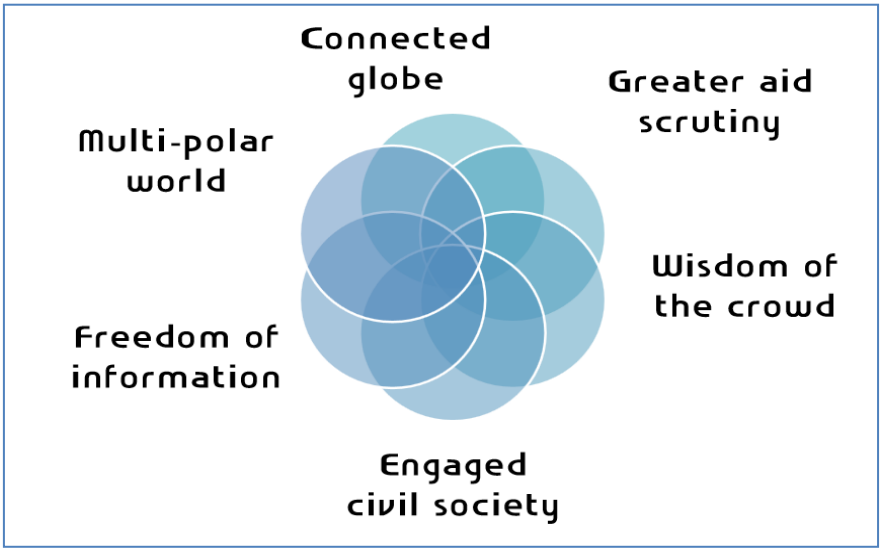
The underlying principle of open development is that increased access to information networks and communication possibilities, as well as new forms of participation and collaboration results in social, economic and political development. In this respect, it is less controlled information networks (such as crowdsourcing) take on new forms that alter how resources (information and people) are organized and mobilized to achieve desired outcomes (Heeks, 2010; Hickey, 2013). Moreover, open development is characterized by the engagement and innovation of more participatory, more collaborative, more inclusive and more beneficiary-driven approach providing the necessary resources to remain true to those goals. Its lower costs make it possible for marginalized but motivated participants to mobilize to adequate knowledge or resources (Barron, 2006). Besides, it shifts power and control due to open development challenging power relationships and the status quo (models of production, ownership and control of digital content and the networks on which the content passes); those marginalized will take the opportunity to take the open knowledge and expand it for the

production of creative solutions (L. Chan & Gray, 2013; Githongo & Drummond, 2010). Open development is sustainable and transformational (Heeks, 2010; Thompson, 2008). And it needs to be approached and understood in particular domains (e.g., health, education, government etc.) and specific development contexts of situations.

The Institute of Development Studies defines "open development" as looking into different aspects of openness, such as access to data, information and knowledge, the co-construction of new knowledge, the contextualization of knowledge, development processes, and power relationships which can contribute to development and social change. Multilateral and bilateral donors are simultaneously developing their own open development agendas in order to share their knowledge and experience more widely, while establishing a means for better governance and accountability of development aid resources (Bentley & Chib, 2016).

The World Bank has developed a map of the "open development" approach which shows how integrated these various aspects are as seen in the following figure below (Hickey, 2013). In addition, World Bank has opened data, knowledge and research to foster innovation and increase transparency in development, aid flows, and finances (Rossel, 2013). According to World Bank, open development is about making information and data freely available and searchable, encouraging feedback, information-sharing, and accountability (http://www.worldbank.org/open/).

Figure 1. World Bank Conception of Open development



Source: World Bank *(Hickey, 2013)*

UK's DfID (Department for International Development) has opened a Development Tracker (https://devtracker.dfid.gov.uk/) that uses open data on international development published by the UK Government and partners to show where the UK is investing in developing countries to implement the UK Aid Strategy. The open data is taken from the International Aid Transparency Initiative (IATI)[5] open data standard. The tracker is proposed to act as a hub around open development, bringing together tools and training materials in one place. The tracker's content is focused on increasing data literacy among civil society and journalists in aid-receiving countries, and it is envisioned that much of it will have a high reuse factor among other audiences.

[5] The IATI standard is an international standard for international development data and allows ready comparison of information from different donors (http://iatistandard.org/).

Other initiatives include the Open Development Toolkit (http://opendevtoolkit.org), which is a project from Development Initiatives (DI)[6] and the Open Knowledge Foundation[7], which began in January 2014. The Toolkit is purposed to act as a hub around open development, bringing together tools and training materials in one place, with the aim of increasing use of open development data and encouraging its use to inform decisions within the sector.

Tapscott and Williams (2012) talk about five basic principles of collaboration, openness, sharing, integrity and interdependence to open approaches. Probably the best explanation of this emerging new approach comes from Smith, Elder and Emdon which refers to an emerging set of possibilities to catalyze positive change through 'open' information-networked activities in international development (Smith, Elder, & Emdon, 2011). "Open" here means information-networked activities that have more information that is freely accessible and modifiable and more people who can actively participate and collaborate.

According the report by Open African Innovation Research (Open AIR), creating a framework that is more integrated in theory and cross-cutting in practice creates new possibilities for interdisciplinary research and policy-relevant insights (de Beer, 2017). The report highlighted theoretical gaps between the fields of open development and open innovation by extending open development beyond the field of information communications technology to address aspects of innovation systems more generally. It

[6] Development Initiatives (DI) is an independent international development organization that focuses on the role of data in driving poverty eradication and sustainable development. (http://devinit.org)

[7] Open Knowledge International is a non-profit organization focused on realizing open data's value to society by helping civil society groups access and use data to take action on social problems. (https://okfn.org)

applies the concept of openness to innovation in practice across the domains of open science, open education, and open data.

In short, open development is as a way of organizing social activities for development benefits that favor: a) universal over restricted access to communication tools and information; b) universal over restricted participation in informal and formal groups/institutions; and c) collaborative over centralized production of cultural, economic, or other content (Smith et al., 2011). Open development implies an end product in itself as well as the means to achieve it. Amartya Sen (1999) explains it in terms of open approaches that processes that can, in and themselves, constitute development (the ends) insofar as they establish the conditions for people to escape from the '*unfreedom*' (Sen, 1999) of poverty, and they can instrumentally bring about development by allowing more people to more effectively execute those capabilities.

The application is taking on two names which are sometimes used interchangeably - "Development 2.0" and "open development" (Smith et al., 2011). Likely, adopting these new names demonstrates how the theory is moving out of just the field of pure economic theory merging with theory and application in other fields such as communications, IT, ecology, education, and networks. The term Development 2.0 designates new ICT enabled approaches that can alter the processes and structures of development.

In sum, in this study, the open development approach is about providing access to information, and permission to participate as well as innovative initiatives that employ knowledge that is built and shared collectively and networked in design with a locally-derived idea to be applied to local context and needs. The preceding discussion suggests

that in the context of development work, even institutions such as the World Bank, which were previously strongly identified with the more traditional developmental approach described, are now turning to economic theory that is more consistent with the open development approach.

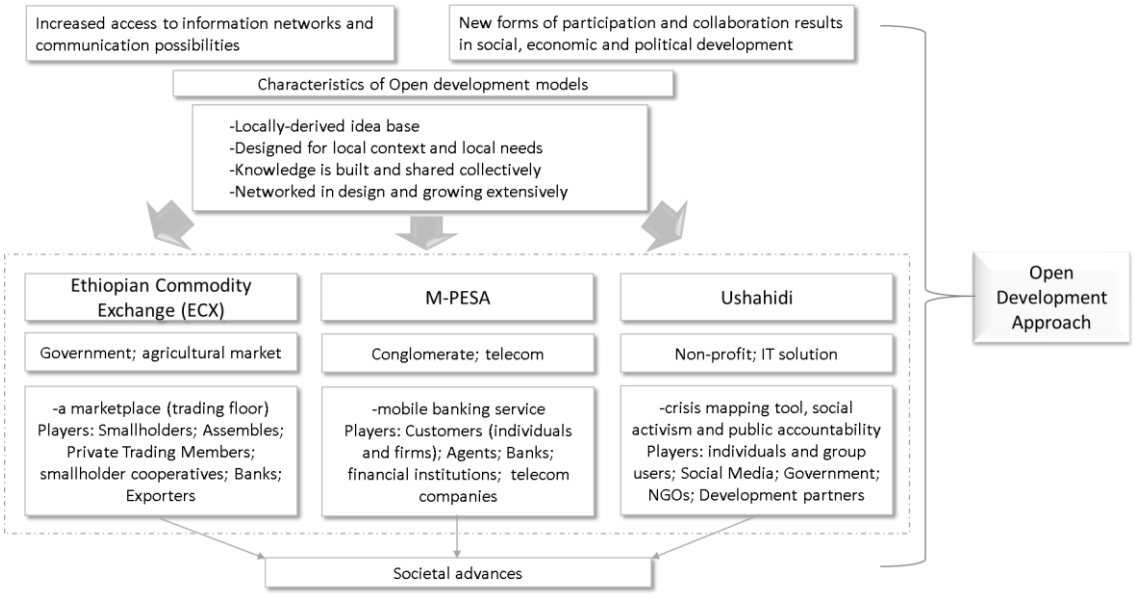
2.4. Conceptual framework of the study

Three case studies which appeared to be built around the open development approach are taken for this study in order to test and critically analyze the efficacy of this approach within the limits of three cases. The open development approach was conceived intellectually from the theoretical base of the endogenous growth theory, and scholars tried to lay out characteristics of the approach (even as projects/cases were already underway or in use). The open development approach is described along with its assumed characteristics. The cases for the study are then examined to see whether they, in fact, fit these characteristics.

The study then proceeds to examine the impacts of the cases on the lives of the people who are the beneficiaries. This is discussed if there is a macro evidence of changed lives that follow a rather traditional definition of societal advances as well as how people do describe the changes in more contextual circumstances. Further analysis deals with how these impacts can be categorized and also be examined through the cases in contrast with the literature at hand. Finally, in the discussion, the study tried to take a broader look at whether there is any evidence that open development approach yields societal advances that might not otherwise be gained by comparing it with the

open development literature. The study tries to identify the evidence derived from studying the processes of the cases and the outcomes for the people impacted.

Figure 2. Conceptual framework of the study



2.5. Summary

This chapter provided the general theoretical framework of the study at hand. First, open development approach is a new way of conceiving of development that encompasses components of an integrated world, sustainability, the value of knowledge, learning and equity. It further explained the theoretical basis of the approach that is the endogenous growth theory as well as the link between the theory and this application that provides an insight as to how open development might yield some unique outcomes or processes. The next chapter will deal with the overall methodology framework of the study.

Chapter III. Methodology

This study is an exploration of development cases and employs mixed methods design to explore and find out whether the cases have produced expected outcomes in line with open development. A mixed methods design is used for collecting and analyzing data through the incorporation of more than one method, in this study, qualitative analysis of data and document analysis, in a single study or series of studies to understand an evaluation problem (Creswell, 2007).

Often times, qualitative methodologies are used early on to develop the instrument, to put it together, to make sure the content is correct, and then it's tested in a more quantitative manner. Triangulation, i.e., the use of several methods, data sources and researchers to examine the cases, was used in this study to identify aspects of a phenomenon more accurately by approaching from different vantage points using different methods and techniques. Concurrent mixed methods design consists of triangulation among the methods concerned, the purpose of which being to obtain different but complementary data on the same topic, which speaks to quantitative and qualitative data collection happening simultaneously. Quantitative data has been obtained from various research works to support the qualitative data collected at the study sites through multiple research tools including semi-structured interviews and non-participant observation.

3.1. Case Study

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and

context are not clearly evident (Yin, 1994, p. 13). Case study as a research strategy comprises an all-encompassing method-with the logic of design incorporating specific approaches to data collection and to data analysis. In this sense, the case study is not either a data collection tactic or merely a design feature alone (Stoecker, 1991) but a comprehensive research strategy. Case study research, through reports of past studies, allows the exploration and understanding of complex issues. It can be considered a robust research method particularly when a holistic, in-depth investigation is required. Recognized as a tool in many social science studies, the role of case study method in research becomes more prominent when issues with regard to education (Gulsecen & Kubat, 2006), sociology (Grassel & Schirmer, 2006) and community based problems (Johnson, 2006) were raised. One of the reasons for the recognition of case study as a research method is that researchers are becoming more concerned about the limitations of quantitative methods in providing holistic and in-depth explanations of the social and behavioral problems in question. Through case study methods, a researcher is able to go beyond the quantitative statistical results and understand the behavioral conditions through the actor's perspective. By including both quantitative and qualitative data, case study helps explain both the process and outcome of a phenomenon through complete observation, reconstruction and analysis of the cases under investigation.

The cases selected for discussion in this study are the Ethiopian Commodity Exchange (hereafter ECX), M-PESA and Ushahidi projects, the latter two of which are based in Kenya. These models have received a significant amount of attention from both the media and the international development community and have been considered as significant initiatives in development (Haile, Rehermann, & Volk, 2017; IFC, 2010; IMF, 2011; Runde, 2015; USAID, 2013). The two countries were selected for two reasons;

first, the cases under discussion are the predominant examples that are in wide use in the particular area of east Africa and the cases have received a significant amount of attention from both the media and the international development community. The literature about open development has repeatedly mentioned them since they hold an integrated characteristic of the open models with an ever-increasing growth for more than 10 years in operation. Second, due to the qualitative nature of the study, being the native of the region the researcher had a relative ease to collect the required data within the limited research period and resource.

The cases are mainly active in the East African region, ECX is under the management of the Ethiopian government, and M-PESA is under Safaricom, the Kenyan mobile network operator, while Ushahidi is a non-governmental, not-for-profit social enterprise. As a native of the region, the researcher believes that the models chosen for the research be limited to major development cases in the region. The research sites include locations of the case studies in the two East African countries of Ethiopia and Kenya, which were chosen on the basis that although the open development model is widely emerging throughout the world, the cases under consideration in this study have been representative examples.

The three cases studies were selected with purposive sampling (also known as judgment, selective or subjective sampling) through a literature analysis as well as consideration of suggestions by development scholars. Purposive sampling is a non-probability sampling method and it occurs when “elements selected for the sample are chosen by the judgment of the researcher” (Black, 2009). The main reason of using purposive sampling is to focus on particular characteristics of the selection that are of

interest, which will best enable the researcher to answer the research questions. The cases being studied were purposively selected for assessing whether the phenomenon of open development exists and what the applications of it would be. The criteria for the selection of the cases are based on the key characteristics of open development. These conditions include that the start-ups were locally derived idea based and designed for local context and local needs. They are also networked in design and grow extensively within the networks. In addition, knowledge is built and shared collectively which eventually results in societal benefits.

Access to the projects was requested directly through the main administrative offices of the ECX, M-PESA and Ushahidi prior to the arrival at the research sites. The ECX has its head office at the 3rd Floor of Al-Sam Tower in the capital of Addis Ababa along with 21 branches and 60 warehouses in provincial areas under Ethiopian Agricultural Commodities Warehousing Service Enterprise (EACWSE). ECX head office and the various branch offices and warehouses located in the EACWSE sites in provincial regions of the Amhara, Oromia and the Southern regions along with neighborhood villages were visited. The field research in Ethiopia was conducted in provincial cities and some of their surrounding towns and villages of Jimma and Adama in the Oromia Region; Hawassa and Dilla in the Southern Peoples and Nationalities Region (SNNPR) as well as Gondar and Bahir Dar in the Amhara Region (as seen in the Figure 2 below). The Oromia and SNNPR regions are the major coffee growing areas of Ethiopia. Coffee plantations located in Gomma, Mana, Limmu Kosa and Kersa districts in Jimma zone were also visited and coffee trade processing units and the primary markets were observed. Jimma is one of the three top producers of coffee in the region, along with the Sidama and Gedeo Zones of the SNNPR. On the other hand, in Amhara

Region the districts of Chilga, Dembiya, Gondar Zuria, Lay Armacho Metemma and Belessa in the North Gondar administrative zone were visited, where other commodities than coffee such as oilseed and bean are produced.

M-PESA is under the management of the Safaricom Kenya communications company, the head office located at the Safaricom House on Waiyaki Way, Westlands Nairobi. The research sites include the head office as well as local service agents and provincial M-PESA centers. Under the new constitution of Kenya that came into force in 2013, Kenya is divided into 47 federal counties that are headed by governors which are further subdivided into 262 sub-counties or districts. Similarly, the Ushahidi head office is based at the Bishop Magua Centre, on Ngong Road in Nairobi. Particular research visits were done through the support of local researchers in the Department of Gender & Development Studies at Kenyatta University.

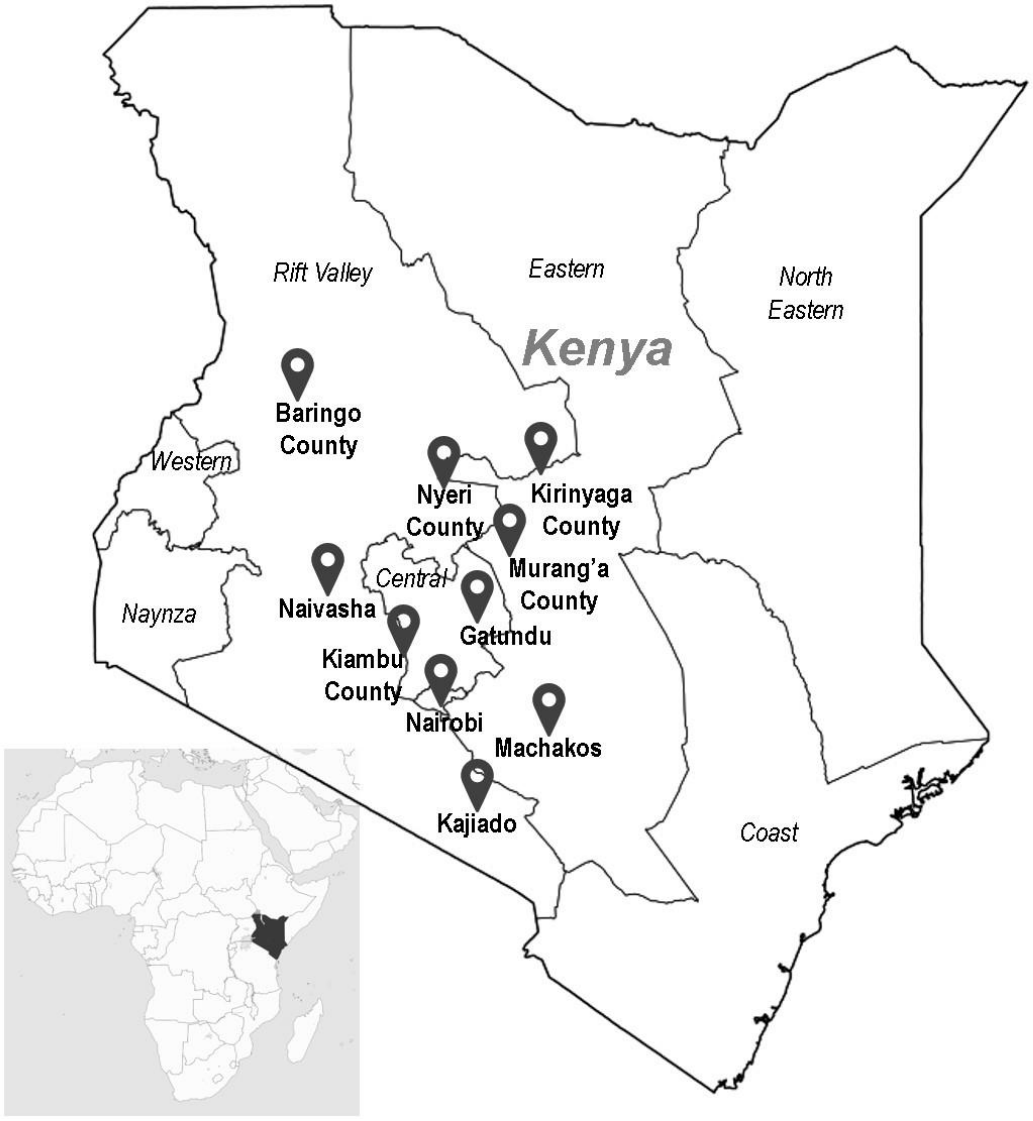
During the field research to Kenya, areas visited include Central Nairobi, Kasarani, Kibera, Westlands areas of the Nairobi County; Othaya, Tetu, Kieni areas of Nyeri County; Gatundu, Githunguri, Thika-Juja areas of the Kiambu County; Kabarnet, Kabartonjo area of Baringo County; Central Machakos, Kathiani, Kangundo areas of Machakos County; Gichugu, Kirinyaga central area of Kirinyaga County; as well as Gatanga, Kandara areas of Murang'a County and Kajiado and Naivasha towns (as seen in Figure 3 and 4 below).

Figure 3. Map of research data collection sites in Ethiopia

The research is aimed at understanding the social impact of these cases on the lives of the beneficiaries through an analysis of the changing practices based on the open development cases. In order to gain multiple perspectives in the area of open development, this study used the maximum variation sampling strategy (Creswell, 2007). To achieve these, groups consisting of practitioners of the open models were purposefully selected as sample settings from diverse community members of in the urban and rural areas of Ethiopia and Kenya. Practitioners are engaged in similar fields of work who have been either successful beneficiary or non-beneficiary of the open development cases under consideration. The practitioners were diversely selected based on the dimensions of occupation, age, gender and educational levels. These dimensions

allowed getting a developmental and gender perspective on the phenomenon of open development.

Figure 4. Map of research data collection sites in Kenya



3.2. Data Collection

The data gathering was done over a period of over three months beginning from December 2016 until March 2017 in the research areas mentioned above. For this study, data was mostly collected in the forms of semi-structured onsite and virtual interviews, a non-participant observation, collection of archival documents, and a reflective journal. The target group of practitioners and non-practitioners for the interview include project designers and project implementers. Before interviews were conducted, a brief description about the study along with participation guidelines were read to all the informants. Then copies of the interview consent form (Appendix 2) were distributed to the informants who were willing to sign the forms for the interview. There were times where oral interview consent was filled (with permission) to interviewees who were not willing to sign written consent forms. The list of informants who were interviewed for the study is arranged as in Appendix 3. Names of the interviewees were anonymized using pseudonyms to protect their identity even though a few interviewees expressed that they would have no problem in being quoted by name. Anonymized interviewee names are always first (given) names. All quoted interview material was either audio recorded and transcribes or recorded directly from the field notes. Most interview quotes are from verbal dialogue with individuals and groups, and later grammatical issues edited by the researcher. Many of the quotes were received by electronic mail and there was a time where the CEO of ECX had a special talk session to a group of researchers from various countries, which I was a participant.

Whenever needed, informed consent forms for non-participant observation were presented to officials who are in managerial positions such as M-PESA, Ushahidi and ECX officials as well as M-PESA agent shops and ECX branch offices and warehouses.

During this phase of the project, simple questions were forwarded to the informants in case more explanation was needed about activities not familiar to the researcher. Similarly, participants were asked their agreement to provide some documents that have a direct association with the study at hand with prior informed consent.

This study uses a mixed-methods approach to research how open development applies to the cases under consideration. This includes review and analysis of the current literature, document, interviews, non-participant observation, and documental and reflective journal analysis to collect the required data for the study. The sources of data include published literature, websites, project documents, and project documents, interviews with project designers, project participants, project managers, project participants and affected communities.

Interviews

Interviews were conducted on the research sites upon the consent of the interviewees. The interviews were semi-structured and open ended. Semi-structured interviews are interviews of a qualitative inquiry that has a framework of themes to be explored and allows participants to exercise more freedom and creativity in responding to questions so that innovative ideas can emerge and get deeply explored. More than 89 informants in total were interviewed, individually or as a group, for the research in the two countries for the three cases as listed in the table below and in Appendix 8. The interview included questions about their understanding of the cases under study, what they know about the model, how the practice has affected their living or thinking, whether the practice indirectly affected the living or thinking of other people who are

not directly participants of the cases. The number of interviewees for the three cases varies due to the nature of the Ushahidi platform that it is deployed and run by individuals for use by anonymous users from their computers and mobile phones.

The following table summarizes the number and type of interviewees of the overall study for the three cases in the two countries.

Table 2. Summary of the number and type of interviewees

Type of Interviewee	Ushahidi		M-PESA		ECX		Total
	M	F	M	F	M	F	
User	3	4	21	18	17	9	72
Administrator	2	4	2	1	8	-	17
Total	5	8	23	19	25	9	89

Non-Participant Observation

Non-Participant Observation were also conducted to gain additional information about the processes and outcomes of open development and translate it into a relevant document. The observation allowed documenting the practice dynamics that take place when practitioners are engaged in their daily routine with relation to the experiences involving open models. The observation was conducted by a non-participant observer (i.e., researcher) and took place few days after the interviews. It was carried out in the working sites, offices, fields etc. with a request made by letter of cooperation that was sent to the institutions in charge of the cases prior to the visit.

Documents

The documents gathered for this study include any type of official project reports, unofficial records, or any pubic literature about the open model under study. For the purpose of data analysis, the document was used with any identifiable information erased. The research focused on document analysis based on publicly open documents to individual readers and the media. Whenever there was a need to access information other than publicly available documents that needed institutional permissions, a signed consent was requested from the relevant government offices and management offices as needed by explaining details of the research project. The research required the informant not to disclose information unless authorized to do so and only in ways agreed with the providing body. Proper acknowledgement of title, author, copyright owner, and copyright date is clearly mentioned in the research output document.

Reflective Journal

The last form of data was a reflective journal and field notes kept by the researcher. The journal allows the researcher to describe his feelings about conducting research in this area of study. According to Morrow and Smith (2000), the use of a reflective journal adds rigor to qualitative inquiry as the investigator is able to record his/her reactions, assumptions, expectations, and biases about the research process. The field notes provide additional data for the analysis.

Ethical Considerations

All the interviewees were treated in accordance with the ethical guidelines of the Collaborative Institutional Training Initiative (CITI), the Seoul National University Institutional Review Board (IRB) and research permit clearance from the National Commission for Science Technology and Innovation (NACOSTI) of Kenya (as listed in Appendices 1-5). Although there were no identifiable risks for participating in this study, a couple of considerations were kept in mind when dealing with sensitive issues of political, ethnic or religious issues of practitioners. Given that this study deals with community members, there were times that participants felt the pressure to answer all the questions designed for the interview given that the researcher holds a position of power. Every caution was taken to ensure that respondents felt safe, comfortable and had the ability to withdraw from the study if they felt the need to.

3.3. Data Analysis

Before the data was analyzed, all the interview and observation contents, as well as documents, journal entries and field notes were transcribed. The process of transcribing allowed the researcher to become acquainted with the data (Riessman, 1993). Then Microsoft Word files for the interviews, observations, documents, and journal entries were created. All files were saved in the researcher's portable computer protected by setting a password in which he only has access. The researcher used the meaning of analysis context as the unit of analysis for coding and also for the anticipated description. This means that the data is not coded sentence by sentence or paragraph by paragraph, but coded for meaning.

The data collected is later analyzed project by project through thematic analysis. Thus, interviews, observations, documents, and field notes were analyzed for each practice. Themes salient across all the cases as well as those that are extremely different are kept. For the thematic analysis, the researcher followed Braun and Clarke's (2006) step-by-step guidelines. The author used the following guidelines to highlight the flexibility of this qualitative analytic method. These guidelines are (1) familiarizing oneself with the data collected, (2) generating initial coding of the data; (3) reading throughout each transcript to immerse oneself in the data, (4) defining and naming themes, (5) reviewing themes relating to open development by categorizing the content of any text that relates to the characteristics of the cases or their impacts, and (6) producing the report of the results based on the final group of themes. The characteristics of the cases used as reviewing themes include (1) locally derived idea base, (2) designed for local context and local needs, (3) networked in design and growing extensively, as well as (4) knowledge built and shared collectively. The impacts of the cases analyzed were: diversified functions, enhanced efficiency, expanded resources in terms of economic benefits, inclusion of marginalized groups, and strengthened social interactions.

Validation Strategies

As the area of qualitative research is likely exposed for social and behavioral scientists critique on the validity of studies, this qualitative research will need to utilize some validation strategy to make it credible and rigorous (Creswell & Miller, 2000). Thus, credibility for this study was achieved using the validation strategies of

triangulation, and researcher reflexivity. The data was triangulated with multiple forms of data that were collected in this study (i.e., interviews, observations, documents, reflective journal entries and field notes) along with existing literature about the open development theoretical premises to locate the major and minor themes of the study. The researcher carried out observations of the cases under this study and observations were done about the systems and platforms run by the projects. A descriptive note of events such as an interview, chance encounter, observation, which contain as little interpretation as possible were also constructed during the field research. Comparison between initial explanations and the data collected were done in order to make meaning of the data gathered. During the writing stage, theoretical concepts were reviewed from the given literature and to link it with data collected while analyzing it to see patterns or recurrent themes.

Evaluation criteria

As a first step, the cases have been chosen to fit the model described in the theory of open development. They were reviewed and explored if they fit the primary characteristics of open development: if societal development results from building ideas, if the cases are built from a locally derived idea base, and if the resultant knowledge is built and shared in a public way or as a public good or benefit. Three cases of the open development approach were examined to determine whether they meet these basic criteria. This was done primarily through document analysis before the fieldwork. Then, once the cases were found to qualify for the study, they were carefully analyzed as a component of the mixed methods design, which includes both qualitative and

quantitative approaches. The exploration into the cases was made on the basis of the primary expected outcomes relating to the use of the open development approach:

a) Do the cases under study show the characteristics of open development approach?

b) Did communities or societies benefit by increasing their capabilities as outlined by open development approach?

Some of the concepts to be analyzed to answer the research questions include the key characteristics of the open development approach such as locally derived idea base, locally developed, designed for local context/local needs, networked in design, use of state-of-the-art designs, which is knowledge. The centrally expected outcomes of open development cases based on the theory include result in the societal development through ensuing knowledge is built and shared collectively, outcomes are evaluated in terms of the knowledge that grew collectively (through networks), whether the communities or societies benefit by increasing their learning capabilities and knowledge access.

3.4. Limitations of the Study

Although the necessary care was taken to ensure that the data collected, and the analysis made in the present study conducted in the regions under consideration to be of utmost standard and free from all bias using the approved methodology and tools, yet it suffers from certain limitations. This study is considering three cases for exploration whether they are functioning according to the principles of open development models.

The number of cases under analysis may not be enough to make a clear statement about open knowledge cases. Since open knowledge is dynamic and changing, what is known today may change tomorrow. As practices in open knowledge are dynamic and constantly in flux, it is expected that the pertinent documentation is not always complete. Therefore, the present study selected cases from around ten years ago, since the documentation for these was more complete than it would be for more recent cases.

Due to the scope of this research project, the current study is limited to a particular geographic region. On that basis, it may not be possible to make fundamental inferences with regard to other geographical regions, although the growth patterns, development trends or local issues and concerns are common to various regions and affect the ways in which the open model is utilized. Furthermore, this study is conducted over a certain interval of time and is a snapshot that is dependent on conditions occurring during that time. As open models are more reliant on ICT infrastructures of a given community or country, processes as well as outcomes will be dependent on the robust change that follows.

The process of collecting data also has faced some challenges related to the unstable sociopolitical situations of the two countries. There has been unprecedented wave of protests followed by state of emergency in Ethiopia in recent times which has made data collection at the sites of the case studies difficult. Many people were reluctant to respond to interviews due to the growing anti-government sentiment amongst the rural residents. In the same way, preparations for the 2017 Kenyan general elections along with the prolonged strike by medical doctors and teachers were some of the unexpected challenges faced by the researcher during the data collection period.

Election related violence has repeatedly been witnessed by the majority Kenyans. As a result, several community members were afraid of being interviewed as they believed government and opposition agents may use their words to their disadvantage during this socially volatile period.

3.5. Summary

This chapter discussed the research design of this study which has made its bases on mixed methods of qualitative analysis of data and document analysis. It was also explained that data collected through multiple research tools, such as semi-structured interviews and non-participant observation, has been triangulated by documentary analysis, personal diaries of participatory observation along with the relevant literature review. The following chapter deals with the background of the three cases selected for analysis in this study then examine them to see whether they, in fact, fit the characteristics of the open development approach.

Chapter IV. The Three Cases of Open Development

This study took three examples of development or social entrepreneurship cases at work in East African countries. Two of the cases were from Kenya and the third was from Ethiopia. The case studies were selected after they have been examined whether they fit the open development approach. The three cases were examined to see if they, in deed, fit the characteristics of open development approach. The key characteristics of the approach reveals that ideas have evolved out of the opportunities afforded by emerging technologies, networks and learning and provided the opportunity to solve local problems. This chapter provides the background features of the cases under consideration and examines whether these cases can lead to development processes and outcomes that are local idea derived, networked and beneficial to local communities.

4.1. Innovation and technology startups in Ethiopia and Kenya.

Ethiopia has been known for years as one of the poorest countries in the world with significant economic and social challenges (Kivlan, 2016; von Braun & Olofinbiyi, 2012). However, there have been demonstrable improvements to curve its problems in the recent years to the extent that it became the fastest-growing economy in the world in 2017 (World Bank, 2017a). Over the past five years, the government has been preparing science and technology innovation documents, developing science and technology infrastructure, linking education with science, developing manpower capacity, giving due emphasis to problem solving research as well as in providing assistance to the development of the sector (Gashaw, 2015).

The Ethiopian government has been giving due emphasis to the development of science and technology innovation in a bid to transform the nation from an agricultural-led economy to industry. Ethiopia has adopted a national economic policy that focuses mainly on implementing the Agricultural Development Led Industrialization (ADLI) strategy. ADLI aims to bring in an effective economic growth and to build technology capability that enables the development of micro, small, medium and large industries. As the policy has been executed by applying appropriate strategies, between 2003/4-2010/11 the real GDP showed double-digit growth for eight years in a row. Such accelerated growth has been attributed primarily to improved performance of the agricultural sector.

Government has been trying to establish an institution at the federal level that assists secondary school students with a tendency to science and technology innovation to develop their capacity. The practical training offered in TVET institutions and research being conducted at various institutions, manufacturers, universities, service providing institutions have greater role in the national development drive. Based on its quality infrastructural strategy, the government did enable institutions to discharge their regulatory and service role thereby ensuring export product and service quality at the same time make them industries competitive in international market. By choosing 18 key technologies, the science and technology roadmap under preparation not only indicates the country's growth in the sector but also the sector's development when the country joins the ranks of lower middle-income economies of the world (Gashaw, 2015). Thus, they will serve as a guiding document for national development programs. Analyzing and identifying science and technology development gaps, the government

has devised strategies that help strengthen the development of the workforce in the sector.

Kenya's economy benefits from a favorable geographic location, good economic infrastructure, relatively skilled labor force, high educational standards and strong civic institutions, in particular when compared to its regional peers (UNECA, 2016). Kenya's population was estimated at 48.5 million (at the end of 2016) with almost 70 percent of the population under the age of 35 (World Bank, 2017b). As the most developed economy in eastern Africa, its economy is growing an average of 5 percent annually (World Bank, 2017a). Almost one out of three Kenyans are connected to the Internet, 75 percent have a mobile phone and one out of every two uses their mobile phone to make mobile payments (Communications Authority of Kenya (CA), 2017; Ndemo & Weiss, 2016). The capitol city, Nairobi, has transformed into a technology epicenter with 3G Internet connections becoming more affordable and mobile payment services booming and the promising start-up scene and ecosystem are constantly reinventing their offerings (Bright & Hruby, 2015).

The number of adults in the country who had access to formal financial services in 2006 was 26.4 percent which had more than doubled to 66.7 percent by 2013 (Muthiora, 2015). The driving force for more people to have access to financial services sending and receiving money, opening bank accounts, and applying for loans than ever before is mobile network operators' leveraging technology, ubiquitous distribution networks, and partnerships with banks to deliver mobile financial services to underserved segments of the population who are not served by financial institutions. Mobile money has enabled anyone with access to a mobile phone to perform basic financial transactions without

having to use a bank account or rely on riskier, less efficient methods like delivering cash in person. In addition, Kenya has experienced an e-commerce boom thanks to a high number of mobile Internet users partly driven by the growing availability of affordable smartphones (Mtshali, 2017).

Despite various political and socio-economic challenges, Kenya is a leading nation aspiring to become an optimal place for innovation, youth entrepreneurship, startup economy prototyping and incubating businesses. Government bodies (such as Ministry of ICT and the ICT Authority) are among the institutions supporting the build of technology entrepreneurship ecosystem in the country. Business incubation provides entrepreneurs with access to critical information, education, contacts, capital and other resources crucial to the growth of the business that may otherwise be unaffordable, inaccessible, or otherwise unknown to ICT Startups in Kenya. Efforts to encourage even faster growth of this sector are evident with Nairobi spotting several tech incubation hubs full of young people as they strive to actualize their ambition to become the next Microsoft's Bill Gates or Facebook's Mark Zuckerberg (Wokabi, 2012b).

Innovation is often associated with the large and fast-growing youth and effective science and technology innovation systems tap into and nurture these talents. The quality of product ideas presented by students and entrepreneurs at competitive technology fairs in Kenya demonstrates that there is no shortage of innovative spirit in Kenya (Pasquier, 2014). As the regional center for a wide range of industries, not to mention its financial center, Kenya is well-positioned geographically, with its access to the Indian Ocean and its proximity to Middle Eastern and European hubs. Startups are

thus well-placed to establish themselves first in Kenya and expand from there despite weak supportive technology environment.

Kenyan innovations in the technology field have acclaimed titles that have had a massive impact on continental as well as global economy. M-PESA and Ushahidi are world known innovations that have challenged the old order and triggered a new wave of innovation in financial services and search and rescue measures (Wokabi, 2012a). Such and more innovations have seen the country referred as the Silicon Savannah, in comparison to the Silicon Valley of the US. Started and developed in Nairobi, M-PESA and Ushahidi are now undertaking the historically unprecedented step of expanding from Africa into economically developed nations of the world, rather than the other way around. Regardless of how the projects were initiated, the role of locally derived idea was an important base for people to unite to solve their problem with the help of technology. They received the inspiration to solve the local problems of many Kenyans making M-PESA root its origins in Kenya with much of the work done with the collaboration of local and global financial services firms in figuring out the needs of people without access to banking services (Kamau, 2014).

4.2. ECX in Ethiopia

ECX is a platform system established with the aim of creating an efficient, transparent and orderly marketing system to serve the needs of buyers, sellers and intermediaries, and promote increased market participation of Ethiopian small-scale producers (Hernandez, Lemma, & Rashid, 2015). It further envisioned creating a centralized trading floor for buyers and sellers. The system was anticipated to develop

more secure and reliable schemes for handling, grading, storing, among other services, encourage risk-free payments, and offer a goods delivery system to settle transactions (Alemu & Meijerink, 2010; Gabre-Madhin, 2006). It also intended to build trust and transparency among all market actors through the dissemination of market information and clearly defined rules for trading and warehousing, as well as the eventual provision of internal dispute settlement services.

A commodity exchange system is a central market place where buyers and sellers meet to transact any kind of commodity with certain agreements. Bringing together buyers and sellers in a central market place at any point in time results the greatest concentration of trading for a given good, discovery of true market price for a good and allow maximum effective competition among buyers and among sellers (Gabre-Madhin, 2006). By integrating low-level cell phone use in rural areas with simple networks in the main city, Gabre-Madhin linked coffee farmers to global markets which resulted in flourishing of coffee production in the communities. Although this has an impact on the incomes of coffee producers in rural areas the communication technology used was quite different than it would have been in South Korea or the U.S. (Kim, 2017; Petty, 2010).

The new development approach in developing nations requires crafting local solutions to local problems as the basis for building effective public and private institutions. It is emphasized that solving problems locally promotes more sustainable and self-sufficient communities. ECX is one example of the new breed of commodity exchanges that are springing up around the world. As with other such exchanges, the ECX is designed to combine the best features of a modern commodity exchange with

local traditions. Ethiopia has a long history of the trading agricultural goods in markets: the establishment of a commodity exchange mindful of local ways of business is a logical step in the country's economic development (Francesconi, 2009). In this section, I will discuss the historical background of how ECX was formed based on a locally derived idea based to solve local problems.

Background of ECX (Recurrent Famine in Ethiopia)

Ethiopia is one of the countries in East Africa hit by a frequent cyclical famine due to the country's dependence on rain fed smallholder agriculture that is constantly affected by drought, rapid population growth and agricultural market dysfunctions. During the 1973-1974 Wollo famine, 300,000 people died from famine, the cause of which was not a problem of food shortage in the country but lack of ability to access food (Lawson, 2012). The Ethiopian Ministry of Agriculture Report of 1973 stated that output for 1972-1973 was only 7 percent lower than the previous year (Ethiopian Ministry of Agriculture, 1973). Also, food prices in Wollo were no higher, and often substantially lower, than elsewhere in the country. Similarly, it has been reported that during the 1983-1985 famine, the worst in the country's history, more than 400,000 deaths occurred (De Waal, 1991).

Another famine hit Ethiopia in 2002 despite good harvests in the previous years: production in some areas was insufficient, and food did not flow from surplus to deficit areas. Grain prices fell below the historic average, particularly maize prices in surplus regions fell by almost 80 percent (Gabre-Madhin, 2003; von Braun & Olofinbiyi, 2012). About 6 million people were in need of urgent food aid, and 15 million faced the threat

of starvation (Gabre-Madhin, 2003). Despite food available in the domestic market, unable to supply adequate food to keep people alive, the Government of Ethiopia reached out to the international community for assistance.

It was during this time that a Cornell business school student and a native of Ethiopia, Eleni Gabre-Madhin, observed the problem of market imperfection and the resulting famine affecting millions of people. She was conducting a survey on grain markets across Ethiopia for her doctoral thesis, and she had come to a town known as Nekempt in Wollega region in 1996 because it was there that, during the terrible Ethiopian famine of 1984, farmers produced a grain surplus while thousands of people perished in the northern regions of Tigray and Wollo (Gabre-Madhin, 2012).

During her travels, Gabre-Madhin met a grain trader called Abdu Awol in the grain wholesalers' section of the Nekempt market where he told her enthusiastically his story of grain-trading business, which he had inherited from "the Old Man," his father, who had inherited it from Abdu's grandfather. Abdu told her of the grain market challenges. He said that he had no good way of learning prices, and he only knew traders in Addis Ababa, so that was where he, along with all the other wholesale traders from Nekempt, sold their grain (Gabre-Madhin, 2012). Gabre-Madhin has already observed that, between 2001 and 2002, Ethiopian maize farmers in the western part of the country produced two years of bumper harvest leading to an 80 percent collapse in maize price due to lack of market information. Later, in July 2002, Ethiopia announced a major food crisis, with more than 14 million people at risk of starvation, while some 300,000 tons of grain were left in the fields to rot in early 2002 (Gabre-Madhin 2007). What also happened that year is in the areas where there were good rains, and where farmers had previously produced surplus grain, farmers had decided to withdraw from

the fertilizer market, not use fertilizer and actually had dropped their use of fertilizer by 27 percent. She emphasizes that this was similar to what has happened during the Ethiopian famine of the 1980s and it is not just specific to Ethiopia, but happens over and over, all over Africa. This became a starting point for finding a groundbreaking solution to this problem.

Gabre-Madhin says that it was six years before she saw Abdu again. This time, "armed with a doctoral degree and a nice job as a researcher at the International Food Policy Research Institute in Washington, DC," she went back to Nekempt to conduct a national grain and coffee market survey spanning 45 markets and hundreds of traders. She found Abdu in the same stall doing the same thing where he was happy to talk to her about his grain trading, though he was somewhat less enthusiastic than before. She asked him how he found out what prices were in far-off markets and where he sold the grain he bought from the farmers. But his reply was the same as he had given in 1996: he had no good way of learning prices, and he only does trading with traders he knew in Addis Ababa. She asked if he knew there was a shortage of grain in the country and that prices were rising and why he did not think of selling his good maize in the markets of Tigray and Wollo in the north and Dire Dawa in the east, where prices were high.

Abdu told Gabre-Madhin that he has tried to find a buyer for his maize in Mekele, a town in Tigray. After a lot of asking around, he found the phone number of a buyer and called to arrange a deal. He told the trader in Mekele that he had good-quality maize, and they agreed on a price. Then, with great excitement, he loaded up a truck and started the trip of 900 kilometers, crossing three regional boundaries where things started going wrong immediately. He was stopped over and over—more than a dozen

times along the way—at road checkpoints where he paid bribe after bribe. The trip took longer than expected and when he finally arrived in Mekele, the buyer, to Abdu's dismay, claimed that the quality of the maize was poor and that prices had gone down. He was no longer interested in Abdu's maize. And Abdu hardly can afford to take the maize back, so he had no choice but to sell at a terrible loss and return home. Gabre-Madhin says that she went back to the US with that disturbing story replaying in her mind without being able to help (Gabre-Madhin, 2012).

The development of the agricultural market in Ethiopia is characterized by insufficient market information, poor quality, unstable price, lack of trust among trading partners, and uncoordinated markets (Gabre-Madhin & Goggin, 2005). The lack of market information creates fluctuating prices and huge price overhead on the consumers. Farmers are getting only a small portion of the profit due to weak access to storage, telecommunication and transportation infrastructures and existence of multiple middlemen at every stage of the market chain. Gabre-Madhin explains that Abdu's story was not an isolated case of one trader and one market. It was the story of thousands of traders and farmers and end buyers she had come to interview over more than a decade of research on agricultural markets in various regions of Africa. Quoting Gabre-Madhin (2012);

> Here is what I had learned spending hundreds of hours sitting on sacks and stools all over rural Africa: Most traders rarely grew their businesses or their investments. Trade was limited to short distances, involved very short storage periods, and was confined to networks of family members, friends, or ethnic connections. Those with access to more contacts and better information were better off. Traders faced a high risk that they would not get paid after a trade and that the purchased goods would not be delivered in the right quantity and quality. Defaults were rampant because there was virtually no legal means of enforcing contracts. I found that 67 percent of traders regularly faced contract defaults as my friend Abdu had, and only 4

> percent had recourse to legal means of resolving these disputes. Because trade was over short distances, per-kilometer costs of transport were exorbitant. A lack of standards and certification meant that goods had to be reinspected and rebagged at every trade, pushing handling costs to a whopping 26 percent of the final price. (Gabre-Madhin, 2012)

Farmers were even worse off than traders, with less information, fewer connections, and little power to negotiate better deals. Gabre-Madhin states that she had calculated that because of the long chains and the buildup of costs due to high risks and inefficiencies, the farmers' share of the final price in most markets was no more than 30 percent—even without any processing or other addition of value to the commodity from one end of the chain to the other. High costs and the inefficient supply chain simply made it unprofitable to invest in processing; as a result, less than 5 percent of Ethiopia's grain was industrially processed in which these high domestic transaction costs, including the costs of contract enforcement and information search, made agricultural trade within Africa virtually impossible (Gabre-Madhin, 2012).

With only one-third of the output reaching the market, commodity buyers and sellers tend to trade only with the people they know to avoid the possibility of default or being cheated. Often, smallholders only have access to local price information, being unable to negotiate better prices and subject to the potential market power exerted by local merchants. If farmers in a particular region are especially productive, their local market gluts with produce and prices drop precipitously. In addition, local producers often receive a small share of the export price, particularly in the coffee market; this is largely explained by the participation of several intermediaries along the value chain resulting in market inefficiencies (Akiyama & Baffes, 2001; Gabre-Madhin, 2006).

Local solution for local problem

According to Gabre-Madhin, the solution for local problems should come from within the local needs. In June 2007, during the TEDGLOBAL international chapter dedicated to Africa, Gabre-Madhin presented her vision for Ethiopia's (and Africa's) first commodities exchange (Gagliardone, 2016). She was determined to find the solution on how markets can be developed in rural Ethiopia to harness the power of innovation and entrepreneurship. Gabre-Madhin again took the opportunity to speak at a conference in 2012 to share the facts and tell the stories of Ethiopia's markets and the people struggling to make them work which were likely quite new to the policymakers, whose preoccupation with the urgent challenge of increasing production had not caused them to consider market problems, except to wonder how to keep prices high enough to sustain farmers in bumper years (Gabre-Madhin, 2012). She emphasized the need for formalized trust in the market and for going beyond infrastructure, such as roads, to put in place the market institutions needed for quality grades and standards, warehouse receipts, market information, coordinated trading, payment systems, and contract enforcement.

As to her assertion, all of these, should be established in a holistic and integrated fashion, rather than in the fragmentary approach observed all over Africa in different donor interventions in which she pushed further, presenting for the first time the idea that a commodity exchange was precisely the holistic platform that would integrate all of these elements (Gabre-Madhin, 2012). At the request of the Government of Ethiopia, Gabre-Madhin produced a paper, summarizing earlier ideas about making a commodity exchange that builds the needed institutions from the ground up for grading and

certifying quality, issuing warehouse receipts, trading, relaying market information to all actors, enforcing contracts, and ensuring payment and delivery.

Gabre-Madhin noticed how traders and brokers in the Addis Ababa grain market gathered at dawn every morning to assess the supply that had come in during the night from the surplus areas in the northwest, west, and southern regions of the country and the buyers that had come in from the northeast and east (Gabre-Madhin, 2012). The day's trading starts precisely at 6 a.m., almost as if announced by a bell. Frenzied bidding occurs, and deals are made to clear the market, until it abruptly stopped exactly three hours later, every day. She learned that all of this happened by tradition, with no government involvement at all, which sounded like a commodity exchange in a basic form, with donkeys and laborers instead of polished trading floors and electronic screens. She also noticed that many local areas now were in range of cell networks and can access a simple cell phone or receive information through FM radio receivers in remote areas.

Then Gabre-Madhin took the opportunity to return back to Ethiopia to establish and lead the International Food Policy Research Institute (IFPRI)'s Ethiopia country program which gave her way to sit and design a modern commodity exchange that can bring solution for Ethiopia's and Africa's, marketing problems. She explains the situation in the following words:

> It was a big move, and this time, in contrast to my student days, I was well placed to interact with government leaders, the donor community, and my oldest friends in Ethiopia—the private traders like Abdu Awol whose problems and constraints I had spent most of my career trying to understand (Gabre-Madhin, 2012).

Gabre-Madhin was then asked to lead a task force, which included nine members from the Ministry of Agriculture, the Quality Standards Authority, the Ethiopian Grain Trade Enterprise, the Ethiopian Institute of Agricultural Research, and the Ethiopian Development Research Institute. The task force also consulted with a panel of private-sector market actors. The first report of the task force, produced in just 35 days, recommended including food-grains, oilseeds, pulses, and coffee in the exchange, creating a legal framework, and addressing constraints in financial-sector policies. These recommendations were reviewed and accepted almost immediately.

Before starting work on a detailed design document, in 2006, Gabre-Madhin organized a study tour with six senior government officials, including the deputy prime minister, and six private-sector industry leaders, including representatives of the Coffee Exporters Association, the Oilseed and Pulses Association, the Grain Trader's Association, and private banks to visit India's rapidly growing commodity exchanges in Mumbai: the Multi-Commodities Exchange (MCX) and the National Commodities and Derivatives Exchange (NCDEX). Gabre-Madhin explains:

> Although we learned greatly from the experience of India, we made important decisions that significantly departed from what we had observed there. For example, we believed that starting with an electronic trading system would exclude many market actors, given Ethiopia's weaker Internet penetration, so we decided to start with a physical trading floor in Addis Ababa. We agreed that it was important to start with spot trading (for immediate delivery) to build up the discipline and understanding of the formal trading system and to avoid speculation early on. Futures trading would come later. And we thought our exchange should start with a nonprofit orientation, like the traditional exchanges in the United States and Europe, and later transition to a for-profit entity. Not only did we debate these ideas within our group, but we also engaged in deep discussions with our Indian hosts, in both government and the exchanges, exemplifying the best of South-South cooperation (Gabre-Madhin, 2012).

After the team returned home invigorated and ready to develop a model tailored to Ethiopia's needs, declaring that the Ethiopian exchange will be only for Ethiopia, not a copy of any particular model. Both policymakers and private-sector actors had a new confidence in what we were trying to do, and new bonds had been forged between the two sides. Gabre-Madhin asserted that the team remained committed to exploring and learning from global best practices, later visiting exchanges in Chicago, Johannesburg, Buenos Aires, and Dalian, China. In mid-2006, the final task force report spelled out a complete model for the operational design of the exchange, including the setup of the corporate entity, the sequencing of commodities, a legal and regulatory framework, membership structure and requirements, and training needs.

Establishment of the ECX

The Ethiopia Commodity Exchange Project was quickly established following the recommendations made in 2006, with initial donor funding from the US Agency for International Development, the Canadian International Development Agency, the World Bank, the International Fund for Agricultural Development, and the United Nations Development Program who committed US$9.2 million in just two weeks (Minney, 2017). This figure grew over the years as commitments increased. The World Food Program and the European Union joined the list, and donor funding eventually reached US$29 million (Gabre-Madhin, 2012). The project started to build all the elements of the exchange simultaneously rather than sequentially. Lawyers, warehouse and quality experts, IT developers, finance experts, business professionals, trainers, and communications experts were thrust together, creating momentum. The formation of

ECX became real through the proclamation 551/2007 opening the way for ECX to become a model commodity exchange platform to African markets.

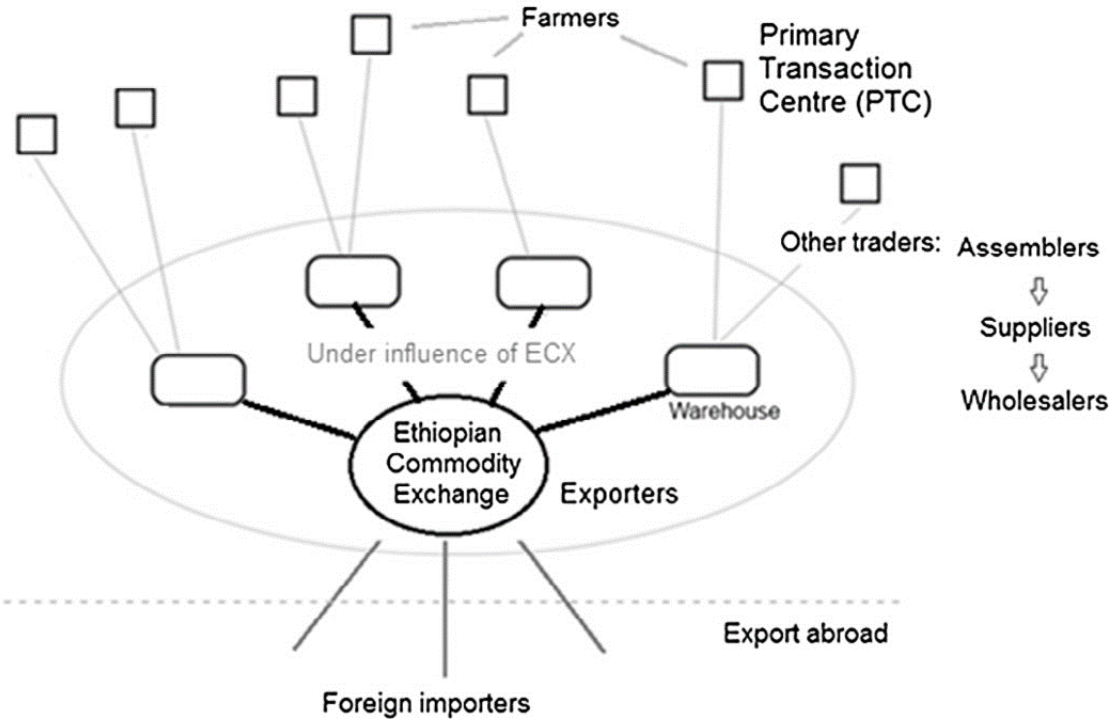
To Gabre-Madhin and her fellow local experts, the heart of the problem was the central question of how market exchange can be coordinated efficiently, at minimum transaction costs, among the countless of actors in the rural economy, the diverse and spatially dispersed producers and consumers, in such a way as to enhance livelihoods and lead to the optimal allocation of resources (Gabre-Madhin & Goggin, 2005). In order to solve the problem of how to bring about a "self-coordinating" market order, she traced out the two core aspects that must be addressed: the transmission of vitally needed market information and the low-cost enforcement of contracts among market participants.

Gabre-Madhin made it certain that ECX is designed to serve smallholder farmers and small traders, it will not exclude those with less education or less capital, and it will balance the interests of all actors and of the public and private sectors (Gabre-Madhin, 2012). A commodity exchange is not aimed to eliminate traditional markets around the country, but rather to build up these informal markets by adding technology and systems to bring more transparent, more efficient, and more reliable trading to all concerned.

In addition, Gabre-Madhin was aimed at solving the problem of market imperfections. ECX has great potential to link farmers and their cooperatives to the market in Ethiopia. A commodity exchange depends on the functioning of allied sectors like banking, insurance, transport, IT services, and even inspection services. The availability of information concerning what is going on in the market significantly improves the decision-making capability of the farmers and strengthens their bargaining

power. Farmers are managers for their own smallholdings, they require information which is quality and sufficient to influence their final decisions (Shibanda, 1999). Thus, priority was given to ensure the accessibility to information, its delivery, its free flow and its outreaches so that informed decisions are made (Kalusopa, 2005). The establishment of ECX is aimed at transforming Ethiopia's tradition-bound agriculture through creating a new marketplace that serves all market actors, from farmers to traders to processors to exporters to consumers through providing a secure and reliable end-to-end system for handling, grading, and storing commodities, matching offers and bids for commodity transactions, and a risk-free payment and goods delivery system to settle transactions (ECX, 2016).

Figure 5. Schematic representation of the Ethiopian Commodity Exchange (ECX)



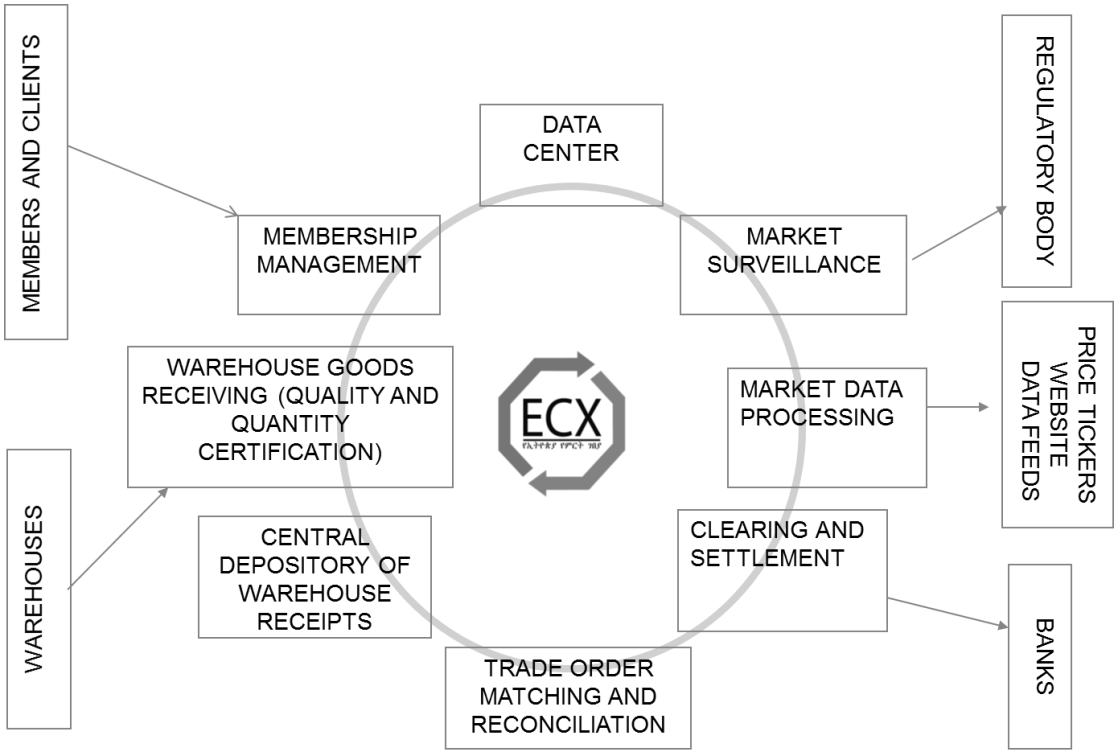
Source: Meijerink, Bulte, & Alemu, 2014

Since 2008, ECX has increased the number of agricultural commodities traded at the exchange from only one to seven. Currently the ECX trades coffee (*Coffea* sp.), sesame (*Sesamum indicum*), pea beans (*Pisum sativum*), maize (*Zea mays*), wheat (*Triticum* sp.), green mung beans (*Vigna radiata*), and red kidney beans (*Phaseolus vulgaris*) in the pipeline. Since Ethiopia is generally known as the birthplace of coffee and is the producer of the highest premium Coffee Arabica in the world, dozens of coffee contracts are available, each having its own particular contract code/ticker symbol, delivery point and contract specification. Many of these contracts are directly related to the regional varieties that have developed over the millennia comprising Ethiopia's history of coffee cultivation: major varieties include Harar, Jimma, Sidama and Yirgacheffe. Maize is one of the world's primary agricultural commodities, and its importance in the Horn of Africa is increasing as population growth puts pressure on traditional crops. Two corn contracts, mixed maize and white maize are traded on ECX. Haricot bean contracts on the ECX are split into red kidney beans and white pea beans which are also available in two forms of contracts of processed and unprocessed red kidney beans or white pea beans. As with coffee, it is likely that Ethiopia is an early center of sesame cultivation (Bedigian, 2003). This commodity is still important to the region's economy, and so contracts for three varieties are offered on ECX: Gondar, Humera and Wollega. Like maize, wheat is a key foodstuff in Ethiopia and surrounding countries. Three varieties are traded on the Ethiopia Commodity Exchange: hard wheat, soft wheat and mixed wheat.

ECX has nineteen delivery centers and 60 warehouses around different regions of Ethiopia with two electronic trading centers currently at work since 2015 and further six electronic trading centers being built around the country. The placement of the

electronic trading system created an opportunity to introduce more commodities onto the exchange and ECX held a training session for some 760 traders for the electronic system. ECX has expanded opening electronic trading centers in seven different regions beginning with the launch of its first commodity center outside the capitol (Addis Ababa) in Hawassa, followed by Nekemte and Humera regional electronic trade centers also expected to become operational.

Figure 6. Integrated ECX Technology Solution



Source: (Gabre-Madhin, 2009)

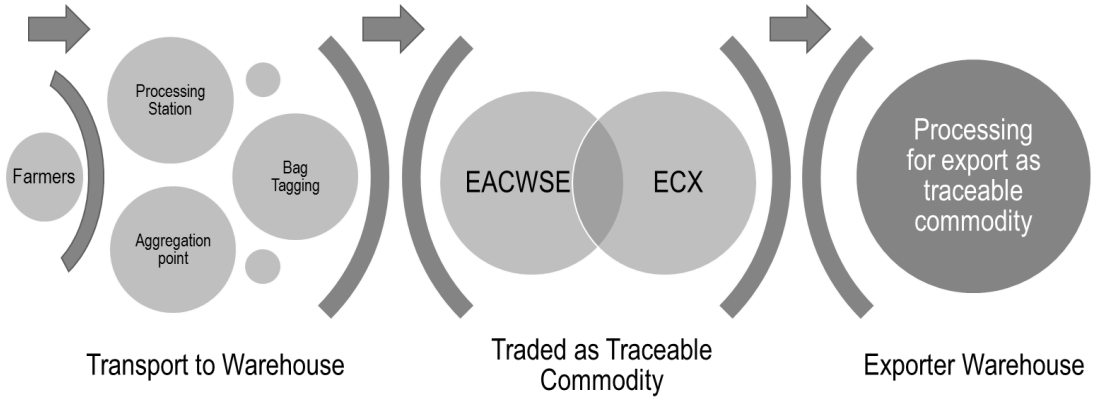
Since its launch, the ECX has traded more than 3.9 million metric tons of agricultural commodities with only a fraction of these commodities were traced to their source using a traceability system (Haile et al., 2017). Due to growing concern about a

lack of traceability, the ECX officially launched its cloud-based IBM-enabled national traceability system in 2013, which runs jointly with the warehouse operator EACWSE in collaboration with the United States Agency for International Development (USAID), designed to function with a bar code system to track commodity trades (ECX, 2014; Mungai, 2015). EACWSE was mandated to separately and independently handle warehousing services of agricultural commodities as an offspring of the current Ethiopia Commodity Exchange. EACWSE has the objective of providing innovative warehouse management service to customers and stakeholders through the application of best practices and available technologies.

Traceability is providing buyers with origin and processing information on commodities traded. In addition to creating market access, traceability enables ECX members and clients to meet the demands of international buyer who have strong interest in traceability by ensuring sustainability, quality, safety and security of commodities. All the parties involved in commodity trade will benefit from the initiative. Considerable experience has been gained from the investments made by ECX to launch a functioning Commodity Exchange and ECX Warehouse Receipts programs as well as the traceability project and the electronic trading system.

The traceability process in Figure 6 shows how bags of commodities traded on the exchange are tagged with geo-referencing to over 2,500 washing and hulling stations or aggregation points throughout Ethiopia's agricultural regions. The bag-tagging system provides the commodity exchange with continuous real-time data analytics which makes it also capable of learning and predicting the quality of commodities based on domestic growth and processing conditions (Kahrmann, 2015).

Figure 7. ECX commodities traceability process flow



Source: Derived from "Traceability project 2014; Ethiopian Agricultural Commodities Warehousing Service Enterprise (EACWSE)" (Haile et al., 2017)

Ermias Eshetu, CEO of the ECX says, "Our coffee in Ethiopia is diverse, and traceability is not just finding where it's from but who is involved, meaning the growers. These facts will improve our ability to move coffee and create premium value for buyers and consumers," (Newsome & Parkinson, 2016). He further explained, "True traceability goes beyond the commodity's type or origin to tracing where the commodity has been. We wish to track the footprint of our coffee and where and when it was washed, stored, who sampled and graded it, and when it was shipped."

Organization of ECX

ECX is a locally conceived idea having a unique design that it integrates the entire "eco-system" related to the market, spanning the central trading system, warehouse delivery centers, product grade certification, clearing banks, an arbitration tribunal, a market information system linking rural sites, remote electronic trading centers, and a

secure data center to manage membership and market information. ECX is accountable to the Ministry of Trade under the regulatory body of the Ethiopia Commodity Exchange Authority (ECEA), which is in turn accountable directly to the prime minister's office. ECEA has powers and duties to extend and oversee ECX actors, clearing institutions, exchange traded contracts. ECEA has the power to investigate and act upon violation of the law concerning the regulation of a Commodity Exchange.

ECX was designed as a public-private partnership among the government of Ethiopia, market participants, and members of the exchange, who have purchased their seats and have trading rights. Although the exchange is wholly owned by the government of Ethiopia, it has an autonomous and professional management that shall be neither related to the ownership of the exchange by government nor to the membership of the exchange. The exchange has members that have been recognized as exchange actors by the Ethiopia Commodity Exchange Authority and who have the right to trade only for their own account or either for their own account or the account of clients (ECX, 2008). At a sale of membership seat in ECX, any person who fulfills necessary requirements set under the rules of the ECX and other pertinent laws can acquire membership of ECX that shall, among other things, confer a right to trade at the exchange. There is no restriction on period of membership for full members. These members may also trade in any commodity listed on the exchange. Full members tend to be large companies and institutions. Limited members of the ECX must renew their membership annually, and are only able to trade one commodity. In addition, they are restricted to either buying or selling that commodity, not both. Limited members tend to be smaller organizations, traditional merchants/traders and individual traders. Each membership type may be further split, into trading members (those who may only trade

on the exchange on their own behalf) and intermediate members (those who may trade for themselves, or for clients).

ECX has a Board of Directors, Chief Executive Officer, who shall organize, direct and administer the exchange, and the necessary officers and staff. The composition of the board of directors, which oversees the management of the exchange, is designed to keep a healthy balance of owner and member interests (ECX, 2008). Thus, it is composed of 11 members, of whom six, including the chairperson, are representatives nominated by the owner and five are elected by the members of the ECX. ECX has created a marketplace, where sellers and buyers come together to trade, assured of quality, quantity, delivery and payment, by implementing its establishing proclamation, the rules of ECX and other pertinent laws that governs its daily operations.

Gabre-Madhin established a reliable interface for buyers and sellers to meet an idea that has inspired other African countries also to follow suit. Gabre-Madhin explained, "during my tenure at ECX, 18 countries came to visit and expressed incredible interest in setting up exchanges" (Whitehead, 2013). However, it was indicated that Ethiopia's unique political and economic conditions, under which the state-run exchange is mandated, meaning that exporters can only procure products through the platform. Hence, the ECX model is unlikely to be repeated in other African markets. Commodity trade specialists point out that Ethiopia is unique in that it has a very centralized view of the way things are run. "When you have those forces in your favor then the speed at which the exchange develops is a lot higher. When you don't have that centralized control there will have to be something else that drives its success" (Whitehead, 2013).

Formerly, most exchanges in Africa's developing countries such as in Kenya, Malawi, Nigeria, Uganda, Zambia, and Zimbabwe have either failed or continue to exist only on the paper with government or donor support. According to Rashid, success and failure of these exchanges depends either on conduct trade or generate enough revenue to profitably pay for their operations (Rashid, 2015). ECX is an exception in that it generates enough revenue to pay for itself with direct policy support, which requires all export commodities to go through the exchange. ECX serves as an example to other developing nations wishing to establish their own commodity exchanges, as it successfully involves all relevant parties (from the global trading community to the government of Ethiopia and local merchants, traders and growers), and reflects local traditions (Ethiopia has a tradition of trading agricultural commodities going back many centuries). Indeed, the mix of commodities traded reflects local as much as international demand, with for example dozens of varieties of Ethiopian coffee traded as commodities.

ECX works together with different NGOs and strongly with banks and other financial institutions. Networks and information flows are vital for the success of projects such as ECX. In the past, information flow used traditional means of communication such as word of mouth as well as unreliable rumors. Word of mouth typically traditional means is almost inappropriate source of marketing information in commodity market, but it shows improvement together with change in technology somewhat used modern information technology other than conventional communication. Ahmed (2017) indicated that there are different means of communication; mobile alerts and broad band internet are used in order to provide the necessary information to the

trader about commodity market mixes. Network coverage for telephone service and appropriate internet connection are installed and are showing further improvements.

Through the support of policies that discourage export through arrangements other than the exchange, ECX trading volumes went from US$ 240 million in 2008 to US$ 1 billion in 2011 to US$ 1.4 billion in 2012 (Whitehead, 2013). An estimated 850,000 small-holding farmers (mostly producers of coffee, sesame and other cash crops) - around 12 percent of the national total were involved in the ECX system (UNDP, 2010).

4.3. Ushahidi in Kenya

Background of Ushahidi (Post-Election Violence of Kenya)

In 2007 Kenya held disputed presidential and parliamentary elections in which the outgoing president Mwai Kibaki, from the majority Kikuyu tribe, was declared the winner among protests from his rival Raila Odinga of the Luo tribe who had claimed the votes were rigged. Violence erupted in late 2007 and early 2008 with ethnic clashes spreading across the country that resulted in the reported death of over 1,200 persons, the displacement of over 268,300 individuals and the destruction of over 41,000 houses (OHCHR, 2008, p. 8). The riots and violence made the government to exert force to control traditional media sources.

A young Kenyan lawyer and prominent blogger, Ory Okolloh, began blogging extensively to report about the violence, riots and rumors. Despite the fierce threat from the government towards media, Okolloh took the bold move of asking people to post comments and send emails to her blog describing those events that were not being

reported elsewhere (Meier, 2011). Having a wide readership, she received continuous streams of information from her readers who were documenting numerous human rights violations taking place across the country. Okolloh was soon overwhelmed with the volume of information she was receiving and could not blog fast enough. She later fled to South Africa after having received a number of targeted death threats. Okolloh continued blogging from Johannesburg where she suggested in a blog post that a Google map "mashup"[8] be set up to allow others to document human rights violations directly since she couldn't keep up with the volume of information she was receiving (Meier, 2011). She soon found out that her blog was quickly overflowed by reports at which she was prompted with the idea of creating a website that collected reports, sent on-line on the site or either via SMS, and then map them for easier visualization.

Consequently, Okolloh shared her idea in the blog asking the Kenyan IT community to begin cooperating to build the website. Her request was simple: "…any techies out there willing to do a mashup of where the violence and destruction is occurring using Google Maps?" (Usahidi, 2009). Fellow technology bloggers Erik Hersman, David Kobia and Juliana Rotich read the post and decided to act on her suggestion and soon the Ushahidi platform was born (Meier, 2011). Within one week, the website was launched with the cooperation of other African software development team that comes from different countries in Africa, including Kenya, Ghana, South Africa and Malawi and other contributors in the US and Europe. The start for Ushahidi has been the interaction, the build and share of knowledge among many local and global professionals.

[8] Mashup means a mixture or fusion of disparate elements; the differing testimonies of Ushahidi participants primarily appeared as *Google Maps* location markers along with top of the screen was lined with links to more information about the events at hand.

It was made to be a free and open source mapping software that allows anyone to create a live and rich multi-media map of an event or unfolding situation. Unlike standard Google and Bing Maps, the Ushahidi platform allowed witnesses in Kenya to text in their own reports of human rights violations using a simple SMS "short code" set up with the telecommunications company Safaricom (Meier, 2011). The site gave citizens an alternative to traditional, government censored media, because it was able to obtain reports as soon as the event happened, covered a broader geography than traditional reporting and included a larger number of reports from a varied source of informants (Okolloh, 2009). The bloggers shared the map on their blogs to get the word out and thus began to crowdsource the reporting of crisis information from the ground—human rights violations that would otherwise have gone largely undocumented by other sources like the Kenyan government, mainstream media and the 147 election monitoring organizations.

The launch of the platform

Ushahidi (meaning "testimony" in Swahili) is a local initiative that was started by a collaboration of Kenyan citizen journalists. The word refers to the purpose of the organization, namely giving voice to citizens and empowering local communities by creating a tool helping them to share and access information.

Ushahidi is a free, open source platform that allows its users to send in reports and gather distributed data via SMS, email or web and display it on a map or timeline (Poblet, 2015). These interactive maps are being used to detect fraud, uncover discrepancies in voting, and report on human rights violations as well as humanitarian

situations. It was initially a platform that has been expanded into downloadable and web-based platform that has been used in a variety of contexts after it was developed in order to channel reports of violence and peace efforts in Kenya after the post-election fallout at the beginning of 2008. The original website was used to map incidents of violence throughout the country based on reports submitted via the web and mobile phones. The website had 45,000 users in Kenya in the beginning, and served as the catalyst for realizing that there was a need for a platform based on it, which is used by others around the world. Later it became a global organization that empowers people to make serious impact with open source technologies, cross-sector partnerships, and ground-breaking ventures. Since computers are out of reach for many Kenyans, Ushahidi allowed its system to work simply on cellphones. In addition, Ushahidi had no venture capital backing, it developed its own open-source software, known as the *Ushahidi* platform, which allowed others to use the source code to remix its tool for new projects.

Ushahidi has grown into a global non-profit technology company with a mission to change the way information flows in the world and empower people to make an impact with open source technologies, cross-sector partnerships, and ground-breaking ventures. It enables users to make smart decisions with a data management system that rapidly collects data from the crowd and visualizes what happened, when and where. Ushahidi suggests a new paradigm in humanitarian work. The old paradigm was one-to-many: foreign journalists and aid workers jet in, report on a calamity and dispense aid with whatever data they have. The new paradigm is many-to-many-to-many: victims supply on-the-ground data; a self-organizing mob of global volunteers translates text

messages and helps to orchestrate relief; journalists and aid workers use the data to target the response (Giridharadas, 2010).

Ushahidi also represents a new frontier of innovation, in which entrepreneurship is born of hardship and innovators focus on doing more with less, rather than on selling new and improved products. Ushahidi is responsible for founding the I-Hub, a technology hub in Nairobi which has helped build the technology community in East Africa, growing to over 14,000 members, has incubated 150 tech startups that have created over 1000 jobs (Macrae, 2015). Nat Manning, who has been one of the key personalities of the Ushahidi project since 2011 explains,

> At Ushahidi, when we got our first investment, instead of renting an office we created the [I-Hub], a tech hub in Nairobi. After three years there are now over 11,000 members, 125 companies formed, and over 700 jobs created. You might have heard of the LEAN startup model – in short, keep iterating until you have solved a problem for the customer. Well who knows the problems and customs of the developing world better than those who live there? For instance, Ushahidi just launched a new product. As a tech company spread across 9-time zones, it's pretty frustrating when we can't get online. We kept looking at that modem in the corner, and we realized that it was designed for the USA, for a desktop computer in a cubical with the assumption of ubiquitous electricity and fiber. That's not the reality for most of the world, nor will it be any time soon. We deal with daily power outages and typically the mobile networks are more widespread than a wired connection. So, we created the BRCK. It's a redesign of the modem for the developing world. It has a battery backup that charges on any type of electricity, and has both an Ethernet port and a SIM card, and seamlessly switches between the wired network and the mobile network. (Manning, 2013)

Ushahidi developed BRCK, a device that allows for rugged, reliable and easy access to internet connectivity where electricity and internet connections are problematic both in urban and rural areas. It is a critical innovation for a variety of sectors across Africa as many technologists get frustrated when the Internet is dysfunctional. BRCK is designed to allow users to access the Internet in Africa and

overcome some of the challenges that are unique to the continent. According to Ushahidi, the BRCK allows users to leverage the nearly ubiquitous mobile broadband and turn it into a connection optimized for productivity, rather than solely consumption. With the BRCK, teachers, administrators, doctors, and caregivers can mitigate the unreliable connectivity by caching and distributing content to remote locations and setting up reliable WIFI hotspots. It was reported that the product works in the harshest conditions (Lungati, 2014b). This shows that the guiding philosophy of Ushahidi is to build new software and, in doing so, to solve real-world problems.

Designed for local context and local needs

According to Stogyte (2013), the design of the Ushahidi platform was influenced by the values of the developers with consideration or importance given to the local cultural context. As a platform for crisis communication Ushahidi's deployment is in critical situations (such as floods, earthquakes, riots), which in most cases involve large participation of society members in need of fast, efficient and intensive communication. Taking into consideration that these situations usually emerge in particular geographic areas with specific local cultural contexts, the attention to the features of local environment where a certain ICT is being implemented is crucial for the technology to be adopted and used. Stogyte (2013) found out cultural patterns shared among the Ushahidi community such as shared motivations, shared values, and boundaries distinguishing Ushahidi from other organizations. The main goals of the organization as officially declared on its website are democratizing information, increasing transparency and lowering the barriers for individuals to share their stories.

In the case of the Ushahidi platform, the definition of users is not limited to the public at large who generate the content of a platform by submitting reports, but includes the people who deploy, manage and work with the platform in order to deliver a specific project. The platform allows assigning different roles ("None", "Administrator", and "Super Administrator") to different users, which determine different functions and power to monitor the content. In this way, the delegations and functionalities are distributed according to the specifics of every project. It is also possible to create specific roles (as a reporter, viewer, observer, etc.) and to give to each of them specific permissions to see or edit information inside the platform. The concept proposed by Tedre (2006) can help recognize the awareness of the users' local context among the technology developers. It was stated that close attention is needed to the end-users with sensitivity to the overall local technological infrastructure, local needs, local users, local culture and society (Tedre, Sutinen, Kähkönen, & Kommers, 2006). This is one of the features of open development which makes it different from traditional development approaches.

Speaking with the Arabic journal Knowledge Wharton of the Wharton School of the University of Pennsylvania, Ushahidi co-founder and executive director Juliana Rotich says that she is thrilled that others elsewhere in the world have turned to this platform to make their own social tools (Knowledge@Wharton, 2013). "The software can be a simple thing, but tapping into the wisdom of the crowd takes some hard work," she explains. Ushahidi was launched with the cooperation of African software developers. Apart being a platform that uses to collect the eyewitness reports of crisis or events sent in by email and social network and text messages to be mapped together, Ushahidi is also the name of the open source software developed for that site, which has

since been improved, released freely, and used for a number of similar projects around the globe.

Juliana Rotich clarifies, "We provide toolkits on our [w]iki to share best practices, but by and large, the best and most successful uses of Ushahidi are powered by local developers who extend their network and invite others to assist them in partnership. Local people know best how to work it in the local context. Every country is different. Every community's learning is different. So far, the experience gained through the development of Ushahidi is showing that local talent can create the technology." (Knowledge@Wharton, 2013)

Stogyte (2013) describes that Ushahidi is platform oriented towards the end-user through its various technical settings. He explains that

> [t]he local context of the technology infrastructure matters, since it is critical to know if the technology is to be deployable. This entails getting to know the local technological context so as to adapt to the local technology means that are set in the local area and are to be used to deliver the platform. […] Local needs are relevant to any technology, but it is a much bigger issue when the goal of ICT is to collect crowd-sourced data. Local needs translate into the goals that Ushahidi is meant to deliver. As the platform aims to empower the communities to take action for their own benefit, a clear understanding of the value that it brings to the members of these communities is essential in order to meet the goals. (Stogyte, 2013, p. 29).

In order to meet the needs and expectations of users, feedback mechanisms and regular communication is a big part of developing, deploying and adjusting the platform to a particular emergency situation or cultural context. The software developers work with broad range of participants including NGOs, as well as sustained debate and collaboration with the scholarly community. In addition, the broad scale of customization options speaks to the importance given by Ushahidi to the local needs of

the users. These options make the platform adjustable to different specific goals through changeable functionalities and interface by users of the software in which some of them would literary customize the whole thing and change the whole interface to fit whatever they need. Further, customizability is strongly related to the following section of this chapter dedicated to the relevance of the platform to local users.

Stogyte writes that eligibility to local users include the skills and abilities of the users needed to take advantage of the technology and cultural or contextual specifications are not implied in a tool itself. Ushahidi as a technological development is neutral and allows the deployment managers responsible for its social and cultural aspects (Stogyte, 2013). Therefore, the adjustment of the platform to the local context is at the large scale left to the platform user. The awareness of the difficulties that users may face in using the platform encourages efforts to solve their problems. Since its establishment, the Ushahidi platform has been adopted in various contexts in order to serve different crisis-related goals as explained in the following section.

Ushahidi Networked in design

As Kenya experienced a post-election fallout, with diffused violence; the Ushahidi platform was developed for reporting and mapping violence. Ushahidi started as a closed community working for this specific event. However, following the success of the platform and its deployment in other crises, the organization opened up and started developing software following the principles of open source software development. Nat Manning describes himself not as a development worker traveling to local areas for humanitarian work, rather a tech person working from his place in San Francisco since

Ushahidi's software is at use in 159 countries across 35 languages. He emphasizes that "that could not have happened [three] years ago. And because of access to the Internet, open source tools, and open data we have been able to do some pretty cool stuff!" (Manning, 2013).

Ushahidi was launched with the cooperation of African software developers who based the innovation on network. Volunteers did all the work during the first two months: programming, data gathering, report checking (calling or emailing reports, comparing with media information), maintenance, software upgrades and promotion of the site. Apart being a platform that uses to collect the eyewitness reports of crisis or events sent in by email and social network and text messages to be mapped together, Ushahidi has since been improved, released freely, and used for a number of similar projects around the globe.

Networks, properly designed grow by their design and structure. Knowledge-based technology networks are assisted when the knowledge upon which they are based, is easily or freely accessible. The Ushahidi platform has ever since gone through several upgrades. As mentioned above, the technology allows individuals, grassroots organizations, media companies and large humanitarian organizations to easily create and publish live multi-media maps of unfolding situations around the world. This multimedia component is important because the Ushahidi platform integrates powerful tools like Twitter, Facebook, SMS and smart-phone apps by providing a different a crowdsourced framework that can counter official state announcements. In addition, the platform can serve as a powerful recruitment or mobilizing mechanism for social movements and other causes.

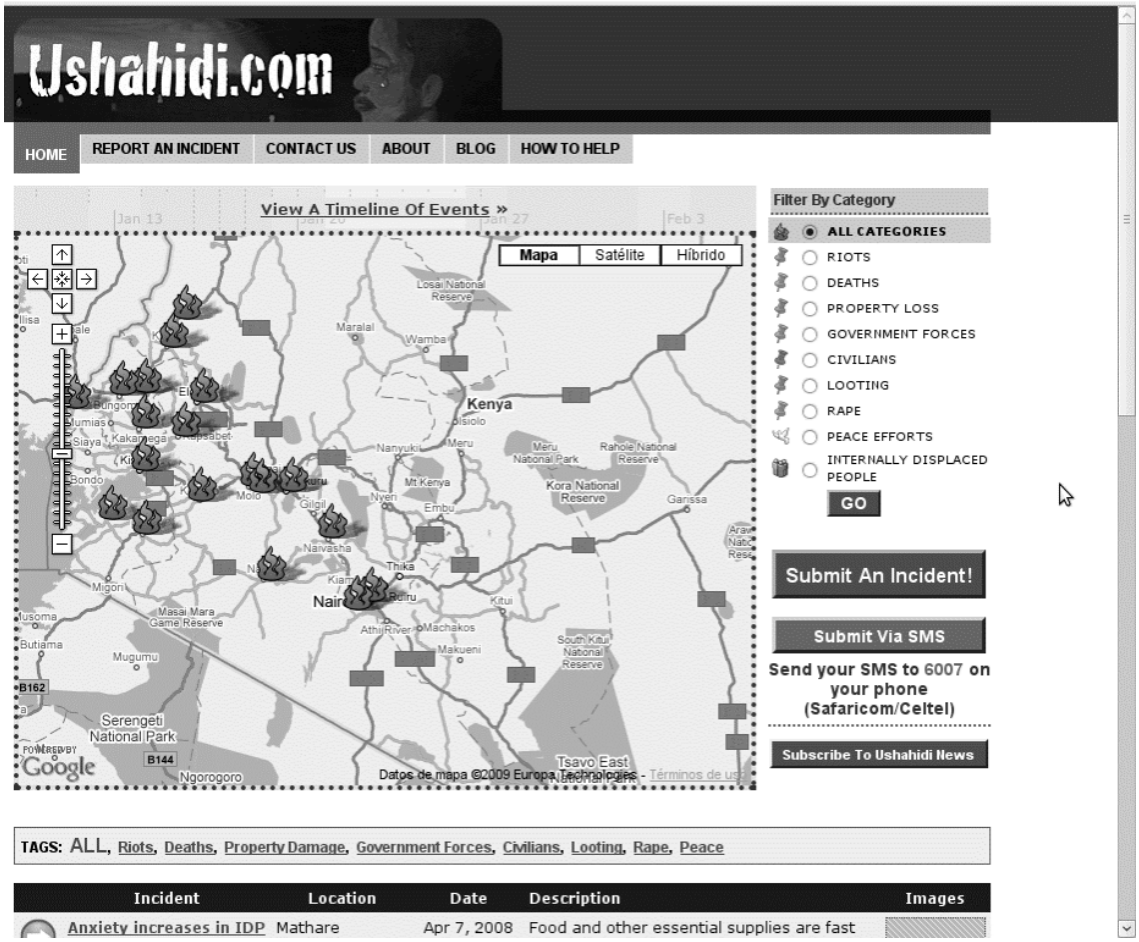
The fact that Ushahidi is supported with crowdsourcing makes it different from other types of institutional survey systems which require specialized staff and are performed days or weeks after the events occurred. This will help for the large amount collected data to be stored and mined at any time in order to give meaning to the information acquired. Crowdsourcing is the act of obtaining information or input into a task or project by enlisting the services of a large number of people from the internet. It is the activity of outsourcing a task to a "crowd," which is generally a distributed group of often unknown participants (Smith & Reilly, 2013, p. 27).

The Ushahidi platform is a simple, near real-time, multichannel crisis data collection and analysis platform. It is a collaborative mapping platform that enables real-time aggregation of SMSs, tweets, emails, photos, videos, comments and also voice recordings, with location, time and date marks. Figure 6 below shows an example view of the Ushahidi platform. After an initial categorization, reported events or incidents are accumulated or clustered graphically on a map. The result is a dynamic situational map updated through participatory sensing from the grass roots as events unfold. In the aftermath of the crisis the resulting map becomes a searchable repository or memory of an event, something that has extraordinary implications for future evaluations, legal purposes or historical accounts.

The political vulnerability and dangerous situation that prevailed at the time of Ushahidi development and first deployment where such that the characteristics of simple, near real-time, high density, high sampling frequency, unstructured and unconstrained data acquisition were very important (Diamond, 2010). As such, Ushahidi, a free open source platform (FOSS), became part of a new kind of technologies that

empower individuals, facilitate communications, and foster mobilization, enabling citizens to provide humanitarian response, to expose abuse, to protest, and to act as social auditors (Diamond, 2010).

Figure 8. An example view of the Ushahidi platform



Source: Ushahidi.com

It is undeniable that the crowdsourcing concept has been around for quite some time that made Erik Hersman, one of the Ushahidi's founders, surprised that this technology had not been attempted in the humanitarian field before. However, the problem is that open access, a philosophy that permeates Ushahidi design, operates in

direct contrast to the underlying ideas in the humanitarian and crisis response organizational world where knowledge silos seem to be prevalent (Yates & Paquette, 2011). In a critical tone, Hersman believes that aid organizations hold on to information very tightly because it is a commodity that enables funding (De Waal, 2010).

Table 3. Components of the Ushahidi platform

"Reports"	It indicates information that is submitted by the users of the platform or the public at large. They consist of digital objects such as text, video, and audio. Besides, depending on a communication channel (SMS, email, Twitter, RSS feed and the web) through which they reach the platform, they might include other digital objects such as tweets, tags, and alerts that signal newly submitted reports. The reports are arranged by categories
"The Map"	It is one of the most important features of the platform. It is used for displaying information. The base of the map is chosen from several options: Google map, Yahoo map, Open Street map (OSM), or Visual Earth. The map consists of *"Categories",* that is to say, complex digital objects (that consist of other digital objects) that are used to systemize the information being mapped. *"Layers"* (complex digital object) that are used to display different types of information. Layers can be *static* or *interacting.*
"The Timeline"	The timeline shows the number of reports mapped over time and by default shows the overall trend of the reports from the beginning of the deployment to the current day as a static graph.
"The Incident List Box"	It appears below the Timeline and it represents the list of reports in the chronological order starting from the most recent one.
"The Reporting Box"	It contains the information how to submit the reports (a number for sending SMS, e-mail address, etc.). Digital objects found: text, links.
"Official and Mainstream News Box"	It contains the news feed about the matter from media sources (generated via RSS). It consists of such complex digital objects as news articles that have text, pictures, video, audio within them, as well as other digital objects, such as links and tags.

Source: Stogyte, 2013

The Ushahidi platform is adjustable and modifiable for each specific case of use. Here, the features of the platform are analyzed in relation to the cultural values of the developers the digital objects refer to. The platform has since gone through several upgrades. The latest version, Ushahidi v3, was released in September 2015. It allows for custom survey creation, and the running of multiple surveys on a single deployment, amongst other feature improvements from v2 such as embeddable maps and surveys, analytics, private deployments, and management of roles and permissions. After its initial deployment in the aftermath of Kenya's disputed 2007 presidential election, soon in 2008 it was used to track anti-immigrant violence in South Africa, to map violence in eastern Congo and in 2009 to track pharmacy stock outs in several Southeast African countries such as Malawi, Uganda, and Zambia. It was also used to monitor elections in Mexico and India, among various other projects. Later in 2010, Ushahidi was used in the humanitarian efforts during the earthquake in Haiti where nearly 40,000 independent reports were sent to the Ushahidi Haiti Project of which nearly 4,000 distinct events were plotted (Morrow, Mock, Papendieck, & Kocmich, 2011). The details of this will be discussed in the impact analysis Chapter 5.

4.4. M-PESA in Kenya

Background of M-PESA

Kenya’s traditional banking infrastructure was not designed to meet the needs of all segments of the country’s society. In the year 2006, 400 bank branches and 600 ATMs served a population of 36 million people, reaching only 18.9 percent of Kenyans (Omwansa & Sullivan, 2012). Another 7.5 percent had access to other formal services

through microfinance institutions, but the remaining population was either limited to informal mechanisms, like savings groups, or completely without access to banking services. Despite this lack of formal bank services, the financial lives of the poor are complex, and Kenyans without access to banking services had found ways to pay bills, save, transfer money, and otherwise hedge their financial risks (Omwansa & Sullivan, 2012).

The arrival of M-PESA, (M, for mobile; PESA for money in Swahili), brought more inspiration in technological innovation in this area so that other systems such as the Ushahidi also were introduced. Open development also allowed other systems such as the Mcopa (a loan service system – mobile borrow) that use the Safaricom mobile telephone line connections to be invented. There have also been award-winning smart greenhouses designed by two Kenyan students that allow farmers to control temperature, humidity and soil moisture on their mobile phones (Mutiga, 2016). In this respect, Kenya has been the leading country in producing various local idea based solutions to local problems.

A young Kenyan entrepreneur told me the following:

> There have been lots of innovations that have come into the market including particular systems where you are able to figure out from your mobile [phone] where in Kenya today tomatoes are selling cheaply than any other place. Where can you find maize, chicken, pineapples cheaper? There are lots and lots of innovations that have come out simply because of the belief that M-PESA had made life easier. There is a system that tells you that this is the right tomato species that are appropriate to seed for a particular farming location. Lots of innovations connecting people with technology have come into existence simply because of the revolution that M-PESA has brought to Kenya. That's why places like the I-Hub are becoming core innovation initiators. And people are being aware of this more and more. (2017.01.15)

Many Kenyans believe that M-PESA is an innovation of Kenyan origin and, in fact, that it was an invention of a Kenyan university student. A private innovator, Nyagaka Anyona Ouko claimed that he is the creator of M-PESA and that Vodafone and its representatives stole the idea of Mobile Cash Transfer from him (Founder (The), 2017). He insists that he has been "trying to patent a money transfer system way back in 2003" until he was awarded a certificate by the Kenya Copyright Board dated 15 June 2012 (Founder (The), 2017). Despite various such claims about the origin of M-PESA, it is widely accepted that its conception has deep roots in Kenya. However, M-PESA has been acknowledged to be a locally initiated innovation that is currently licensed to Safaricom under a trademark license agreement from Vodafone. Vodafone provides the managed services to Safaricom and authorizes Safaricom to operate the M-PESA service in Kenya (Bankelele, 2012). Ever since its advent, M-PESA has been welcomed for years as a Kenyan technology success story, which has testified Kenya's world-class technology scene.

Local ideas as solutions to local problems

Kenyan users have contributed a lot for the growth of M-PESA, even though Nick Hughes, a senior Vodafone employee together with his teammate Paul Makin, a banking sector professional are credited with conceiving the idea of M-PESA in 2003 (Omwansa & Sullivan, 2012). The original idea was business. The first initiative of M-PESA was to facilitate customer loan repayment to microfinance institutions. An initial pilot that turned into a commercial service showed that most customers were using M-PESA as a low-cost payment service. According to Michael Joseph, the former CEO of

Safaricom, M-PESA was originally made as a mechanism for disbursement and repayment of microfinance loans using mobile phones, and trialed a prototype service in Thika, north of Nairobi (TechChange, 2013). Joseph explains it in the following way,

> Originally, we worked on the idea of microfinance loans using mobile phones, and trialed a prototype service in Thika, north of Nairobi. What we found in practice was that people who received the loans were sending the money to other people hundreds of miles away. In hindsight, we had inadvertently identified one of Kenya's biggest financial challenges (Joseph, 2017).

Indeed, the system was successful for the purpose it was originally established but the observation was that local people were using it for something else other than just making microfinance earns repayments reducing the costs associated with handling cash and thus making possible lower interest rates. The users were sending money among themselves across long distances because the system enabled them to do so (Joseph, 2017). Later, this led to the re-design of M-PESA as a mobile banking service that can easily allow customers to send money, deposit and withdraw cash, pay bills, purchase airtime minutes, and, in some cases, transfer money between the service and a traditional bank account—all from their mobile phones.

> So, we took a chance, and re-engineered the loans system to focus squarely on transmitting money from one phone to another. We wanted to have a 'branch' on every street corner, so we needed to recruit a huge network of agents. Our aim was that customers would visit those agents with cash, then, through a series of SMS messages, convert that money into electronic funds that securely sat on their SIM cards. Then, via SMS, they could transfer that money to anyone else, who would then visit their local agent and withdraw that cash again. The transaction needed to take place in seconds and the transaction cost would need to be very low (Joseph, 2017)

Paul Makin states, "We spent a lot of time in Kenya, talking to ordinary people (not big business). That's where the idea came from" making the origin of M-PESA to

have deep origins in Kenya along with the fact that global and local knowledge played important role together into its establishment (Bankelele, 2012). According to him, Safaricom was extremely helpful, and Kenya was a good environment for innovation. Makin clarifies, “People are willing to try new things and try to make business …but they were a good partner network. Very supportive. And you can’t do proper security without being in the network.” (Bankelele, 2012). The fact that users adopted the platform to solve their problems made way to the beginning of a powerful tool for mobile money transfer system. What was noticed was, while less than 25 percent of Kenyans have bank accounts, 80 percent can access mobile phones. The strong penetration of mobile technology within the country could become the bases for the innovative solution. Makin further explained, “We talked as a team in a Nairobi bar. Came up with it, asked the barman to try it. He liked it, so it stuck. Vodafone didn’t like the name. Not corporate enough. But Nick fought for it, and won.” (Bankelele, 2012).

One of the cofounders of M-PESA, Susie Lonie writes

> Sitting in a comfortable office in England and deciding what Africa needs is an approach doomed to failure. The market is littered with first-world solutions that have utterly failed in emerging economies. For this project to be successful Vodafone needed someone on the ground in Kenya, ensuring that the team properly understood the environment in which the service needed to work, and the detailed product requirements. That’s where I came in. (Hughes & Lonie, 2007)

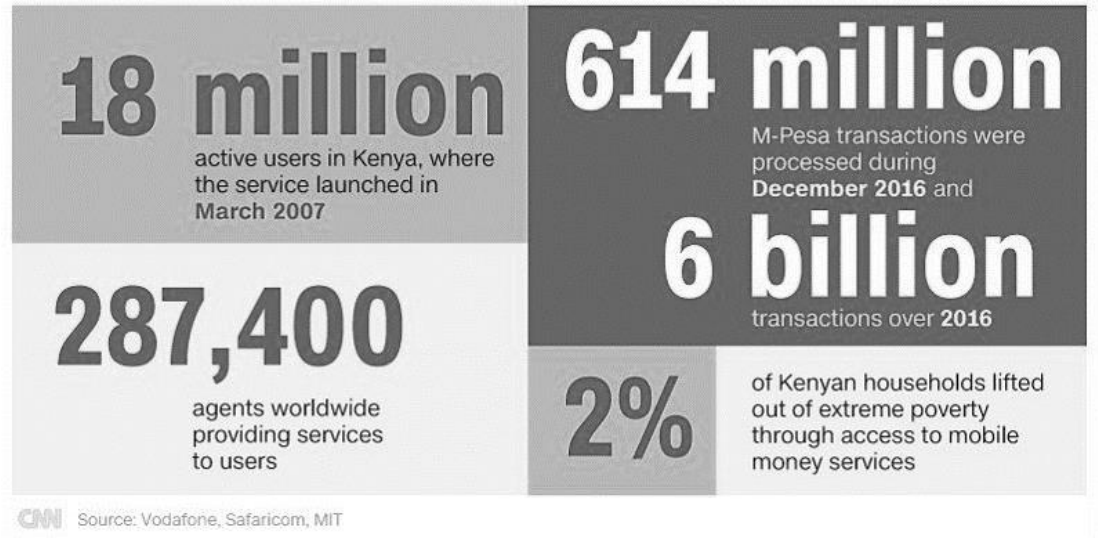
Today, banking is done in creative ways using mobile phones in Kenya. It is estimated that more than half of all personal transactions of money are now done through phone transfers in Kenya. Unlike the traditional system where money is transferred from one account to another through a bank, such transfers, using phones in Kenya, involve direct transfers of funds through the cell phone company using phones of low-level technology (Porteous, 2006).

M-PESA has created an easier system by which poorer Kenyans can manage their money. Even through simple 2G Nokia phones, M-PESA allows people to transfer e-money between each other via text message. The virtual money is backed up by real money in a bank account not owned by the user. This is a useful service for people who do not want to manage a personal bank account because the bank is too far away from their homes (Suri 2016). Users withdraw cash by selling the e-money, or deposit cash and receive e-money through M-PESA agents[9]. The agents are usually small-business owners or microfinance institutions, and they receive small commissions when managing transactions.

Once a user signs up for M-PESA, money can be paid into the system by handing cash to one of Safaricom's 40,000 agents (typically in a corner shop selling airtime), who credits the money to that user's M-PESA account. Money can also be withdrawn by visiting another agent, who checks that the payer has sufficient funds before debiting from the account and handing over the cash. Money is also transferable to others using a menu on the phone. Cash can thus be sent one place to another more quickly, safely and easily than taking bundles of in person, or asking others to carry it on behalf. This is particularly useful in a country where many workers in cities send money back home to their families in rural villages, thus saving them valuable time that they would otherwise have spent traveling.

[9] M-PESA retail agents are responsible for registering new customers and facilitating cash deposits and withdrawals. Retail agents often play a key support role for customers as well, since they are able to quickly and easily contact M-PESA Customer Care.

Figure 9. M-PESA key statistics



Source: (Monks, 2017)

The Network and Technology of M-PESA

The reason for the success of M-PESA is that it has had several factors in its favor, including the exceptionally high cost of sending money by other methods; the dominant market position of Safaricom; the regulator's initial decision to allow the scheme to proceed on an experimental basis, without formal approval; a clear and effective marketing campaign ("Send money home"); an efficient system to move cash around behind the scenes; and, most intriguingly, the post-election violence in the country in early 2008 (Economist (The), 2015). M-PESA was used to transfer money to people trapped in Nairobi's slums at the time, and some Kenyans regarded M-PESA as a safer place to store their money than the banks, which were entangled in ethnic disputes. Having established a base of initial users, M-PESA then benefitted from network effects: the more people who used it, the more it made sense for others to sign up for it.

Michael Joseph, describes it in the following way,

> Since 2007, M-PESA has enhanced the lives and livelihoods of people without bank accounts, giving them access to essential financial services through their mobile phones. I am delighted and proud that M-PESA has reached the 25 million active customers milestone. M-PESA continues to expand, evolving beyond traditional money transfers to encompass savings and loans, payment of salaries and benefits, settlement of utility bills and school fees and to enable vital health and agricultural solutions (Vodafone Group, 2016)

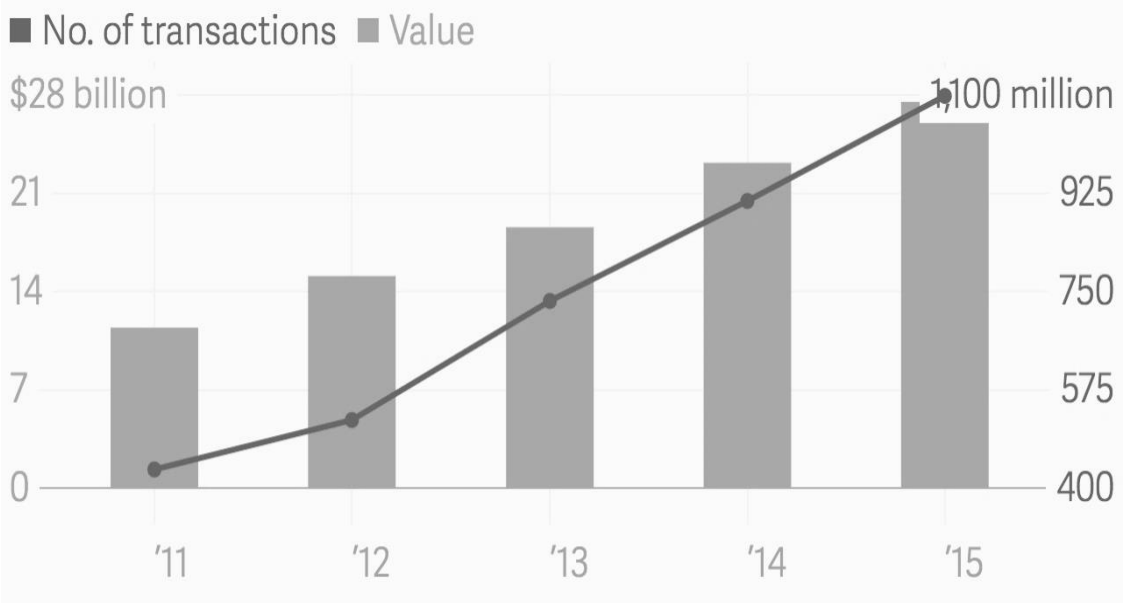
According to MIT Professor Tavneet Suri, the process of linking insurance plans with trusted family and friends has created a more entrepreneurial spirit and people are now more likely to use their money to create their own businesses and help grow the economy, as failure has become less risky (Russo, 2016). It has been noticed that a shift of a population of poor farmers to local businessmen driven by the economic incentive of profit (Russo, 2016). Since 2007, M-PESA has enhanced the lives and livelihoods of people without bank accounts, giving them access to essential financial services through their mobile phones and M-PESA now has more than 30 million active customers (Mtshali, 2017).

Safaricom reports that within one year of its launch in 2007, it had close to two million M-PESA customers register with the service and over 2000 active M-PESA agents with over 9 billion Kenyan Shillings (KES) transferred through the system (Morawczynski & Miscione, 2008). M-PESA had over KES 6.9 trillion value of transactions in the FY2017 and the registered M-PESA accounts as proportion of the adult population exceeds 90 percent and more than 96 percent of Kenyan households (Safaricom, 2017d). M-PESA has become successful due to its dense network of agents, with over 130,000 agents, which is more than 40 times the number of ATMs and enables a person living in the city to deposit money in Nairobi and then transfer it to his family

in the village, who can then withdraw the funds from the nearby agent (Dawson, 2017). It is used as a substitute to costly and unsafe courier services, and it has an economic impact. Hence, the key to the success of M-PESA is that it benefits from the network effects. The system only works when enough people use it but once the word of mouth recommendations reached a critical number of subscribers the system became viable and then new uses were found for the platform.

Technology was also used to provide a solution development which meets the needs of both agents and customers, not to mention the mobile money service provider. Even though, M-PESA uses some of the state-of-art designs of technology for its money transfer platform technology itself was not the ultimate goal. As to Hughes and Lonie (2007) explained that financial services in emerging markets are not about new technology rather about new applications of existing technology. Moreover, the technology at use needed to provide a simple functional specification design to customers. Safaricom has started delivering the network of the future through 4G, which is now available in over 30 counties in Kenya. Its investment, in what they call, a second generation M-PESA network allows it to process over 21,000 M-PESA transactions every minute, and provide access to two mobile-based loans every second (Safaricom, 2017c).

Figure 10. M-PESA number of transaction growing pattern (between 2011~15)



Source: Charts by Quartz (Masinde, 2016)

Local transactions by Kenya's mobile money service, M-PESA currently exceed transactions made by Western Union globally, the International Monetary Fund (IMF) reports. According to the IMF, "M-PESA now processes more transactions domestically within Kenya than Western Union does globally..." (IMF, 2011) As a testament to its power, millions of Kenyans used M-PESA for social impact this year to raise millions of dollars to fight hunger in Kenya. Through the Kenyans for Kenya campaign, small donations as low as 10 KES or about US$0.10 were made by citizens in both urban and rural areas. Though the campaign had the goal of raising about 500 million KES (about US$5 million) in one month, this goal was reached in only two weeks. As of September 2011, the campaign had raised about 672 million KES or about US$7.9 million (Jidenma, 2011).

M-PESA is a successful innovation due to its provision of a good demonstration of the social aspects of diffusion of innovation. Kenya, like many African societies, is

heavily dependent on personal relationships and word-of mouth represents a key way for ideas to spread. In the case of M-PESA this helped build up the network effect; essentially without a critical mass of people connected to the system it does not offer much advantage. But the more connections there are the more attractive the system becomes. In the case of M-PESA this 'tipping point' was reached quite early and the widespread connectivity then enabled other services to be added which reinforced the value and drew more subscribers into the network. This network effect extended beyond the phone use itself to the network of retail stores able to offer the service so that people could deposit and receive money.

4.5. Summary

This chapter provided a background description into the characteristic features of the three cases selected for the study, by examining whether they fit into the theoretical description of the open development. This has been explained by examining whether the underlying ideas of the cases under analysis are in line with the core concepts of open development. The projects were investigated whether they are locally derived idea base and designed for local context and local needs. In addition, the pattern in which the projects are networked and grew extensively through the network connections, which result in the building of knowledge that is built and shared as a public benefit. The following section will deal with the diverse impact analysis of the cases under study, namely, the ECX, M-PESA and the Ushahidi.

Chapter V. Impact Analysis of the Three Cases of Open Development

This chapter discusses the findings concerning the impact of open development projects in bringing positive change in the lives of the users or beneficiaries in the two nations under consideration. This has been explained by examining whether the underlying ideas of the development projects under analysis result in outcomes that are successful in benefiting communities through the utilization of the open development approach. The analysis of the outcomes of this societal development ranges from whether the communities or societies benefit from the use of this approach through the impacts on their lifestyle, to increasing the openness of access to knowledge and information. The impacts of the open development approach are analyzed in the extent to which services provided are diversified; whether they are provided in such a way that they enhance efficiency; whether they are secure, whether they are inclusive and promote social cohesion, and provide expanded resources which is analyzed by the extent of their impact on economical livelihood and mitigation of poverty of the beneficiaries. The discussion indicates that the magnitude of the impact in each feature for the three cases differs.

There is a tendency to question whether "open development" cases fit old development definitions of benefits. The findings show that there is evidence that network effects lead to clear evidence of expansion of opportunities or resilience. This leads to a variety of changes, many are not as obvious or even as quantifiable as monetary gains or even "poverty reduction." The following are some categories where the research shows either expanding opportunities or expanded resilience. The impacts of the cases are categorized into four groups that are derived from the analysis of data collected through interviews, observations, reflective journal entries and field notes

collected at the project sites, along with existing literature about the projects. The categories include projects that have provided diversified functions; enhanced efficiency; offered expanded resources and economic benefits that may result in poverty reduction while promoting the inclusion of marginalized groups, and at last strengthened social interaction.

5.1. Diversified functions

It was found out that the three platforms have developed rapidly, demonstrating increasingly diversified functions with the help of up-to-date technology. For example, M-PESA has been growing to provide diverse services, apart from the simple deposit and withdrawal of money, such as paying bills, buying goods, getting loans, as well as specialized platforms to support small enterprises. Ushahidi has also grown to become a useful tool of development projects apart from its original deployment as a disaster mapping software. The ECX has grown to include more commodities into its trading items by introducing online trading and traceability systems and expanding its warehouses and branches. In what follows, the ways in which the three cases under consideration, M-PESA, Ushahidi, and ECX, have diversified are examined.

5.1.1. M-PESA

With regard to the mobile money transfer system, M-PESA, the simplicity of the process as regards the way in which this system works and its utility in today's environment makes it an asset for everyone across the economic social and geographical

divide. A Nairobi resident, Opiyo, who is in his 30s, works for a non-government organization. He explained how M-PESA has become a very useful system which enables citizens either to send money to and receive money from other people, pay bills, arrange loans, as well as purchase airtime or goods.

> This can be done just by going to the SIM-card tools and find M-PESA tool there. But to withdraw a cash, you need to go to an M-PESA agent (dealer). Not all shops are dealers but several of them are there. You can do also savings at virtual banks which work with other banks; they are more or less like M-PESA banks. You can also borrow money from that bank. And the Lipa Na M-PESA means paying with M-PESA. Some places have a 'Till' number, so you can use those numbers to pay for services or goods with minimal amount of commission or you can also pay your bills using pay bill numbers of service providers. Some places take of those commissions to make it easier for their customers to pay. Even though it is a minimal charge paid for the services, most of the times Safaricom does not disclose fully how much they charge you for a particular service. (2017.01.15)

An M-PESA agent and shop retailer Violet (aged 32, from Ruai) describes her experience with M-PESA as follows:

> I personally use M-PESA for many purposes such as saving, paying bills, buying goods at the supermarket and transferring money. It is a very useful tool in my life and my business. Sometimes, I send money to my parents; it helps me stay connected with my family. My husband uses M-PESA for his business more than I do. Life has been easier ever since we have started to use M-PESA. (2017.02.26)

According to John, who is in his 30s, is a microfinance employee in Nairobi County, M-PESA is also integrated into larger systems, such as micro-financing systems, to provide loans to farmers and other business people. He reports,

> One of the benefits of M-PESA is that you cannot be limited by banking hours. You can use it at night, at non-working hours at a remote area. It is very convenient to people in those areas. In a banking setup, you will not find a branch network in each and every other village. By using your phone, you access cash, you can send money. So, this brings a lot of convenience and connection. Shops have Till Numbers, it is also very secure and very cost-effective. Normally what they would have done, if they wanted to have a bank account, you have to take a *Matatu* (bus) to

> town, that involves a cost not only in terms of time but also the cost. So, by the fact that you can access the services at hand, you are accomplishing your work better. People in the villages reduce their costs and connect to the center easily. (2017.01.20)

There are more than 50 different banks in Kenya, and they all have mobile platforms that connect them to M-PESA. According to John, even if banks have their own mobile money transfer module, the utilization of such modules is very low compared to M-PESA. As John points out, "what [the banks] did was to link their systems with M-PESA to produce connection among themselves which makes it easy to get even a small amount of loan by the local users." (2017.01.20)

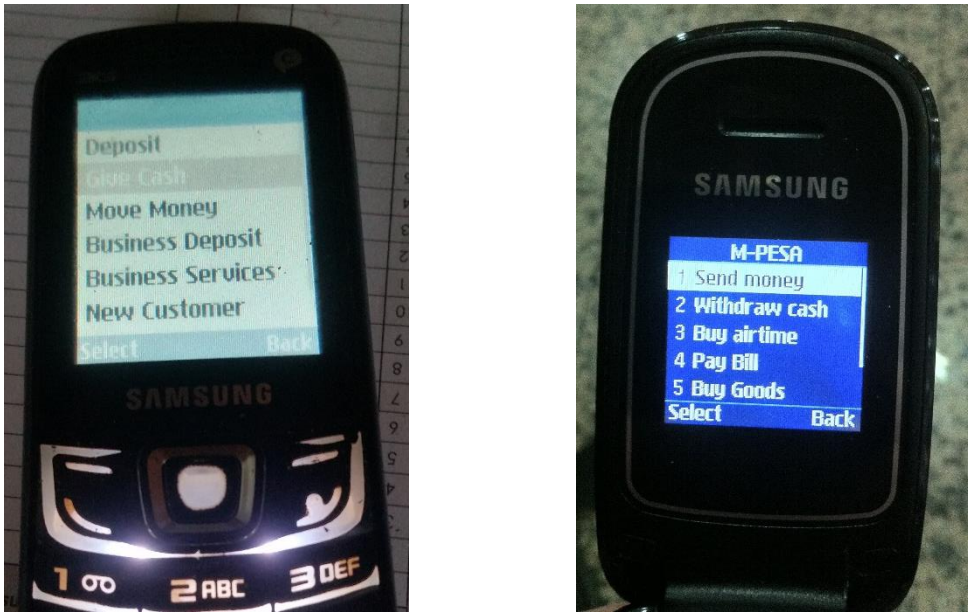
Leya (who is in her 30s), an M-PESA agent residing in Kiambu County, explained that she started to use M-PESA while he was a student in college because he used to depend on her parents by receiving the money they used to send him. Specifically, she said,

> While I was a student, it is very fast and the best way to receive money through M-PESA. But now I use M-PESA beyond sending and receiving money, to pay my bills and to buy goods. More than that, now I am an agent. I made my living from M-PESA. I give withdrawal and deposit services to M-PESA customers in this area. (2017.01.19)

Figure 8 shows the types of 2G phones that are used by M-PESA agents (on the left) and regular users (on the right). Edwin (aged 41) owns an M-PESA agent shop in Ruai area. He describes his experience with M-PESA as follows:

> I have known M-PESA for the past years. I have been using it ever since in most places I go to receive services; shopkeepers, gas stations, and even at the banks who have connected their services with the M-PESA system. It is possible to buy goods and pay bills with M-PESA, besides transferring money into personal accounts of family members and friends. (2017.02.26)

Figure 11. M-PESA screens of agent phones (left) and user phones (right)



Other chief applications of M-PESA include its deployment in various healthcare services and programs. Groups that typically have limited access to formal financial services have benefited from the financial products offered through M-PESA. In particular, its short-term Pay Bill Account service allows users to fundraise for a variety of purposes, including expenses relating to medical needs, education, and disaster relief (Runde, 2015). The Kenyan carrier, Safaricom, has partnered with healthcare finance organizations such as PharmAccess Foundation and CarePay to introduce M-Tiba, a mobile health wallet that channels money that is meant for health services directly to recipients from donors and government (Vodafone Group, 2016). This allows customers to redeem their savings digitally with cashless access to a network of registered clinics and pharmacies. The World Food Programme is also using M-PESA to help deliver their food aid program in Kenyan refugee camps.

5.1.2. Ushahidi

One of the key features of Ushahidi software is that it is associated with the availability and access to internet facilities in the areas in which it is deployed. Clearly, if internet access were not available, none of the benefits of this crisis mapping system would be felt in local communities. On my visit to the Nairobi office of Ushahidi, which is located in the I-Hub building, I was accompanied by one of the guides who supported me while I conducted field research. He told me that, indeed, Ushahidi is rather a rare innovation in the country as well as the continent overall. I found out that many Kenyans I met are familiar with the Ushahidi platform. The Ushahidi platform has so far been deployed in over 125,000 cases in over 160 countries in 45 languages, with 10 million posts or testimonies, purportedly positively affecting the lives of 25 million people who have been reached in critical situations since its launch in 2008 (Ushahidi, 2017).

Chris Mukuria, an Innovation Engagement Officer of Ushahidi, emphasizes that Ushahidi is a non-profit technology company that builds open source platforms to help citizens, journalists, organizations, governments, and others gather, manage, analyze, and visualize crowdsourced data.

> Ushahidi started as an ad-hoc group of Kenyan bloggers coding it in a couple of days from various locations, trying to figure out a way to gather more and better information about the 2008 post-election violence in Kenya. Our tools have been used by tens of thousands of individuals and organizations fighting for social causes in over 159 countries — whether for monitoring corruption in Zimbabwe, gathering real-time data on local poverty issues, or giving people a voice in the Syrian crisis. Everyone at Ushahidi comes to work here because we know that every day people around the world use the tools we build to improve the lives of millions. (2017.02.03)

The reports that range from monitoring election related violence to collecting relevant demographic data during an outbreak of endemic diseases. Ushahidi has expanded its innovations and solutions to reach various domains of social problems. Linda Kamau, Lead Developer of Ushahidi explains,

> Our team tends to think big and rewards creativity and an entrepreneurial attitude. Over the past years, we have built the [I-Hub] – the tech community hub in Nairobi, the BRCK – a redesign of connectivity for the developing world, and other projects like Savannah Fund, AfriLabs, and Crisis Mappers. Our ethos – we don't just build products, we solve problems. (2017.01.09)

A staff at Ushahidi has also put this in the following way;

> …what is this software all about in the first place? The Ushahidi software is a platform used to map information. To this end, the software is obviously not a methodology for information collection. The methodology that users choose to collect the information they map has nothing to do with the Ushahidi platform. These methodologies can include representative sampling, non-probability sampling such as crowdsourcing, etc. In other words, the information mapped on Ushahidi is not always collected using crowdsourcing. Nor is Ushahidi restricted to mapping crisis information. A wide range of events can be mapped using the platform. Non-events can also be mapped, such as football stadiums, etc. … In many ways, the use of Ushahidi platform will only be as good as the organization or persons using the tool. (Ushahidi Staff, 2010a)

There are several significant examples of the deployment of the Ushahidi software worth noting. In concert with the Kenyan government's Open Data Initiative, an Ushahidi-based crowdsourcing platform called Huduma (Swahili for "service") was launched in February 2011 to track the efficacy of social programs. Huduma employs SMS, e-mail, and Twitter to allow citizens to submit reports on the operations and effectiveness of services like healthcare and education as well as on infrastructure needs, supply or utility shortages, and other problems with government services and conduct (Gigler & Bailur, 2014). There are six categories for reporting: education, governance, health, infrastructure, water, and justice. Contributions can be submitted anonymously,

but must show the location of the sender. Ushahidi will then map the reports on the Huduma site, identify the authorities, and the districts can compare progress. Not only does this increase program accountability, but it gives communities more opportunities to compare and contrast the progress of various districts (Day, 2011).

Following the 2007 Kenyan elections, it has since been used to monitor elections and map voting irregularities or election incidents in several countries, including the United States by the Obama Campaign for America in 2012 (Manning, 2016) and in the Nigerian elections in 2011 (Bailard & Livingston, 2014) as well as in Afghanistan and Lebanon. Ushahidi-based election monitoring projects, such as Sudan Vote Monitor, Cuidemos el Voto in Mexico, Eleitor 2010 in Brazil, Vote Report PH in the Philippines, and Amatora mu Mahoro in Burundi, have created visuals on maps and timelines with data received from citizens and election monitors (Gigler & Bailur, 2014). It was also used to organize relief efforts during the recent civil war in Libya, and in participatory post-conflict mapping in Sudan. Other deployments of the platform include the Situational Awareness Geospatial Enterprise (SAGE) by the United Nations Department of Field Services and Peacekeeping (Baudet et al., 2017).

Local activists groups such as Humanitarian Tracker are also using Ushahidi to monitor violence in the Syrian civil war (Humanitarian Tracker, 2013; Lungati, 2014a; Ushahidi Staff, 2011). HarassMap, which is an award winning volunteer-based initiative, was founded in 2010 to help women report on sexual harassment in Egypt (Ushahidi Staff, 2013, 2015). Rebecca Chiao was a sexual harassment victim herself and she thought the problem was that people had to change their ideas of what is acceptable behavior and what is not which required a different focus, a focus on challenging social

norms that created tolerance for sexual intimidation in Egypt (Smith & Reilly, 2013). She simply thought that citizens could report, via mobile phone, sexual harassment where it occurs, and display these reports on geo-located pins on a map on the Internet. This will be a powerful way to better understand and increase public awareness of the prevalence of the problem and to potentially engage with the Egyptian public—especially given a 97 percent mobile penetration rate in Egypt. Hence, HarassMap was launched with the help from the tech company known as NiJeL which has an expertise of providing data science and visualization services (HarassMap, 2017).

The HarassMap project goes well beyond being a digital reporting system. When someone reports an incident by text message the system auto-responds with a text containing information about free services for victims including psychological counseling, self-defense classes, and legal aid (Smith & Reilly, 2013). The HarassMap team sends a small but dedicated group of trained volunteers into their communities to talk to people with a presence in the neighborhood (such as shop owners or doormen) about sexual harassment and try to convince them to stand and act against it. HarassMap co-founder Rebecca Chiao explains,

> Our community mobilization volunteers often bring a copy of the map with them out into their neighborhoods: the map and the eye-witness stories documented on it help them show that harassment does in fact happen on their very streets. Our research team also analyses the reports on the map, and we use this analysis – together with feedback and experience from community mobilization volunteers – to create insightful communications campaigns against sexual harassment that encourage people to stand up and take action against it (HarassMap, 2017).

Syria Tracker, which is a project of Humanitarian Tracker with collaboration of various groups, offers a crisis mapping system that uses crowdsourced text, photo and video reports and data mining techniques forming a live map of the Syrian conflict since

March 2011. Syria Tracker provides: a continually updated list of eye witness reports from within Syria, often accompanied by media links, aggregate reports including analysis and visualizations of deaths and atrocities in Syria and a stream of content-filtered media from news, social media (Twitter and Facebook) and official sources (Humanitarian Tracker, 2013).

The Ushahidi platform was also used in response to the earthquake of 2010 in Haiti and in Japan after the 2011, as well as to the earthquake of 2015 by the Nepalese Army. The Ushahidi Haiti Project (UHP) was an effort to produce a crisis map after the January 12, 2010 earthquake in Haiti. The Ushahidi Haiti map was set with a team of volunteers from the Fletcher School of Law and Diplomacy at Tufts University free SMS code to crowdsource needs assessments from the disaster-affected community. The project represents an impressive proof of concept for the application of crisis mapping and crowdsourcing to large scale catastrophes and a novel approach to the rapidly evolving field of crisis informatics (Heinzelman & Waters, 2010; Hesse, 2010; Meier, 2012; Nelson, Sigal, & Zambrano, 2010; Ushahidi Staff, 2012a). The final report of the Independent Evaluation of the Ushahidi Haiti Project describes that the project addressed key information gaps in the very early period of the response during the first days and weeks post-quake before UN and other large organizations were operational by providing situational awareness and critical early information with a relatively high degree of geographic precision, by providing situational information for smaller NGOs that did not have a field presence in Haiti, by helping smaller, privately funded responses to more appropriately target needs and, by facilitating private citizen actors (Morrow et al., 2011). The Ushahidi tools have received wide notoriety as a result of deployment in Haiti, and there were efforts to generate necessary information as the

cholera epidemic emerged and unfolded. A study led by Harvard University public health scholars found Ushahidi was one of the social media approaches that generated data allowing for quick detection and response to cholera outbreak (Chunara, et al., 2012).

Another good example of the Ushahidi deployment is the Uchaguzi (meaning "election" in Swahili), which is an elections initiative technology platform was born out of the violence that followed the 2007 Kenyan elections, later joined by the partnership of the Constitution and Reform Education Consortium (CRECO), and InfoNet (Ushahidi Staff, 2017). It is designed to ensure the safety of citizens' participation in the electoral process and access to electoral services. It was also deployed to follow "citizens society to report on electoral offenses such as intimidation, hate speech, vote buying, electoral offenses, misinformation, as well as alert authorities to raising tensions and acts of violence" during Kenya's 2010 Constitutional Referendum (Ushahidi Staff, 2010b).

Uchaguzi received over 2,500 messages during the constitutional referendum, some of which were forwarded to the Interim Independent Election Commission (IIEC) for action. One example is that of a photo sent by monitors to Uchaguzi. Significant campaigning had been done using the color associations of green for "yes" and red for "no." The photo was of a poster hung at two polling stations in which these colors were reversed. The error was reported to the authorities and the IIEC removed the posters (Rakotomalala, 2010).

According to Jessica Heinzelman, Uchaguzi team member the goal of the platform was really multifaceted: to collect data, to understand what was going on in the

country and also to be able to respond to it. Uchaguzi relied on crowdsourcing via SMS to map incidents of electoral disruption. The project established an SMS short code that individuals could use to send reports via mobile phones and also fielded reports through the Internet and Twitter (Land & Meier, 2012). It also sent monitors into the field to observe and send back messages via SMS. Uchaguzi mapped these data points and made information and maps available online. They also fed reports to local authorities who were able to respond to specific incidents of electoral irregularities. Currently in 2017, the Uchaguzi ecosystem brings together some 700 trained field observers deployed by CRECO located at various polling stations around the country performing the vital task of verification, Action Response Teams through InfoNET, comprised of the Electoral Management Bodies, that respond to and action all verified reports, and a team of analysts that gives a State of the Nation Report throughout the electoral period (Ushahidi Staff, 2017).

During the 2017 Kenyan general elections, Uchaguzi had received over 7000 reports from a mix of sources by the day following the elections and it was reported that almost 63 percent came in via SMS, 4 percent from Twitter, and 24 percent from other web sources, including newspaper articles (Ushahidi Staff, 2017). Of the 7000 reports, only 104 were verified as security issues. These included political party agents “acting in a hostile manner”, perpetuating “dangerous speech”, and instigating “mobilization towards violence”. The largest number of reports (425) were about positive events in relation to the management of polling stations and people being pro-active about exercising their democratic right to vote and calling for a peaceful election. Ushahidi analysis indicates that the picture of election day events provided by Uchaguzi is one of a generally orderly voting process devoid of major acts of crime and violence, in spite

of voter turnout being in excess of 15 million (Ushahidi Staff, 2017). Once the polls were closed, 291 reports about counting irregularities were received, along with 266 reports on polling station administration. Many of the reports attributed the irregularities to the challenges of using the Kenya Integrated Election Management System (KIEMS) system, observers not being allowed to witness the counting process, late tallying of results due to technical issues, and party agents refusing to sign off the final results declaration forms (Ushahidi Staff, 2017).

The Uchaguzi initiative combines advanced technologies with human verification capabilities. For the Kenyan election, hundreds of volunteers from 15 countries have been working with Ushahidi's Nairobi team to sort, research, and publish the incoming reports. An Ushahidi employee said that "working with these volunteers from around the world calls for high levels of advance planning and co-ordination but it's exhilarating to be part of a global team working simultaneously on a single project that is live and essential to ensuring that the rights of ordinary citizens are protected." (Ushahidi Staff, 2017). And for Nathaniel Manning, Ushahidi's Executive Director, "the project is a powerful reminder that one person at a time, no matter where he or she lives, can indeed make a difference and that the internet can be a tool for mutual support."

Figure 12. The workflow of Uchaguzi platform

Source: https://uchaguzi.or.ke (Ushahidi Staff, 2017)

One additional good example of Ushahidi's deployment is the Vital Signs project, which is a project led by Conservation International (CI) with partners from Columbia

University, the Earth Institute, and the Council for Scientific and Industrial Research in South Africa. It aims to gather and integrate near-real-time, highly granular data on agriculture, ecosystems, and the wellbeing of populations. The data is publicly accessible in an online environmental monitoring system, for the world's top scientists and policymakers to use. Dr. Sandy Andelman, Vital Signs Executive Director explains, "The foundation of Vital Signs is providing open access information at all the scales that are relevant for agricultural decision making – from a smallholder farmer household to a farm plot, landscape, region, and all the way to the globe."[10]

Ushahidi's solutions team designed, built, and deployed a web-based environmental monitoring system for the Vital Signs partners. Due to the ambitious scale of the project and the number of users that needed supporting, the platform requirements were very complex and changed often. The system needed to support large amounts of many different types of data, and allow users to manage, clean and download the data. The Vital Signs environmental monitoring system was successfully completed on time and handed over at the end of 2015. The Vital Signs platform is now ready to scale to ten countries in Africa in the next two years another step toward fulfilling the project's primary mission of facilitating an equilibrium between increased agricultural output and environmental sustainability. In sum, the Ushahidi platform has also been the most prominent and influential open data monitoring and crowd source contributor, and has been applied to generate the necessary information in emergency settings of humanitarian crisis, in election- related violence, and in collecting essential demographic data.

[10] https://www.ushahidi.com/case-studies/www.vitalsigns.org

5.1.3. ECX

The trading platform, ECX, has also expanded to include the trading of more products than just than coffee, which was its original purpose. It now encompasses the trading of commodities such as sesame, haricot beans, maize and wheat. Furthermore, the number of traders has increased tremendously. During my visit to Ethiopia, I met several beneficiaries of the ECX who were satisfied by the diversified services of ECX. Mr. Mohammed (who is in his 30s) is a coffee supplier in the Mana district of Jimma zone. Mana district is located 20km from Jimma town and 378 km south west of Addis Ababa. He explains the various benefits he has received ever since he started using the ECX platform to export his coffee produce. As Mr. Mohammad points out, due to ECX, suppliers are generally able to maximize the volume of the goods they export. As he puts it:

> More than 20 suppliers like me exist in this area. We collect the produces from the farmers and take it to the warehouse in Jimma city for export. There are about 22 Farmers Associations with more than 20,000 members and 12 Farmers Service Cooperatives with more than 16,000 members in this district. We collect coffee produce from small scaled farmers and sell it to the suppliers to bring it to the warehouses of ECX. Up to 50tones a day and 4000tons per year is exported through the ECX from this district. In future, famers will be more beneficiary if they can get the access directly to the ECX and not through the suppliers or mediator merchants in between. (2017.01.03)

As previously mentioned, the data from the CEO of ECX, Ermias Eshetu, was in the form of a presentation. He summarizes the benefits of ECX to members thus:

> The Ethiopian Commodity Exchange is designed to be a marketplace where buyers and sellers meet to trade, assured of quality, quantity, delivery and payment. It will control a system of daily clearing and settling of contracts. It will improve market efficiency by operating a trading system where buyers and sellers use standardized contracts.

> Market transparency will be accomplished by distributing market information in real time to all market players. (2017.01.12)

It was also pointed out that ECX is considering to go beyond agricultural commodities to possible trading of bonds, shares, or non-agricultural commodities, such as minerals and metals, is another exciting proposition that can have important benefits to other sectors where transparency, efficiency, and integrity of contract enforcement and payment systems are greatly needed (Gabre-Madhin, 2017). In conclusion, the preceding analysis has detailed the diverse functions of ECX from the perspective of various stakeholders, namely, farmers, suppliers, and exporters, and has revealed that the diverse functions of this trading platform include an expansion of the number of commodities being traded; quality assurance, high volume of trade, delivery, and market transparency. In what follows, the enhanced efficiency promoted by M-PESA, Ushahidi, and ECX, in comparison to the methods used prior to the advent of these platforms, is described.

5.2. Enhanced efficiency

This refers to the quality improvement of services and solutions provided by the open development cases. The enhanced efficiency can be measured by the ability to accomplish a given task with the least waste of time and effort as well as reduced transaction cost and competency in performance of the systems. The three cases under study, M-PESA, Ushahidi and ECX, were also found to have optimized the relevant services provided by the respective entities.

5.2.1. M-PESA

The mobile money system M-PESA comes as a free encrypted SIM card and is compatible with most basic phones, which are affordable to many individuals, especially those living in rural areas (Komen, 2016). M-PESA allows people to access the banking services they lack in different situations. For most users in the rural areas, M-PESA is used as a tool for mobilizing payments.

Before M-PESA was introduced, sending money through other alternatives such as the post office and banks was either more expensive or very inconvenient and slow, while transactions using M-PESA enabled this to be done simpler and quicker. Mr. Wilson (who is in his 50s) and runs a butcher shop in Ruai area in Nairobi explains,

> I use M-PESA almost every day. I transact money for my business here at the butchery shop through M-PESA. I pay my bills without going to the bank or the post office. M-PESA made my life easy. I learn how I can use more services every time. There are so many agents nearby where I live. They work till late evening. It is quite easy to use the system. My customers can pay through my till number when they buy any of the meat products. Sometimes we don't have change for big notes. Using M-PESA solves the problem. No need to worry about small changes. M-PESA transfers the direct amount of money into my account in a safe way. (2017.02.26)

Jane, who is in her 40s, is a farmer who lives in Dakindu Village in Nyeri County. She pays her son's school fees from within the confines of her farm:

> Using my phone, I select the M-PESA option then follow the instructions. I enter the head-teacher's number and send him 2000 Kenyan shillings. This makes me happy as I can conveniently pay my son's school fees by simply sending it via M-PESA. (2017.01.21)

Joseph (aged 35) is a public servant living in Nyeri town. He explains the efficient uses of M-PESA in his life. He states,

> When I travel away from my place, and I need extra money for accommodation, I use M-PESA to pay for the hotel expenses. I don't need to carry a lot of cash in my pocket all the time. I have three children. Without travelling to my son's school, I can pay his school fees from my work place. I pay electricity and other bills from my mobile phone. It saves my time and extra expenditure. I buy goods from the supermarket and I also save 700 KES per week. I try to use all the services that come along with M-PESA. (2017.01.22)

M-PESA has been continuously upgraded so that enhanced features such as mobile e-commerce payments can be added to the mobile money transfer platform (Pedroncelli, 2017). Bob Collymore, the CEO of Safaricom, explained that upgrades aim to be as efficient as possible to avoid disruption of customer transactions, while enabling customization of features and functionality. Safaricom announced the release of revamped M-PESA Application Programming Interfaces (APIs), providing the capabilities for developers to build and deploy their solutions on top of the platform. The purpose of the launch of this e-commerce platform, known as Masoko (the Swahili word for markets), is to support and enable small- and middle scale businesses to sell their products online.

One of the ways in which efficiency is enhanced with regard to mobile money transfer platforms is through a significant reduction in transaction costs[11]. For example, when M-PESA was launched in 2007, the average distance to the nearest bank was 9.2 kilometers. The distance to the nearest M-PESA agent was reduced to merely 1.4 kilometers eight years later (Logan, 2017). When M-PESA was launched, it created a network of agents that were geographically dispersed, which meant that more people in

[11] Transaction costs are expenses incurred when buying or selling a good or service. Transaction costs represent the labor required to bring a good or service to market, giving rise to entire industries dedicated to facilitating exchanges. In a financial sense, transaction costs include brokers' commissions and spreads, which are the differences between the price the dealer paid for a security and the price the buyer pays. Source: http://www.investopedia.com/terms/t/transactioncosts.asp

rural and sparsely populated areas were within reach of one. This resulted in significant and widespread adoption of the system.

Nelson (aged 34), who is an M-PESA agent explains how users can use his agent number to ask to withdraw money from their account. When money is withdrawn, Safaricom notifies him of the amount withdrawn and the balance remaining in his account. Nelson explains further,

> I give them the cash after I receive the notification. For other users who have cash and would like to deposit money in their phone (account) in terms of floats (virtual money), they come and give me the cash which I keep here. And I use the money that the customer withdrew here to deposit to the other customer. If they want to send money or deposit cash to other customers, I use the cash they give me to deposit into the receiver's account in terms of floats. If my entire float is depleted and I have only cash, I can go to the bank. I bring the cash to the bank and the bank loads the floats into my account so that I can continue my dealer work. And vice versa also, if I have only floats and I don't have cash, again I go to the bank. The Banks have sections known as Super-Agents. We are agents and the banks are super-agents. They can execute transaction of big amount money. You can withdraw or load millions of KES and you can also deposit in millions. (2017.01.19)

He also explains the benefits he earns as an M-PESA agent by describing it thus:

> I did not apply to Safaricom myself to become an agent. Safaricom has dealers who have the ability to open Safaricom lines, they bring new M-PESA lines to us (M-PESA lines are free) and they also get replacement lines to sell to us for customers who lost their mobile phones. For every transaction, there is some charge based on the amount of money moving. Safaricom announced recently a newly amended M-PESA commission structure aimed at ensuring agents get better rewards on high value transaction and as an incentive to hold adequate float. For every deposit of 50-100 KES, the agent earns 4 KES. Out of all the commissions the agent is earning the dealer also gets some percentage of it. At the end of the month, what the agent and the dealer get are sent to each of us through M-PESA. (2017.01.19)

Most of the informants in Nyeri County stated that they have been using M-PESA since its launch. In Kenya, and other parts of Africa, the wage-earner typically travels to

urban areas for work while their family stays behind. In order to send money to their relatives, people often travel for days to get home or give the money to a bus driver to deliver it. Prior to using M-PESA, these people generally did not have access to financial services, and in rural areas there was little, if any, traditional banking infrastructure (Joseph, 2017). If people did use banks, they had no choice but to pay transaction costs that took up a substantial amount of their wages. Prior to the advent of M-PESA, sending money through the post office used to cost about US$2.40 for an average sized domestic remittance of US$23 (Joost, 2005), and other alternatives were either more expensive, whereas a similar transaction on M-PESA would now cost about US$0.39 when transferring to M-PESA users and US$0.73 to unregistered users (Safaricom, 2017a).

Martin (who is in his 60s) reports that his standard of living has become comfortable with the advent of M-PESA. He says,

> I am now an old man and I don't have much energy to travel long distances to get banking services. In the past, about six years ago, I used to bring my phone to M-PESA agent to get the services. But later, I learnt from my son how to uses simple services through my son and soon I began to use other services by myself. I know my pin number, so I can use it to withdraw money sent from my son. I can also deposit my money which I earn if I get some work. I can check my balance and sometimes so my savings. I use M-PESA because it has made my life easy saving my money and my time to travel to get any kind of financial service. It takes 300 KES to travel to the bank in town and hours. (2017.01.21)

Mr. Martin is a farmer who produces tea, beans, maize, and potatoes that he sells in the market. He often comes to the shopping center at the market to get the M-PESA services that saves his time and money travel to town. He explains further,

> Even small money I can send. I don't have to spend time to travel to the bank or to other cities to meet people to give them money. I also pay my children's school fees through M-PESA. Even my mother and my wife are also able to use the M-PESA. Sometimes, when my son has no money to

> come home from school, I pay directly to the taxi through M-PESA. My first daughter lives down town Nairobi. Most of the old people who live in this area, we receive money from our children through M-PESA. They don't have to spend time to come all the way here when they are busy. (2017.01.21)

Mrs. Sarah (who is in her 50s) is also a tea farmer who uses M-PESA to send and receive money. She tells,

> I go to the agent and ask for help. But now I can use it myself. I have a son who attends a university in Thika area of Nairobi and I pay his tuition fee to the university through M-PESA. He doesn't have to come here or I don't have to go there we don't waste money to travel. In the past, we put the cash into an envelope and used the city or country *Matatu* (bus) drivers to send money to other cities which was so insecure. They charged us 100 KES for the service, if we send 10,000 KES. We don't know how long it would take for the money to arrive. (2017.01.21)

Mr. Charles (aged 62) is a dairy farmer and runs his restaurant in Ihururu Village, Nyeri County. He has been using M-PESA for the past 5-6 years.

> We have our pride in M-PESA. The advantage of M-PESA is very easy to use and fast and direct. I use M-PESA to order raw materials for my restaurant through M-PESA from Nairobi. It is so convenient to transact money. And also, it makes communication so easy and reliable. I do my savings and I pay my water, electricity, cable television and other bills through M-PESA. I save the time going to banks and wait for long lines. Before M-PESA, I had to travel to Nyeri town 30 minutes by car from here or I sometimes used the post office. (2017.01.22)

In the same way, Mrs. Daquida (aged 66) who lives in a remote village far away from the Nyeri town testified,

> M-PESA has been a bridge to connect us with the banking system. Mobile communication made it easy to connect into the central financial system for the poor and marginalized people like me and my area. It is often thought that only people who have a lot of money or who are rich could get banking services in their surroundings. We were completely marginalized. But M-PESA made it easy to simply transact even our small money right from our finger-tips. Elderly people like me can use it as just convenient as younger people can do. My daughter taught me how to use M-PESA at first. Now I learnt how to use it by myself, I just follow the

> instruction. If I don't understand it, I call and ask my daughter. It is quite easy. (2017.01.23)

Mr. Raphael (aged 60), who is a farmer, explains how difficult and costly it was to get banking service in his surrounding in Gatundu before the introduction of M-PESA.

> In the past, sending money wasn't easy. I need to travel to Nyeri town from here paying 50 KES for the taxi. And wait for an hour or so at the bank to send the money. Sometimes we used the post office or people traveling through *Matatu* bus. This is not always reliable. Some people fail to deliver the money and we lose our money. Now, M-PESA helps us a lot. We also can pay our bills and we use it to buy goods in the supermarket. I also use M-PESA to pay hospital bills. In these days, hospitals do not accept cash payments. Whenever new services are brought by M-PESA, I always like to learn how to use it. (2017. 02.11)

Mr. Christopher (aged 55) works at a public university restaurant inside Nairobi. He shares his experience of M-PESA as follows,

> I have been using M-PESA for several years. I use M-PESA mainly for transfer and saving purposes. I saved money to buy my own house. M-PESA was helpful to me to save even in small amounts every day I get paid. Since I work many hours during the day, I have no time to go to the bank. M-PESA made it easy for me to save money and use it for a great purpose. Some of my family are living in Mombasa which is very far away. It makes it easy and fast to send money through M-PESA. When my wife needs some urgent money, I transact money to her easily. When my friends are in trouble and they need my help, I can send it to them which has make our friendship ever closer. (2017. 02.11)

Availability of M-PESA outlets in all towns around the country means that almost every family in the country has a story about the service. Families stayed in touch and were able to send and receive money and airtime during Kenya's worst election-related violence at the beginning of 2008. Rosemary (age 40s), a farmer in Murang'a explains, "M-PESA was a great help to us during the post-election violence when we had no airtime and immediate money. Our children send it to our M-PESA account. They continue sending money via M-PESA even until now." (2017. 02.14) Peter (in his 40s),

who is a landlord and farmer in the area, “My wife introduced me to M-PESA since we are far apart we use the service which is very fast in comparison to other options available. Whenever I have to send my wife money for the family, I use M-PESA which saves me time and any extra bank commission.” (2017. 02.14)

Jennifer (who is in her 50s), also a farmer who lives in Murang’a says, “I am happy with M-PESA service when I am at home and my husband is in the city. I just ask him to send money through M-PESA and he has just sent me some money which I will go pick up from the center which is a few kilometers away when I am done with my house chores.” (2017. 02.14)

Clementina (who is in her 40s), a fish seller in Naivasha says, “My husband is a businessman based in the Naivasha market. He sends fish for me to sell. From the profits I get, I sent him some money via M-PESA after I paid our children’s school fees. We are able to transfer our money with less cost and less time.” (2017. 02.18) Princila (who is in her 30s and a vegetable vendor) and Ann (who is in her 50s and a fruit seller) told that their use of M-PESA has increased due to its convenience and efficiency.

Rosa (who is in her 30s), a vegetable vendor says, “all I have to do now is order for the produce and then remit the suppliers cut by M-PESA without wasting time or extra money.” (2017. 02.14) Victor (who is in his 40s), is a photographer in Murang’a town, “M-PESA service is very reliable. I have never lost my money ever since I used M-PESA as a means of transferring money. If one experiences a problem during a transaction, you can just report to Safaricom and they will sort out. But, of course, before it is too late.” (2017. 02.14)

Mr. Martin (who is in his 60s) is a farmer in Nyeri County. He used to spend much time traveling to the bank to get access to banking services downtown in Nyeri. “It took me more than an hour just to travel and more than two hours to get services since I have to wait for my turn in a long waiting line.” (2017. 01.21) He also reminds using passengers whom he is not familiar to asking them to deliver money to people living in other areas. Sometimes, he also used to travel to other cities to meet people to give them money.

Solomon (who is in his 40s) runs a little shop in Nyeri town. He explains the role of M-PESA both in cities and the rural areas in the following way,

> I come from Baringo County which is about six hours’ drive from Nairobi. This area is full of nomadic pastoralists and they raise a lot of livestock. But M-PESA is being used in common by both among the business people as well as the nomadic people. My relatives in Baringo who are also pastoralists use M-PESA just as I use it here in the city. (2017.01.20)

In the Maasai Mara, pastoralists such as Emmanuel (who is in his 40s) who lives in Magadi makes a living through the sales of goats. Emmanuel says,

> We have to travel long distances in search of green pasture for our goats. M-PESA has made our lives easier because we do not have to travel long distances to give our relatives and friends money. We are able to carry any amount of money in his phone and can access it from any part of the country at any time. (2017. 02.15)

M-PESA platform also offers a gateway to salary payments and bill payments – effectively offering a banking system to people who have been traditionally without access to financial services. This is important in the context of a country where 80 percent of the population does not have access to the traditional banking system. Due to mobile money’s convenience, reliability and popularity, institutions have now adopted M-PESA as an acceptable mode of payment, and have begun paying salaries through it.

M-PESA is now being used to distribute government salaries, which can have a substantial impact on income and the quality of life of civil servants.

Public servants in Nyeri County who are receiving salary payments via mobile money reduced the amount of time they had to spend away from their classrooms to travel to collect their salaries, and reduced the costs of receiving their salaries. Moses (who is in his 30s) is a psychology research officer in Nyeri County. He mentioned that he is also paid through M-PESA, and this makes civil servants like him more self-sufficient and allows them more time to spend on his various duties.

> Now M-PESA is in use in almost every part of my life, beginning from receiving my salary to paying my almost all my bills, and even buying goods from the market. Life is made easy through M-PESA. We Kenyans have managed to solve our problems by ourselves and make our lives better. We work very hard and sustain our lives. (2017.01.21)

Previously, other types of public servants, such as teachers, spent 15 percent of their monthly salary just to collect their salaries. Furthermore, M-PESA also enabled bus drivers, for example, to collect money required for operational costs, as Paul (a bus driver who is in his 40s), explains. Specifically, he reports, "we found M-PESA convenient for the drivers to receive fuel money instead of going back to the office to get paid in cash." According to (Peter et al., 2015, p. 288), M-PESA has played an important role in improving the efficiency and effectiveness of care delivery of health organizations in Kenya. M-PESA was used in processing of payments for staff conducting field activities.

Another feature of M-PESA is the greater personal safety and security that it provides. Mobile wallets offer a secure place to save, since funds are stored virtually, and both the mobile money facility and the mobile phone can be password-protected.

The savings in the mobile wallet can be used during tough times or for productive investments, like establishing or expanding a small business (Logan, 2017). A growing body of research suggests that when a society uses less cash, the rate of crime goes down and the sense of personal security goes up (McClellan, 2014). Just three months after the launch of M-PESA, early anecdotal evidence suggested that customers were storing value for personal safety and security reasons, and for emergencies (Jack & Suri, 2011). Research later confirmed this, citing reasons for using M-PESA as ease of use, safety, and emergencies.(A Thomas, Pande, & Totapally, 2016)

Mrs. Sarah (who is in her 50s) a tea farmer in Nyeri town explains,

> …some people were dishonest when we entrust them to deliver money, they didn't do it. But now we send our money through M-PESA in a secure and quick way with smaller cost. The agents are people we know in our surroundings. The money will not be displaced or disappear. We are sure the money will be delivered right away to recipient. Even if we make a mistake and send to the wrong person, the money will be returned back. They system has been updated to let us cancel transfer of money once we know we have made a mistake. (2017.01.21)

Nicholas (aged 34) runs a veterinary shop at Ihururu village in Nyeri County. He reports,

> …because of M-PESA, I was able to build up my business and use M-PESA to transact money with my customers. When I need to buy products for my business, I don't have to carry cash money with me because I can pay it through M-PESA. I can transfer up to 30,000 KES. We don't have any banking service here unless you go to Nyeri town. (2017.01.22)

According to Mr. Charlie (aged 66), who lives in Gatundu, M-PESA has been useful in maintaining the safety of their money. He explains,

> In the past, we have heard many stories of people who have used the bank branches or ATM (automatic telling machines) lost their money by blackmailers or someone who peeped into their ATM pin numbers and take money from the account. It is not possible to track or catch such criminals. After we started to use M-PESA, such criminalities have reduced a lot.

> Our privacy is kept secret. These days if you transact money on M-PESA by mistake or if someone tries to use your M-PESA pin number, it is possible to track and arrest the criminals. It has become possible to get back your money as well. M-PESA has many good services. In the future, I am planning to use it to get loans for my business. (2017.02.11)

The Murang'a financial services society is one of the groups in the community that has greatly benefited from the incorporation of M-PESA among its services. Those people who began queueing as early as 7am to either send or receive money in the past no longer have to be concerned about carrying cash in bulk or waiting in long lines in front of banks to buy checks.

Mrs. Rebecca (who is in her 50s), and who has been using M-PESA since 2007, feels safer despite the fact that some people in the early days of M-PESA's launch doubted that it was a secure way of transferring money. She reports, "I use M-PESA for purchasing goods for my building materials shop from the suppliers in Nairobi. In the past, I use to take the money in my pocket and pay it, which was not safe. Now, the money is in the safe hands." (2017.01.23)

While these benefits with regard to enhanced efficiency both in terms of reduction of transaction cost as well as the provision of safe and secure system, have clearly benefitted participants in the study considerably, it is not only with regard to monetary transactions that platforms such as the ones examined in the present research that efficiency is achieved. With M-PESA, not only are the actual monetary costs of the transfers lower, but the safety and certainty of the process mean substantial reductions in the costs of sending and receiving money.

5.2.2. Ushahidi

As the platform Ushahidi demonstrates, the efficiency with which information is shared can in fact save lives and help solve local problems. The Ushahidi platform is downloadable software that enables people to submit eyewitness reports during a disaster or other event that can then be displayed onto a map. The main principle behind a crisis mapping platform such as the Ushahidi is that civil society organizations are adopting more agile approaches to data collection to capture and share real-time data with the diffusion of mobile, geo-mapping analytics, and visualization tools. They deploy crowdsourcing, crisis-mapping, and other participatory sensing apps. They involve multiple partners, like-minded individuals, and communities of practice. Furthermore, they provide field-based early warning systems, finely-grained real-time awareness, and real-time feedback from the affected population. However, Meier (2010) reminds that Ushahidi is only 10% of the solution and that the other 90% is up to the organization using the platform. He explains, "[i]f they don't have their act together, the Ushahidi platform won't change that. If they do and successfully deploy the Ushahidi platform, then at least 90% of the credit goes to them." (Meier, 2010).

Ushahidi has allowed communities to collect, filter and extract relevant information such as comments and feedback to supplement official information with public content. Community development is one area where practitioners can leverage time and cost efficiencies, tap into a larger pool of talent, activate more participants, and create greater ownership of the process. The use of crowdsourcing for crisis management could provide a credible means for members to systematically analyze and visualize information to enable crisis managers to respond effectively to a crisis. A key component of Ushahidi is the ability to use mobile phones as a primary means of both

sending crisis incidents and receiving updates. The Internet can be difficult to access or completely unavailable in some parts of the world, so the platform was created with the mobile phone as a foundational element. The following table shows the need, features and functionality of Ushahidi to enhance information gathering and dissemination.

Table 4. The need, features and functionality of Ushahidi

Need	Features	Functionality
A system that can be deployed in the field with a minimum of fuss	Open standards and open source based system	The platform can be set up within a couple hours.
Robust and flexible database	Designed to accommodate data collection templates Information qualification built in	The database is setup to scale and meet requirements for different types or organizations. The API allows for interaction with multiple types of applications
Robust template based structured input	Administrator can setup basic templates for multiple types of organizations and operations	Ushahidi's Beta supports a basic custom form creation template that can be utilized by any administrator
Information verification / qualification for better analysis and decision Support	Qualification of information sources before plotting on the map ensures that decision makers do not received unverified crowdsourced or web-based information	Verified and unverified information can be visualized. Open modification of the system allows for multiple types of visualizations of this data.
Mobile based data entry and input in austere conditions	SMS input as well as smartphone and data-enabled support	Mobile applications for J2ME, WinMo and Android. Future support of FrontlineSMS Forms is planned.
Emphasis on accurate location data	Designed to accommodate industry standard KML geo-referencing standards	Features OpenLayers, supporting Google, Yahoo, Microsoft and OSM. KML/GeoRSS support included.
Reporting and analytics	Export of information in the system is simple for offline storage or population of new instance	Currently all the data can be exported via XML using the API. A mass-export feature is available within the administrative area.
Secure database with the greatest possible access to information entry by outside parties	On disk and over the wire encryption.	SMS is only as secure as the network it operates on. The database is secure, and can support added security depending on the deployment.
A system capable of cataloguing text, audio and video	Is capable of featuring photos and video in addition to text based reports from the field	With the increased use of multimedia, the platform was built to support images and video. This is all easy to sort through the interface.

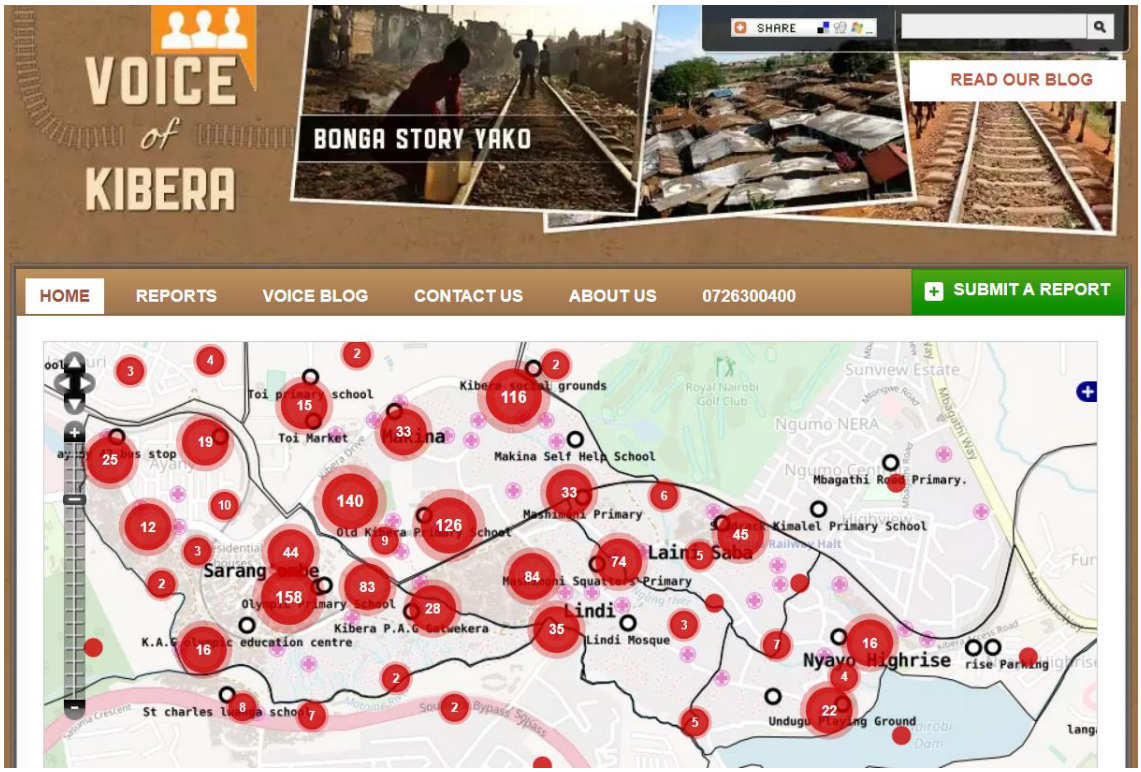
Source: (Ushahidi, 2012)

A good example of Ushahidi's deployment in community development is that of the 'Voice of Kibera,' a citizen reporting project based in Kibera,[12] which is one of the largest slums in Africa. The project is an initiative of Map Kibera and uses the Ushahidi platform to aggregate and map reports. Voice of Kibera is a community website for sharing information relevant to Kibera residents including news, videos, and SMS messages and aims to give collective global voice to Kibera residents by aggregating local citizen reports, Kibera community media and other relevant news and information about the community. In partnership with various local organizations, the Map Kibera team (http://mapkibera.org/) launched Voice of Kibera to visualize reporting in and about Kibera.

Voice of Kibera has been actively engaged with the community and has been working along with other organizations such as Hot Sun Foundation, Kibera Mpira Mtaani, Mchanganyiko Women Self Help Group, Kibera Community Youth Program, Map Kibera, and Ushahidi. The Voice of Kibera Editorial Board which was formed in May 2010, is responsible for the site administration, including verifying incoming messages. The Board members also act as SMS reporters within their community, sending in messages to inform the residents of Kibera and other agencies, such as development organizations and local institutions in real times and on a continuous basis.

[12] Kibera is a division of Nairobi Area, Kenya, and neighborhood of the city of Nairobi, 6.6 kilometers from the city center. Kibera is the largest slum in Nairobi, and the largest urban slum in Africa, infamous for its overcrowding, poverty and lack of sanitation ("Kibera," 2005).

Figure 13. Ushahidi screenshot of community media sharing platform for Kibera, Kenya



(Source: http://voiceofkibera.org/main)

Angela Oduor Lungati, Ushahidi, Director of Community Engagement, explains how the platform was deployed for use in the Kibera community,

> You may let the community know by sending an SMS to the site whether your clinic is offering free TB testing. There's a chance that your report will be featured in local media, such as Pamoja FM[13]. You can also submit things like: your opinions on local businesses or services, problems encountered such as broken street lamps, and things happening right now in the community whether good or bad. (2017.02.16)

Sande, who is in her 20s, is a community leader who is motivated to see a more positively transformed Kibera in terms of, infrastructure, information and knowledge

[13] Pamoja FM (Pamoja means "together" in Swahili) is a community radio station based in Kibera slums in Nairobi, Kenya. It was started in 2007. The slum is a lively, vibrant place and is characterized by a continuous buzz of activity. Operating from a small office at the top of a tall building overlooking Kibera, the station has close ties with the slum as the community are actively involved in contributing to the broadcast content.

exchange and above all unity of purpose for the people of Kibera. Sande hopes that she can work together with other community leaders to achieve change. Her involvement in Voice of Kibera began after he attended a presentation on the project at a Global Giving workshop earlier this year. Sande says she was eager to learn more about the Ushahidi platform - upon which the Voice of Kibera site is built - to use it, made me have a feel of getting involved in. She says, “I found the Voice of Kibera to be a super nice platform for information dissemination - it acts as an online media tool for Kibera and its people.” (2017.02.19) Sande, along with her friend George (who is also in his 20s) also notes that the project has already begun to provide the world with tangible proof of what happens in Kibera, as opposed to media propaganda that the people of Kibera have always seen.

Fred, who is in his 20s, is a member of a community youth group and is involved in environmental issues, such as tree planting, community clean ups. He is also a peer HIV/AIDS educator, which includes encouraging youth to be more creative in how they spend their time; he spreads the message “invest in your time and don't just spend it.” Fred hopes that his peers will get involved in youth programs as a way of empowering themselves through engaging in different activities that allow them to affect positive change within the community - just as Fred has done himself. Fred's involvement with Voice of Kibera began when he learned about the project through a friend. When asked why he is involved in the project, Fred says,

> More often people associate Kibera with violence and all sorts of negativity, giving the world at large a negative mentality toward Kibera. I am thankful for the Voice of Kibera because it gives out the true image of Kibera, highlighting the community's grievances as well as their views in all areas of life; it's through Voice of Kibera that one gets precise, reliable and up to date happenings within Kibera without exaggeration as some media houses do. I feel great when I give out the truth regarding Kibera. (2017.02.19)

Angela Kabari, Ushahidi Capacity Development Officer, explains that the Ushahidi group of technologists spread around the world who get really frustrated when the internet doesn't work, Ushahidi built and spun out BRCK, which builds rugged internet for people and things. In Angela's words,

> At Ushahidi, it is not just about building software, it is about solving problems. With Ushahidi we build open source software tools, at BRCK we build a platform for access to the web, and [I-Hub] we help build the Kenyan tech sector by creating a community with access to services like the mLab, UX lab, and Gearbox. We build these organizations because we want to see more stories like Ushahidi's in the world. (2017.02.19)

BRCK is a product of Ushahidi innovated with a central focus of delivering viable internet options and reliable power to Africa's masses (Granger, 2014). The first version of BRCK was made to deliver connectivity and USB charging for up to 20 devices while the second version, also known as, SupaBRCK — with its dual core processor and a five terabyte hard drive — can be plopped down in just about any environment to provide up to 100 internet connections, streaming video for 50 devices and enough server capacity to run a Linux stack (Bright, 2017). Accompanying BRCK's hardware product is the startup's new Moja service (Moja means "one" in Swahili), which provides ad-supported free public internet access and a content delivery network (CDN) service through SupaBRCK devices.

Ushahidi endorses participation of local organizations because locals know the context and eventually assume the responsibility of maintaining the crisis mapping application. The platform's successful deployment during a humanitarian crisis in the aftermath of Haiti's earthquake in 2010 has proved that the crowdsourced information, which came in the form of reports, helped to improve organizational situational awareness of crisis-related events occurring at various locations; it also increased the

effectiveness of decision-making pertaining to aid and resources (Morrow et al., 2011). Data was crowdsourced from people on the ground. Using social media tools and mobile text messages, the information gathered was confirmed and clarified to support the coordination efforts of the humanitarian relief services, which were comprised of human aid organizations, including InSTEDD, and the Red Cross (J. Chan, 2013). The crowdsourced information, which came in the form of reports, helped to improve organizational situational awareness of crisis-related events occurring at various locations, and enhance decision-making in issues pertaining to aid and resources. In sum, people in various contexts use Ushahidi as a tool to find information and coordinate action with others in times of crisis.

In addition, thousands of people have used this crowdsourcing tool to keep their safety during violence and to defend values such as democracy and freedom, for example, across the Middle Eastern countries by allowing pro-democracy demonstrators to organize and communicate about current situations in their countries (Eaton, 2013; Kamel, 2013). Today, major news media outlets are also using Ushahidi in order to support local and diaspora citizens, who made their voices heard all over the world by using data and live communication tools. For example, Al-Jazeera uses the Ushahidi platform to report situations unfolding in Gaza in Palestine, Uganda, and in Somalia (Duffy, 2011; Ushahidi Staff, 2012b). Furthermore, Ushahidi's effectiveness may be attributed to the fact that it is a credible source of information. The site provides accurate information by conducting checks and verifying reports received from a range of external sources. In addition, NGOs are invited to provide credibility ratings on reports uploaded to the Ushahidi website to validate and organize information for wider use among various human aid organizations (J. Chan, 2013).

According to Bott and Young (2012), donor-supported participatory mapping, such as the cases of Nepal and Sudan demonstrate its important role played in breaking down ethnic-social divisions and engendering inclusiveness and thus conflict sensitivity in community recovery and development planning. The process of collaborative governance and decision-making is a factor in mediation and conflict prevention, the importance of which cannot be overestimated. It was explained that participatory mapping can double as a training exercise for communities and authorities, and at later stages can be enriched by local community members through mobile phone-based crowdsourced tracking of development progress and activities. Whether crowdsourcing initiatives will have a significant impact on governance depends largely on how governments relate to this emergent phenomenon. Embracing the potential of crowdsourcing, especially for participatory development planning and monitoring of issues by citizens, could increase governments' accountability and ultimately their political legitimacy, in the eyes of citizens and donors alike.

Brandusescu et al. (2016) explored in their study the hype about crisis mapping via its extension into community development practices – that is, communities in crisis. They found out mixed results about the actual cost of deployment, the results of disintermediation, and local context with crisis mapping application (namely Crowdmap, which is the cloud-based version of Ushahidi) in their research. Their research demonstrated that the numerous technology constraints, which confirmed the challenges of introducing a new technological medium to community development processes, which is against the assertion of Meier (2012) about the zero cost of developing crisis mapping apps that crisis mapping platforms have supposedly become so easy to use that application development is effortless. In their study, while a community found the

platform useful for voicing opinions another community chose not to adopt the new platform based on effective methods for responding to acute situations that were already in use (Brandusescu, Sieber, & Jochems, 2014).

Another assessment by Brandusescu and Sieber (2017) of crisis mapping's effectiveness reveals that there are persistent technical challenges, although crisis mapping allowed increased opportunities for the developer to insert their knowledge. Analysis of the contributions illustrated the use of crisis mapping revealed tensions in conceptualization of local spatial knowledge politics as witness versus political influence. Crisis mapping could simultaneously aid and disrupt traditional place-based politics of community based organizations in which this critique serves as a test of crisis mapping's universality for other fields (Brandusescu & Sieber, 2017). Empowerment referred by crisis mappers is outcomes like witnessing, storytelling, aid, as well as achieving cultural and social shifts while their research considers empowerment as both process and outcome, difficult to measure, subject to the scale of analysis (e.g., individual, community), amenable to appropriation and exploitation, and often not long-lasting. Crisis mapping contributions therefore can be conducive to knowledge-making in space–time bundles, although a lack of acute urgency can limit the number of contributions submitted.

5.2.3. ECX

Open development provides enhanced efficiency and higher performance for the services provided to the beneficiaries. The ECX platform is set to increase efficiency and access with regard to the trade in new commodities via ECX and enhance its

services, while building stakeholders' capacity. Since its establishment, ECX has revolutionized Ethiopia's tradition-bound agriculture by creating a new market place that serves all market actors, from farmers to traders, processors, exporters and consumers and by being a catalyst for any commodity exchanges across Africa involving people who participate in its business model in their establishment (Shiferaw, 2015).

Prior to the establishment of ECX, agricultural markets in Ethiopia were characterized by excessive costs and high risks of transaction, forcing much of Ethiopia into global isolation. With only one-third of output reaching the market, commodity buyers and sellers tended to trade only with those they knew, to avoid the risk of being cheated or being at risk of default (NYUCTED, 2013). Before ECX was introduced, trade was done on the basis of visual inspection because there was no assurance of product quality or quantity, which drove up market costs, leading to high consumer prices. For their part, small-scale farmers, who produce 95 percent of Ethiopia's output, came to market with little information and were at the mercy of merchants in the nearest and only market they knew, unable to negotiate better prices or reduce their market risk (McVety, 2012, p. 212; Nwuneli, 2016, p. 105). Buyers of grain or coffee not only had to inspect the product visually but also had to reweigh and repack to see if it was the actual quantity and quality that they were contracting. Gabre-Madhin explains the inefficiency of markets in Ethiopia in the following words,

> So, these are all the problems in the supply chain that make us poor and make us food insecure. If people can't get grain where it's produced really efficiently to where it's needed, then you have markets that are segmented. You have pockets of surplus where prices collapse and places in other parts of the county where prices shoot up because there's a deficit and there's no grain coming in (Everitt, 2012).

To a large extent, ECX has solved the problems the traditional market system characterized by poor information, absence of mutual dealing between farmers and aggregates, uncoordinated and informal system; volatile price and unrealistic trading partnerships. In addition, ECX has provided a platform that avoids contract default in payment, quality and quantity; unreliable supply and quality, discouraging productivity and other related factors that previously seriously undermined the contribution of the traditional marketing system to the overall economic detriment of the country and to the livelihood of farmers and buyers. According to Mr. Bayelign Zeray – Branch Director of EACWSE in Gondar,

> The ECX provides a marketing system that coordinates better, that links faster, and that protects the interests of both sides of the trade. The exchange system is a marketing system that is transparent, efficient and innovative, where buyers and sellers come together to trade, assured of quality, delivery and payment. The ECX's design is unique in that it integrates the entire eco-system related to the market, spanning the central trading system, warehouse delivery centers, product grade certification, clearing banks, an arbitration tribunal, a market information system linking rural sites, remote electronic trading centers, and a secure data center to manage membership and market information. An over-arching legal framework and a government regulatory agency ensure the viability of this entire integrated environment. (2017.01.03)

Innovation in the ECX continued through the development of new electronic platforms that have been integrated into ECX. These include an electronic trading platform worth US$3.8 million to replace the original open outcry system in July 2015, with the help of a US$2.2 million grant from the Investment Climate Facility for Africa (Haile et al., 2017). This created the capacity to execute significantly more transactions than the former system, with greater speed and data capture display functions, and the ability to cater to far more participants (Investment Climate Facility for Africa, 2013). The majority of ECX's trades are now made electronically with enhanced efficiency and

it now connects 3.5 million Ethiopian smallholder farmers to markets (Haile et al., 2017).

Mr. Mezgebu Bekele who is the Warehouse Supervisor EACWSE Gondar branch has been in office for the past 3yrs.

> After farmers produce their produce, they had difficulties to approach the market due to the presence of several brokers at different stages. The advent of ECX has helped farmers reduce those obstacles as well as transaction costs. And the networked platform has helped them to get the correct information of the central market. Exporters can get all the produces at the same place without going to the producers. Exporters do not have to go the production sites rather they get a quality guaranteed and certified product transported directly to export destinations. The system has simplified the long process of exporting products by connecting all the stakeholders. Information is easily accessible through mobile phones or digital screens installed at primary markets and recently through the online trade system. (2017.01.03)

According to Mr. Molla Gellaw (market linkage executive of the ECX), to increase the accessibility of trading, ECX has put efforts to open seven electronic trading centers in different regions. The introduction of an electronic trading system has made a remarkable contribution to trade value and performance increases and also helped to minimize irregularities in the trade. The successful deployment of the system also created an opportunity for traders because ECX can introduce new commodities in addition to the seven it is trading now.

Furthermore, the ECX has put into effect a five-year strategic plan (2015-2019) to de-centralize its trading center, with ten branches spread out across the country (Tesfaye, 2016). The ECX, in addition to its Hawassa trading center, has also launched similar trading floors in Nekemte and Humera in the same year. Each trading center will have 50 members, who will be taking part in the transaction process. The seats will be

allotted to cooperative unions and individuals who will acquire the right to trade through competitive bids.

Most African farmers, including Ethiopians, are smallholder farmers whose rural roads are in disorder, making it difficult for farmers to reach the markets. This leads to fragmentation, with each small location in effect isolated from the others. According to Christine Mungai, African agriculture is plagued by low productivity – in some countries, it accounts for 70 percent of employment, but contributes to less than 25 percent of GDP (Mungai, 2015). She further explains that along with uncompetitive markets, deep information asymmetry among the interest groups is the greatest challenge,

> Most farmers sell their produce to intermediaries, either private traders to public marketing boards. Typically, such intermediaries can enjoy being the only purchaser a farmer has contact with. This lack of competition means they can ensure that a farmer has no choice but to take whatever price is offered. This is sometimes as low as 10 percent of the on-going market price. It leads to a cycle of poverty – farmers are forced to sell their produce at harvest time when prices are low, because they have no other choice, and then end up buying food at much higher prices a few months later during the lean season (Mungai, 2015).

Mungai (2015) asserts that a commodity exchange tries to bridge this information asymmetry, and allows efficient trade for bulk commodities.

> The exchange sets up a warehouse network, and issues a receipt to farmers on delivery at harvest time – a maize farmer can then use the receipt as collateral for a loan that he then uses to plant the following season, because the bank is sure the grain will be sold at a high price in a few months' time. The exchange also creates a grading system, so buyers can be sure of the quality of product. This makes it possible for buyers to procure commodities from 'unseen' sellers, at a competitive price (Mungai, 2015).

In the traditional market system, the lack of organization between brokers and agents through a commodity exchange, and the presence of search and transport costs

are in fact the main transaction costs, and are thus obstacles to improvements in efficiency. Transaction costs include the costs associated with drafting and negotiating contracts, as well as monitoring and enforcing agreements, while information costs include searching for the most favorable price for a specific good or service.

These costs imply that farmers are often effectively prevented from taking advantage of price differences between markets, and have insufficient information about the final demand and value of their produce (Andersson, Bezabih, & Mannberg, 2017). Coulter and Onumah (2002) argue that regulated warehouse receipts reduce such transaction costs, since warehouse operators have access to and can distribute information on demand, supply, inventories and the quality of the goods (Coulter & Onumah, 2002). Therefore, innovations that facilitate market exchange by reducing transaction costs and imperfect information will benefit agricultural trade. An increase in the availability of adequate and timely market information should reduce search costs, while an improvement in the legal framework and reduced risk of defaults should reduce transaction costs (Andersson et al., 2017).

Mr. Dereje Negassa (who is in his 50s) is a private coffee exporter. He shares his experience in the coffee business like this,

> I have an experience of exporting coffee for 35 years working both the government and private enterprises. We often say that 'Coffee is a gentleman's business' which means that it should be fair and transparent. However, in the past 20 or more years coffee has become a 'gangsters' business'. Prior to ECX Few people were benefitting from the market process and the farmer was the least beneficiary in all the process. Now the technology introduced by ECX has made it handy providing information accessible to all the parties in a transparent way. In the past times, farmers were cheated by exporters who gave them bad (dry) check that is without enough money in the account. However, now the ECX has made it easy to secure the amount of money in the account assuring the payment at the right time by integrating banking institutions and warehouse services into the

> system. The ECX has added traceability and reliability of products into the export process reducing problems that follow due to low quality produce. (2017.01.14)

In this regard, ECX is being developed as a national commodity exchange to connect regional warehouses that reduces transaction costs and price dispersion between regions. ECX, as a technologically advanced exchange, offers trades based on an electronic warehouse receipt system that links data from warehouse operations, clearing and settlement, and market-information onto one platform (Haile et al., 2017). The system has a warehouse receipt-financing component to provide short-term working capital loans to small-scale traders. ECX provides a fully secured clearing and settlement service and central depository that are electronically linked to eleven commercial banks and a warehouse operator, which in turn is linked to a network of warehouses across the country. These connected warehouses reduce price dispersion among regions and transaction costs for regional farmers (Andersson et al., 2017).

This secured payment system of ECX is digitally linked to the warehouse operator, financial institutions, tax administration agency, and traders. And through this, the ECX settles transactions of more than US$10 million per day with settlements made the following business day. Similarly, the exchange's clearinghouse has cleared more than US$6 billion worth of transactions so far without default (Haile et al., 2017).

Seble (who is in her 30s) is a coffee trader and user of ECX. She explains how the centralized warehouse system of ECX has benefited traders. She says,

> The constant availability of commodities needed in the market such as coffee are assured by the warehouses of ECX. Wholesalers take their coffee to the warehouses and receive a receipt which will enable them to get paid on time. ECX also grades the coffee and ensures its quality. At the auction, buyers and sellers only know the grade and kind of coffee, not who

> produced it. ECX also ensures that buyers have sufficient funds available for trades at the auction. (2017.01.09)

Market participants in Ethiopia now have access to reliable market data through various sources provided by the exchange, including a mobile push service that delivers up-to-date daily market information to farmers and agro-processors via text message and interactive voice response services offered in Amharic, Oromo, Tigrigna, and English languages. As a result, small-scale farmers receive 70 percent of the final price of a trade, up from 38 percent prior to the establishment of the exchange (Gabre-Madhin, 2012). The ECX acts as the regulatory body of warehouses, and has public jurisdiction over their licensing and regulation. This is intended to ensure that warehouses are both credible and capable of providing fair and secure services (Gabriel, 2012). Mr. Molla Gellaw (Market Linkage executive of ECX) explained that, "ECX is providing a secure, low-cost platform for farmers to trade agricultural goods (such as coffee, sesame, haricot beans, maize) in an otherwise tradition-bound system suffering from unusually high transaction risks and costs." Another way in which ECX is efficient is in terms of the safe and secure services that it offers. This is reflected in the relevant literature.

Specifically, ECX assures all commodity market players the security they need in the market through providing a secure and reliable system for handling, grading, and storing commodities; matching offers and bids for commodity transactions, and a risk-free payment and goods delivery system to settle transactions, while serving all those involved fairly and efficiently (Ahmed, 2017). ECX creates trust and transparency through aggressive market data dissemination to all market actors, through clearly defined rules of trading, warehousing, payments and delivery and business conduct, and through an internal dispute settlement mechanism. ECX provides market honesty at

three important levels: honesty with regard to the quality of the product itself, honesty with regard to the transaction, and the honesty of the market actors. According to ECX founder, Gabre-Madhin,

> One of the things I kept seeing over and over, which I'd seen in other parts of Africa, was just how difficult it was for buyers to find sellers and sellers to find buyers, and how difficult it was to enforce the contract. You'd see that a seller, such as a farmer, for example, who sold grain to a trader wouldn't get paid for weeks, sometimes months. There were cases in the coffee market in Ethiopia where people had committed suicide because they had outstanding loans and their buyers hadn't paid them (Everitt, 2012).

CEO Ermiyas Eshetu has said that electronic trade platform has eventually enabled market players to participate directly into the trade from anywhere they are via a secure access and they succeeded in securing their payments. Nevertheless, Minten et al. (2017) found out that modern marketing arrangements (modern retail outlets, packaging, and branding) do not appear to lead to better performance in the coffee business. While they deliver significantly more processed and better-quality coffee, traders employing such marketing arrangements charge significantly higher prices. However, they are not more reliable than the traders in traditional markets both in terms of the quantity and the specific qualities of the coffee they sell (Minten, Assefa, & Hirvonen, 2017, p. 85). They reported that controls by the government to avoid the marketing of export quality coffee in Ethiopia are ineffective.

Gabre-Madhin (2017) has also admitted the challenges faced by ECX ten years after its establishment. She notes that poor functioning of the exchange has forced government to introduce various reformation measures that include the restructuring of the warehousing service enterprises, opening of trading to non-members alongside the introduction of electronic trading. She notes that there still remain concerns and

inefficiencies in the ECX warehouse receipting system which is being tried to be addressed by the notion of implementing a system of selling on truck with bonded yards for trucks to be parked while trading is happening. According to Gabre-Madhin, it hardly resolves the issues around delays and fraud from manual sampling of commodities on truck, as well as grading and weighing of commodity. She suggests that the solution to the ECX warehouse operations problem is not to get into on-truck transactions, but rather to open up the warehouse operation to highly specialized global and domestic warehouse operators-investors who would invest in global standard modern warehouse infrastructure including mechanized handling equipment; automated sampling off-truck; high-speed technical quality assessment; and digitized inventory tracking technology including laser beam stock measurement to ensure speed and accuracy of daily stock positions down to the kilogram, avoiding the current leakages of stock (Gabre-Madhin, 2017).

In sum, the examination of the relevant literature in conjunction with the interview data revealed that the roles played by ECX in delivering enhanced efficiency to the traditionally commodity market of the country in terms of the platforms functions, reduced transaction costs, and safety and security has reached to a stagnant stage and has even found to show deteriorating tendency in its functioning.

5.3. Expanded resources

Further societal benefits of the cases under study also includes expanded resources that may or may not be able to be quantified in empirical forms. These benefits include economic profits that can translate into developmental outcomes such

as poverty reduction or the inclusion of marginalized groups. All the three cases maintain their position on providing some kind of economic benefit to their users, even though this is difficult to prove at the current situation. This section attempts to discuss the impact of the cases on the users in terms of economic or financial values based on the collected data and available literature.

5.3.1. M-PESA

Mobile money systems such as M-PESA have over the years evolved from a money transfer platform to a payment platform, and now many new financial products have emerged that are based on the M-PESA platform. Some of those products, like M-Shwari, allow people on low incomes and those without access to banking services to accumulate capital through savings and affordable credit. M-Shwari is a paperless banking service offered through M-PESA, which enables users to open and operate a bank account on a mobile phone via M-PESA, without having to visit banks or fill out any forms (Safaricom, 2017b). It enables people to move money in and out of M-Shwari savings accounts to M-PESA accounts at no charge and it offers users the opportunity to save as little as KES 1 and earn interest on the saving balance. This cash is moved into the savings account via M-PESA. M-Shwari enables users to access micro credit loans of a minimum of KES 100 at any time and receive the loans instantly on users' M-PESA account. This service of M-PESA has led to an expansion of businesses by making more goods and services available in the market. M-PESA has empowered business creation—many small enterprises and companies rely on M-PESA for nearly all transactions, or provide a service that is a derivative of the platform itself.

Solomon (who is in his 40s) explains it in the following way,

> People in the rural areas are also familiar with M-PESA. In places such as Nyeri, which is about two and half hours' drive from Nairobi, there are a lot of small businesses such as fruit and vegetable shops, construction material shops as well as butchery shops. Most of them do farming activities at the same time while doing their small business. They are more entrepreneurial as compared to other places in Kenya. They have been beneficiaries of M-PESA in their small businesses using products such as the M-Shwari. M-PESA loans have been a great help in starting and maintaining the businesses. (2017.01.20)

Moses (who is in his 30s), and who is a psychology research officer in Nyeri County, explains that he started to use M-PESA while he was in college to receive money from his parents.

> I was born and grown up in this area. And I have been working as a mental health research officer for the past two years. I have been using M-PESA since the beginning. It was useful to me while I was a college student to receive money from my parents. I used to pay my tuition fees through M-PESA. And now M-PESA is in use in almost every part of my life. Beginning from receiving my salary to paying my almost all my bills and even buying goods from the market. Life is made easy and beneficial through M-PESA. We Kenyans have managed to solve our problems by ourselves and make our lives better. We work very hard and sustain our lives. (2017.01.21)

Nicholas (aged 34) from Ihururu village in Nyeri County reports that he built his business through M-PESA.

> I have been using M-PESA since 2008. I saw the advertisement on TV and I went and registered. I was starting my business at that time selling veterinary products. Because of M-PESA, I was able to build up my business and use M-PESA to transact money with my customers. (2017.01.22)

A survey conducted by Munga (2010) to some 500 M-PESA users reveals that there was a significant increase in the monthly income of those who have adopted M-PESA as a business with most M-PESA agents reporting to have earned an average of KES 50,000 (equivalent to US$625) and more from M-PESA. These earnings are

considered significant given that according to the National Income Distribution survey done by Kenya Bureau of Statistics estimates that 80 percent of Kenyans earn less than KES 10,000 (equivalent to US$125) per month (Munga, 2010).

Faith (in her 30s) owns an M-PESA agent shop in a village near by Kiambu County. She tells her experience as an M-PESA agent benefiting from the business,

> Me and my sister graduated from high school, but we weren't able to join college. We were able to open a small shop in Githurai near Kiambu County. Our business was not doing well till we became an M-PESA agents. M-PESA has helped our business to grow up and expand. Now I have opened my own M-PESA shop near the Kenyatta University. My income has been increasing much enough to support my living expense. My monthly income has increased from KES 40,000 four years ago to more than KES 70,000 these days. My sister also runs her own M-PESA agent shop in Nairobi. She [my sister] has experience in being a beneficiary of micro finance credit to expand her shop into a grocery store. (2017.01.19)

Violet (aged 32,) is an M-PESA agent and a shop retailer residing in Ruai. She describes her experience with M-PESA as follows:

> I started this M-PESA agent shop six months ago. There are about three such agent shops around this area. M-PESA has brought a great benefit to the youth like me by creating job opportunity. Our profit is enough for us to sustain our life. I decided to open this shop here because of the private hospital in front of here. People come here mostly to withdraw their money because they need some cash for their medical treatment. Only few individuals (2 or 3 a day) come here to deposit money. So I am planning to open a second agent shop in another nearby residence area of the city where people need the service to deposit money rather than withdraw much. (2017.02.26)

A recently published study by Suri and Jack (2016) on the long-run effects of mobile money on economic outcomes in Kenya provides some valuable insights that with regard to the potential for further economic development and financial inclusion policies across Africa. The researchers surveyed between 3,000 Kenyan households over a six-year period and found that access to mobile money allowed individuals to

protect themselves against income and health risks. In addition, there was a sharp increase in the density of M-PESA agents soon after its launch in 2007 versus those without such easy access to mobile money. The surveys were conducted between 2008 and 2014, during which time the M-PESA agent network expanded dramatically in Kenya.

Suri and Jack (2016) further found that increased access to mobile money has reduced poverty in Kenya, particularly among female-headed households. Rapid expansion of access to mobile money has lifted an estimated two percent of Kenyan households (some 194,000) out of extreme poverty and induced 185,000 women to enter business or the retail industry as their main occupation (Suri & Jack, 2016, p. 1289). The impact appears to be greater for households that are headed by women, due to certain factors, for example, the fact that many low-income women have left subsistence farming to engage in cash-generating entrepreneurial activities upon gaining access to M-PESA. This allowed the women to save more money, thus increasing the financial resilience of their families.

According to the result found by the Suri & Jack (2016), the households whose access to M-PESA agents expanded early on fared better and received more remittances from a larger network of people than the control group. For example, when households faced an economic shock, there was a 12 percent difference in per capita consumption between the two groups, with consumption rising for those households near to an M-PESA agent. There also was a gender effect. In households with access to mobile money, women were more likely to move out of subsistence farming into businesses, suggesting a more efficient and productive allocation of labor. In female-headed households with

easy access to M-PESA, per capita consumption was higher than for comparable male-headed households. The surveys also revealed that households with easy access to M-PESA saved 22 percent more money than those without. The study emphasized that the power of linking households and especially women to a simple payment service resulted in the digital financial inclusion of the poor which contributed to improvement of lives (Suri & Jack, 2016, p. 1291).

Cecilia (in her 30s), Pauline (in her 30s) and Lucy (in her 20s) live with their mother in Kirinyaga town. Cicilia explains about how their family has benefited from the use of M-PESA supported loans to sustain the family business.

> My mother is a single mum. She raised me and my two sisters alone ever since she got divorced. My mom has had a hard time working for the family in the market selling fruits. Since the past two years ago, my mum came to know about the small loans using M-PESA platform. Through the access to loans from the M-PESA loan system, Mshwari, and another loan by KCB [Kenya Commercial Bank] M-PESA loan, we were able to increase our business and open this fruit juice shop.

Morawczynski and Pickens (2009) revealed ten ways in which M-PESA positively impacted the lives of poor people, including lower transaction costs (relative to other methods of transaction, such as PostaPay, run by the Postal Corporation of Kenya, for example). Specifically, as the authors point out, "sending KES 1,000 (US$13.06) through M-PESA cost US$0.39, which is 27 percent cheaper than the post office's PostaPay (US$0.52)" (Morawczynski & Pickens, 2009). This has been especially beneficial to people living in rural areas, according to the authors. M-PESA was also found to have made it considerably easier for poor people to store money. The amounts stored ranged from KES 100 to KES 1,000, which is approximately a week's wages for many of those interviewed by the authors (Morawczynski & Pickens, 2009). Furthermore, 77 percent of the participants in the study reported that their income

increased as a result of their use of M-PESA. The reasons for the boost in participants' income were the following:

> Such an increase is the result of money being sent more frequently. By breaking up their transfers, urban migrants end up remitting more money back home. Also, rural recipients save money when retrieving cash. They no longer need to pay for transport costs to urban centers, where most of the money transfer services are located. Instead, they make the withdrawal directly from Bukura. Such an increase is vitally important for the rural recipients, who depend heavily on remittances for their livelihoods. The financial diaries reveal that such remittances constitute as much as 70 percent of rural household income. (Morawczynski & Pickens, 2009)

Another group of researchers surveyed 350 Kenyan women to understand how much M-PESA has impacted their lives and businesses (Kombo, 2017). The result shows that nearly all (96 percent) of the women who responded have an active M-PESA account and 78 percent of them made at least two transactions per week. More than a third (37 percent) of these women have their own business and 80 percent of them use M-PESA to do their business transactions. Almost all (96 percent) acknowledged that it was possible to scale their businesses as a result of their use of M-PESA. It was reported that a female informant told that M-PESA makes work easier for her clients and - if they do not have enough cash to buy her products, they can use M-PESA to pay (Kombo, 2017). Another informant reported that M-PESA has helped her monitor her financial records and reduce customers' debts by giving them an alternative means of payment (Kombo, 2017). According to the survey, twenty percent of female business owners shared that they use M-PESA to save their profits using M-Shwari (means "calm" in Swahili), which has provided them with access to loans and savings accounts (Kombo, 2017).

Further examination of the relevant literature indicated that M-PESA adoption had improved peoples' livelihood in Bureti District by creating employment opportunities,

increasing income generation, access to credit facilities and social capital between families and friends (Gikunda et al, 2014). As a powerful tool for mobilizing remittances, M-PESA enables people to request a remittance and receive it at a nearby agent, making it easier for rural women to solicit funds from their husbands in the city. This has led to an increase in small and micro enterprises, such as vegetable sellers and foodstuff kiosks due to increased money circulation and income levels. Specifically, using descriptive and inferential statistical methods, the authors were able to determine that the use of M-PESA in Kenya increased employment (indicated by a coefficient of 0.334); increased users' access to credit facilities (0.334), and enabled users to increase their incomes (0.356) (Gikunda et al., 2014).

Based on the findings of another research report by the IRIS Center at University of Maryland, M-PESA's economic effects at the community level are now observable for both users and non-users of M-PESA, through direct effects and externalities, respectively (Plyler et al., 2010). The report pointed out four overarching economic effects that illuminate M-PESA's potential role in supporting economic activities at the community level are in the areas of local economic expansion (in terms of money circulation, expansion of businesses and employment opportunities); security (in terms of physical, financial and food security); capital accumulation (in terms of human, social and financial); business environment (in terms of transactions ease and quality control). Specifically, Plyer et al. (2010) focused on the indirect effects- or externalities- of M-PESA and quantified the results based on the rankings given by the participants in the three communities: Kibera, Murang'a and Kitui, involved in the research based on the various categories under consideration by the authors. Specifically, the weighted rankings relating to the effects of M-PESA on the three communities studied (ranging

from 0 to 0.9), were, for example, physical security (0.19); employment opportunity (0.27); food security (0.56), and ease of transactions (0.58) (Plyler et al., 2010). Interestingly, according to the authors, people in rural areas ranked food security as a more important effect than those who live in urban areas. Food security was mentioned in terms of increased agricultural productivity, improved access to nutritious food and a variety of foods, and more timely access to agricultural inputs. Interestingly, rural women placed more importance on food security than rural men, while urban men placed more importance on it than urban women (Plyler et al., 2010).

Finally, a ten-year study of M-PESA's impact by the audit company KPMG finds that the Social Return on Investment[14] generated by M-PESA grew from Sh83 million in 2007 to Sh184 billion by the end of March 2016 (KPMG, 2016; Maina, 2017). M-PESA customers- relative to M-PESA agents - were the main beneficiaries of this social value, receiving a return in value of Sh160 billion as a stakeholder group in the financial year ending 2016.

In sum, the present study has examined the economic benefits resulting in poverty reduction in relation to M-PESA. People can accumulate savings and obtain affordable credit. It reduces poverty, especially among those households in Kenya, for example, in which a woman is the head of the family. It enables farmers to transition from subsistence farming to commercial farming. It promotes entrepreneurship because small enterprises are able to obtain loans at affordable rates. It helps them monitor their financial transactions more effectively, which enables them to save money. At the

[14] Social return on investment is a term defined by as, "a term originating from return on investment (ROI), as used by traditional investors. It describes the social impact of a business or nonprofit's operations in dollar terms, relative to the investment required to create that impact and exclusive of its financial return to investors" Lingane & Olsen, 2004:118.

community level, it promotes greater money circulation, an increase in the number of small enterprises, and boosts employment opportunities.

5.3.2. Ushahidi

The three cases described in this study do not provide economic benefits in the same manner. There are times when the immediate economic impact of open development initiatives is difficult to measure or specify. Economic impact may not be the direct consequence of the initiative, rather indirect socioeconomic effects could produce the relevant societal advances. In the case of Ushahidi, the effects of which are described in some detail below, the main advances at the community level relate mostly to management of crises and everyday difficulties by local residents, bottom up political activism, and the promotion of democratic or at least egalitarian values.

Studies analyzing the immediate impact of crisis mapping on poverty reduction or economic benefits are scarce. Nevertheless, researches indicate that there is a close connection in terms of the roles played by ICT and data management as a development tool. As Draman (2003) points out, conflict causes an increase in poverty rates in many African nations. However, there are certain problems associated with measuring this relationship, namely, (1) the lack of data that is reliable (2) in cases where data is available, it tends to be in the form of aggregated nation-wide, not localized, and not indicating the socioeconomic cost, and (3) the difficulty in establishing counterfactual causes of poverty, that is, potential other causes of poverty besides conflict (Luckham, 2001). However, Draman points out that, “conflict widens the gap between people’s needs and their entitlement” (Draman, 2003:13). Accordingly, the impacts might be

caused by a general breakdown in public order, destruction of institutions, values and networks. Oucho (2007) states that in the case of Kenya there was conflict following a disputed election result in December 2007. Ushahidi, which, as previously mentioned, is a crisis-mapping platform that was introduced during a conflict following a disputed election in Kenya. IT was designed to enable people to try to guarantee their personal security though in a fast-moving crisis situation.

Specifically, in the words of Hanna (2012), Ushahidi, "allows citizens to adopt new strategies to communicate, coordinate, mobilize, and have their voices heard". Furthermore, as Hanna (2012) points out, this can be achieved at low cost, in real time, and at a large scale. The platform also enables people to make contact with local and global NGOs, and share information with them, while it is also meant to be used to contact security services. In this case, Ushahidi allows NGOs to provide humanitarian assistance, while it allows security services to help provide physical security for citizens. In sum, the platform improves, "governance, social accountability, citizenship empowerment, and institutional reform, [which] are central to development assistance and poverty eradication" (Hanna, 2012).

Ushahidi, which makes its bases on crowdsourcing functions as an informational resource for development, crisis response, and post-conflict recovery. Bott and Young (2012) explain that crowdsourcing serves as a participatory monitoring and evaluation tool for development and humanitarian programs, eliciting feedback directly from program beneficiaries. It also supports empowerment based on the principle of universal participation. Crowdsourcing systems present donors with an opportunity to enhance

local ownership and facilitate broader participation in development and governance (Bott & Young, 2012).

However, Brandusescu et al. (2014) claim that if crisis mapping is not about poverty, it is not about development. They questioned whether crisis mapping, such as Ushahidi, can effectively be used for community development. But, it was also noted that there is a benefit gained from the network nature of crisis mapping. They write that "[m]otivations to contribute to mapping platforms are driven by personal, social or technological goals and vary amongst users…. People here could contribute because they perceive an outlet for creative and independent self – expression." (Brandusescu et al., 2014, pp. 7–8). In addition, Bott and Young (2012:60) explained that "[m]apping exercises have encouraged discussion between villagers and helped with information transfer between villagers and the government, as well as between villages" (Bott & Young, 2012, p. 60). Fung et al. (2015:234), also mention that such technologies as crisis mapping "...can improve political accountability and public deliberation by supplementing the efforts of civic and governmental organizations to establish and disseminate facts, mobilize constituencies, and monitor their socio-political environments."

In their explanation on how deployment of various ICT projects is being used to enhance governmental accountability, political participation, and public deliberation, they write,

> Well-designed and -implemented ICTs can enhance truth-based advocacy by facilitating the collection of relevant information, increasing the trustworthiness of information, and making information accessible. Truth-based advocacy relies on both centralized and decentralized mechanisms of information collection. The Kenyan budget tracking tool is an example of a centralized mechanism. It makes detailed information about financial

> allocations for local development projects publicly available. Corruption has prevented much of the allocated money from reaching poor and rural areas. Official governmental data made available by the tool have allowed activists and nongovernmental organizations (NGOs) to show that funds often fail to reach their intended recipients. The tool thus helps close evidentiary gaps and create common knowledge about corruption among NGOs, community groups, government, and interested publics. (Fung, Gilman, & Shkabatur, 2015, pp. 232–233)

Brandusescu also discusses how Ushahidi does not work for poverty due to its time-limited effects. "Crisis events appear to occur at a singular point or a short duration in time (e.g., earthquakes). Chronic events (e.g., poverty) are long term, complex and, to some, seemingly intractable." (Brandusescu et al., 2014, p. 8). However, Bott and Young (2012) talks about how a similar usage, deployed over time, is effective in stabilizing areas of conflict. "This information would provide the foundation for thematic and area-based conflict analyses that would in turn inform the targeting and design of conflict prevention and peacebuilding interventions. The ownership and management of the early warning system would be firmly embedded within the local institution, with the possibility of requests for support from international actors for the particular interventions (Bott & Young, 2012, p. 59).

Gellers (2016) evaluates the utility of crowdsourcing as a tool for participatory agenda-setting in the realm of post-2015 sustainable development policy using descriptive representativeness (e.g., the degree to which participation mirrors the demographic attributes of non-state actors comprising global civil society) of participants in two United Nations orchestrated crowdsourcing processes. He states that although crowdsourcing may present an attractive technological approach to expand participation in global governance, ultimately the representativeness of that participation and the legitimacy of policy outputs depend on the manner in which contributions are

solicited and filtered by international institutions (Gellers, 2016). In order for participation to effectively promote democracy in global environmental governance, it needs to help non-state actors overcome disenfranchisement, or ‘‘the condition of being marginalized’’ which can be reduced by successfully expanding opportunities for participation and obtaining diverse and representative perspectives from marginalized groups. George et al. (2012) took inclusive innovation as the development and implementation of new ideas which aspire to create opportunities that enhance social and economic wellbeing for disenfranchised members of society. Inclusive growth can be viewed as a desired outcome of innovative initiatives that target individuals in disenfranchised sectors of society as well as, at the same time, a characteristic of the processes by which such innovative initiatives occur (George, McGahan, & Prabhu, 2012).

Hagen (2011) utilized Ushahidi when she launched her community development project, Map Kibera. Hagen’s aim was to, ‘alter the existing local information dynamic’ through the mapping of the stories of residents, a process that enabled them to work on key community issues. In other words, residents of this slum in Nairobi have nor form of representation at all. In sum, in the words of Hagen (2011:91), the aim of this project was to, “represent the multiple realities of a community, and to aggregate their subjective opinions into a collective truth”, so that they could participate in a meaningful debate and work together to try to solve problems that are experienced by residents, which include poverty, health problems, and inadequate facilities to provide clean water, electricity, and sanitation, for example (Hagen, 2011). The valuable information shared by residents is passed on to agencies with sufficient resources to

tackle these problems effectively. In other words, local knowledge is intended to guide local policy-making (Nelson, 2011).

With regard to the economic benefits of Ushahidi, there appear to be two dimensions: activity by users in the non-market sector and commercial activity in the market sector. With regard to the former, crowdsourcing is one of the characteristic features of this platform. Howe (2008) defines crowdsourcing as "the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call" (Howe, 2008; Schenk & Guittard, 2011). This collaborative activity enables community members who are relatively poor and disenfranchised to gain in empowerment and autonomy by cooperating with others to pursue goals that do not require participation in the market sector from which they may be largely excluded. With reference to Ushahidi, crowd-mapping, which is the platform's main concern, is in fact a form of crowdsourcing (Lin, 2012). With regard to the non-market economy Ushahidi applies the Open Source Sharing principle, for example, and thereby "removes the financial barriers for organizations that often do not have the money to write code from scratch or pay hefty fees for data" (Lin, 2012).

However, in terms of economic benefits *in* the market sector, "[Ushahidi] has strengthened economic development and market efficiency through mapping biogas market prices and production across six African countries" (Lin, 2012), for example. Certain economic advantages can be gained for small enterprises through the use of the sophisticated tools that are available through the Ushahidi's commercial service. It should be noted that there is a commercial version of Ushahidi which requires users to

pay and a free version which does not. It is often understood that a free software that offers more features provides the best of both worlds for many people when payment is included. Ushahidi's mapper version is free to everyone, but the paid versions (such as the Surveyor and Responder versions) consist of more features which may give the image of Ushahidi a more of commercial software. Even though the free version essentially consists of multiple components bundled together as a social software platform solution which is good for basic use and functionality, it will not be as efficient as the paid one. This could make a barrier to the wider use of the fully functional software within communities in developing countries. In both cases, users of Ushahidi can benefit from the platform either to operate outside of the market sector through the free version of Ushahidi or inside it through the activities of users who run small enterprises and grassroot sectors. In sum, despite differing views on the challenges in practical applications and the subsequent outcomes of utilizing the software, Ushahidi has been the leading crisis mapping tool that provides software and services to numerous sectors and civil society to help improve the bottom up flow of information.

5.3.3. ECX

In Ethiopia, where 85 percent of the population relies on farming for its livelihood, only one-third of agricultural output reaches the market before the advent of ECX (Rockefeller Foundation, 2013; World Bank, 2005a). The FAO (2015) data indicates that 30 percent of the entire population of Ethiopia lives under the national poverty threshold, the poverty headcount ratio of smallholders is 48 percent and farms smaller than two hectares constitute nearly 90 percent of the total number of farms. These

smallholder families with a farm of about 0.9 hectares generate income amounting to about US$ 0.8 per person per day. But larger farmers – cultivating 3.5 hectares on average – although they make about twice as much (US$ 2.1 per person per day) are not well-off either (Rapsomanikis, 2015, p. 21).

As a result, Ethiopia saw the need to transform its agricultural markets to reduce poverty. The CEO of ECX, Ermias Eshetu, indicated that this innovative solution [ECX] is delivering a game-changing contribution to the Ethiopian economy (IBM Analytics, 2016). According to his explanation, ECX acts as a central marketplace that connects small-scale farmers to major international commodities buyers, with all parties assured of quality, delivery and payment for their goods. Worku (2014) states that commodity exchange plays a major role for agricultural development as an instrument to bring efficient agricultural market by providing lower transaction cost, efficient and transparent means for price discovery, managing risks related with prices volatility and provide a forum for exchanging information about supply and demand condition.

It has been claimed that there are five types of impacts of ECX on smallholder farmers; that is, first, power and participation for farmers to be better able to negotiate prices given market transparency; second, in terms of quality, farmers are able to get market premium for value added to the product (post-harvest handling); third, non-restricted local and national market access; fourth, in terms of risk management, farmers can lock in prices through futures contracts; and fifth, in terms of planning, farmers can use futures prices for planting decisions (Gabre-Madhin, 2007b).

By 2013, ECX had included 11 partner banks, 325 exchange members, 12,500 clients (Rockefeller Foundation, 2013). ECX connects more than 3.5 million Ethiopian

smallholder farmers supported by modern supply-chain infrastructure (Bekele & Daibo, 2017). ECX reports that some farmers have seen their incomes double, which, in turn, is allowing them to increase their production and improve the quality of their harvests. When the ECX first began trading coffee in December 2008, the government suspended the country's traditional coffee auction floor and made it mandatory for all coffee trading to be conducted through the exchange (Gustafson & Hernandez, 2017). This was done to ensure that ECX receive large enough market shares to make it successful on the coffee export market. However, Gustafson and Hernandez (2017) have suggested that with regard to coffee, the ECX had lacked impact on the business, generally, due to three reasons: First, before the establishment of the ECX, Ethiopia had a fairly well-functioning coffee auction floor in Addis Ababa; it is likely that this centralized market location provided enough information to integrate domestic and international markets reasonably well. Second, the strict regulations that the ECX has introduced into the country's coffee market have resulted in higher transaction costs. These costs could potentially cancel out the benefits of some of the ECX's innovations, such as electronic payment systems. Finally, the Ethiopian coffee sector continues to face some inherent challenges that are not affected by the ECX—namely, weak infrastructure and low productivity—and that also play an important role in the price relationships between markets. Even if the ECX functioned perfectly, these challenges were still found to exist and hamper improvements to market integration (Gustafson & Hernandez, 2017). While the authors acknowledge that the jury is still out on its ultimate effectiveness since the ECX is a relatively new institution, they also stress that donors, the Ethiopian government, and any other government that may look to replicate the ECX in their own

countries need to conduct more rigorous assessments of the ECX's policies to ensure that they are in fact helping the smallholder farmers they intend to reach.

Worku (2014), whose study focuses on the benefits to members of ECX in terms of the volume of their exports and the profits that members make on those exports. Specifically, Worku (2014:9) states, "ECX members particularly the exporters have got the opportunity of market access, increment of sale volume and profit through ECX". The quantitative element in the author's research design, that is, the utilization of questionnaires, proved that ECX members boosted their export profits and volume on the basis of the marketing information that they acquired due to their involvement in this system (Worku, 2014). In addition, Kuma et al. (2018) used data collected on about 1600 Ethiopian coffee growing farmers residing in areas of coffee variety produced as defined within the classifications for export markets by ECX, to find that coffee income is associated with improved food security, even after controlling for a variety of household characteristics including total income, wealth, education and the endogeneity of coffee income. Their analysis has revealed that households with a larger share of coffee income in their total income portfolio report less food insecurity than other households (Kuma, Dereje, Hirvonen, & Minten, 2018). Their result also finds that coffee is sold throughout the year, providing coffee farming households with cash income during the lean season when food stocks are generally low and prices high.

Messay (aged 55) is a coffee farmer in Werka district in Southern Ethiopia. She says that she and her husband truck their coffee to Dilla where it was graded by the ECX in preparation for export by a union. They sell it to a cooperative that is part of the

union. Compared to the past before using the ECX, she says that the income of her family has increased remarkably. She explains,

> We have been producing our coffee through our hard work on the coffee field and send it to the warehouse of the cooperative for grading. It is much better now than in the past. Our income has increased by more than double so that we were able to build a new house. (2017.01.05)

Other coffee farmers in the region (SNNP) are also among the informants who have said they were beneficiaries of ECX. Mrs. Tamire (who is in her 40s) explained,

> Even though the overall income increase is not as I have expected, there is some improvement in the coffee revenue since 2010. We are thankful to the government to introduce the system to support small-scaled farmers such as me. We hope in the future things will be better. Even though, I do not know in detail, I expect the system will be beneficial to poor farmers. (2017.01.05)

Mrs. Kebedech (who is in her 40s) has also this to say, “I can testify. Our family business of grain export was on a verge of collapse several years ago. But, since the new system [ECX] has come, out export revenue has increased. We are glad about it.” (2017.01.05)

Mrs. Tamire (who is in her 40s) as well told that using the ECX system has some economic contribution on the grain production of her farm.

> In fact, the government is trying to support small farmers in the recent years. I am not sure if it has to do with ECX, but in the recent years, sending out products to the central market has been convenient and profitable than in the past. However, we still need that regional governments provide the necessary protection to poor farmers like me. (2017.01.05)

Mojo et al. (2017), who examine the benefits of members of market information sharing systems, including ECX, point out the positive effects of spill-overs of cooperative commercialization at the local level. Specifically, there study shows that non-members are at a disadvantage relative to members of such organizations. In fact,

they note that there is a need for a better mechanism that could facilitate more involvement on the part of poorer farmers whose interests would be well served if they had access to the market information that is available through systems such as the ECX (Mojo et al., 2017). Although Hernandez et al. (2015) have stated that the positive impact of ECX in terms of the strengthening of coffee price relationships has been overstated in the Ethiopia's national media, there are several examples of research using quantitative methods that prove farming cooperatives and activities using local infrastructure, such as regional warehouses, achieve market efficiency, for example, if these elements are incorporated into the ECX system (Hernandez et al., 2015). Based on their clarification, the lack of a higher integration between local and world markets in recent years, measured through interdependencies in prices, could be explained by several factors. First, there have only been a few years since the ECX was established such that the process of better linking farmers to markets, encouraging reliable trading relationships, and improving market information is still ongoing.

Observation indicates that farmers are receiving higher prices than before the establishment of the ECX and the volume of coffee transactions through the ECX have considerably increased in the past years. However, media coverage in Ethiopia has always been dominated by reports of the role played by the commodity market on the economy of the country from the perspective of government's policies and strategies particularly with regard to the linkage of ECX to smallholder farmers, improved market efficiency, and increasing export revenue. According to Hernandez et al. (2015), this kind of media analysis is premature and may not hold up under rigorous scrutiny since there is no empirical evidence.

Tirusew (who is in his 30s) is a grain supplier based in Adama city. His story about the role of ECX on the economic benefits of supplies is as follows,

> I am relatively new to the supply trade business. In the past I have been working hired at an office of a local private exporter. What I can tell from my experience working at my former workplace and currently running my small business is that, ECX is indeed very helpful in many dimensions. Businesses have flourished due to the necessary regulation provided by the government authorities. Black market or illegal smuggling of agricultural products has reduced tremendously so that legal suppliers and exporters can become the actual beneficiaries. The former small enterprise I was working for, has now grown. This shows the revenue has increased a lot. As to me, along with other government regulatory services, ECX has produced a good business atmosphere that economic benefits could grow through time. (2017.01.10)

The main finding of Andersson et al. (2017) was that regional warehouses, connected to a commodity exchange, indeed seem to improve local market efficiency. This suggests that when establishing a commodity exchange at the national level, it is important that the benefits of the exchange are distributed to local markets through local infrastructure. Benefits were achieved when local warehouses were connected to the ECX. Of particular interest in the present study is the way in which knowledge sharing, in case through suitable institutions, addresses the issue of knowledge asymmetries and reduces transaction costs. Specifically, using the data for period between January 2007 and December 2012, i.e., three years before, and three years after the first ECX warehouse in the sample became fully functional, the authors state that, "the average price spread between market pairs is reduced by 0.85-1.14 ETB[15] when both markets have an operating warehouse" (Andersson et al., 2017). It is clear that this type of local infrastructure benefits local markets, on the basis of the findings this study. However, Andersson et al. (2017) claim as the commodity exchange has mainly been operating in

[15] 1 ETB (Ethiopian Birr) = 0.0547 US Dollar (data for December 2012, https://www.exchange-rates.org/Rate/ETB/US$/12-31-2012)

a period when world market prices have been falling, longer time series are required for more generalizable results.

Despite the substantial growth in the number of warehouses of ECX nationwide, the data shows that the concentration in just certain locations reflects an important lack of spatial dispersion leaving important transit points for the drought prone areas of the North still lack warehouse access (Andersson et al., 2017). This result also points out that development works only with the right social structural mechanisms in place. Creating an app to replace the brick and mortar exchanges has not solved all of Ethiopia's market problems. Recently the Ethiopian government, whose economic agenda has been focused on agriculture to bring in a staggering amount of export revenue, seems to realize things did not go as planned so it is undertaking massive changes to the agriculture market since 2017. The first step taken was to re-merge the warehousing service enterprise (EACWSE), which spun-off from ECX since 2015 with expectation to bring change in solving the continuous headache of inefficient warehouse sampling, grading, handling, storage, and logistics (Yewondwossen, 2017). Gabre-Madhin also pointed out that implementation problems have led to retraction of this effort and a re-integration of warehouse operations back into the hands of ECX, and, however, the reality is that both of these initiatives in the past three years have led to little actual change on the ground (Gabre-Madhin, 2017).

Francesconi and Heerink's (2011) research deals with the role played by agricultural cooperatives in linking smallholder farmers to ECX and the relative impact of collective commercialization in comparison to individual commercialization. The cooperative approach to marketing proved more conducive to successful and

widespread commercialization when incorporated into the ECX system. Furthermore, in the words of Francesconi and Heerink (2011:170), collective commercialization in this context has proved to "simultaneously reduce poverty and expand agro-commodity flows" This therefore implies gains at both a macro and local scale. Specifically, the authors state that the members of marketing cooperatives, "have rates of commercialization that are between 17 and 29 percent higher than those of independent" (Francesconi & Heerink, 2011, p. 169).

In spite of all these claims, farmers such as Mr. Tesfaye (age 45), who is a grain farmer nearby Gondar, are skeptical of the immediate impacts of ECX on the living standard of poor farmers in rural areas. He says,

> I am grateful about the ECX and the way it provides information to the farmers. ECX has been helpful in many ways for the past 8 to 9 years. However, with respect to economic benefits, I am not really sure to say. Of course, my living has improved somewhat compared to the time before ECX was established, about ten years ago. For poor farmers like me, what is needed more is agricultural support such as farming tools, drought resistant seeds, fertilizers and so on. Government is lacking a lot in providing these to the poor farmers residing widely spread in the country side. We do not have enough agricultural supplies, either they are expensive to get them from the market. Sometimes they are used for political purposes. (2017.01.03)

Mrs. Kedija (who is in her 50s) is also another grain framer in the region. She explains as follows,

> I have been producing ... since I was young. But I began to use the ECX since 2011. My business and my living has improved in the past years. I cannot say it is fully because of using the ECX. It has provided some contribution to the way my products are taken to the central market. However, since the quality standards have been very high and strict with the advent of ECX, it has been difficult for poor farmers who does not get enough farming supplies particularly during the drought seasons. (2017.01.03)

Francesconi and Heerink (2011) do not find significant effects of the ECX on commercialization levels of smallholder farmers in Ethiopia, and Abdurezack (2010) finds that traders can earn excess profits using the predictability in price series even after the introduction of the ECX. According to the coffee exporter, Mr. Dereje (who is in his 50s), there are still challenges in the way government policy is perceived by some people.

> Farmers who are organized in cooperative organizations are way better off in terms of provision with farming assistance. Poor farmers still use backward farming methods without any mechanized systems. ECX is about support given to the produces not at the stage of production rather to the end product. Even though poor farmers had their problems with regards to market access has been solved, the most important thing they need is technical and advisory support in the process of producing their crop. We have heard that government is giving huge strips of land to foreign investors with the aim of making the agriculture sector productive well enough to build the economy of the country. On the other hand, this would affect the small and subsistent farmers in the rural areas in a negative way. They may feel that they are neglected from government support services. (2017.01.14)

According to Santana-Boado, coordinator of Commodity Exchanges, at UNCTAD Special Unit on Commodity, despite the roles played by exchanges as versatile instruments, capable of upgrading commodity sector performance in a range of situations and addressing emerging challenges in general, price risk management is not always an important - or even relevant service - for smallholders compared with price information and physical market services (Santana-Boado, 2010). There is a need by ECX to be able to offer essential training and capacity-building to help smallholders improve cropping and marketing decisions with market information so that it encourages downstream partners to pass on hedging benefits to smallholders.

Minten et al. (2018) reported that transmission of export quality premiums to coffee producers is limited, with only less than one-third of this premium being passed

on, and we find limited evidence of effects due to communal investments. Moreover, as quality premiums are small and average production levels in these settings are low, we estimate that these premiums would only lead to an increased income for coffee farmers of 22 USD per year even with a perfect transmission scenario, and therefore would have little impact on the welfare of the average coffee farmer (Minten, Dereje, Engida, & Tamru, 2018).

Even though some findings of the literature as well as the interview analysis have shown that ECX has some economic contribution to the country's economy as well as limited smallholder farmers as well as some farmer cooperatives through its role as a market efficiency promoter, there appear to be mixed outcomes for promoting the livelihood of smallholder farmers. There is little documented literature or research study that assessed the overall economic impacts of ECX on poverty reduction, even though the Ethiopian government has been asserting that farmers and suppliers have been benefitting from the services of the ECX. This leads to the conclusion that initiatives which are based on open development could have an obscured outcome specially when the projects are under the management of government.

5.4. Strengthened social interaction

Open development projects which have local origins tend to strengthen social interaction and participatory development. People residing in the rural areas have started to draw closer to the central economic center of the countries due to the suitable access of the services. Though different in their magnitude, the three cases under this study

were observed to enhance some kind of social interaction among the users of the platforms.

5.4.1. M-PESA

M-PESA has also become a useful tool for socio-economical interaction and communication to flourish among family members, friends, colleagues and other community members.

Nicholas (aged 34), from Ihururu village in Nyeri states,

> I also became able to send money to my parents who live in the rural area. Everybody in my family is using M-PESA. Our family feels ever closer than before. Our life has been easy with M-PESA working in this area for the past years. (2017.01.22)

Musa (aged 46) is a farmer in Gatundu. He explains the importance of M-PESA in his life as follows,

> This (M-PESA) is a very important technology to change our lives. My children all live in Nairobi. Using M-PESA is more than transacting money. It connects our families together. We communicate and help each other readily. Sometimes people are busy with life and work. There is no need to travel distances frequently to show love to your beloved ones. You can easily show that you love them by transacting a little money into their M-PESA account that will really make them happy. (2017.02.11)

M-PESA has also enhanced social interaction in the communities since the accounts can be shared among close relatives, friends or trusted neighbors. Peter (a farmer who is in his 50s) who is living in Kirinyaga County explains,

> Even though I am illiterate and old in age, I can use M-PESA to transact money easily with the help of other family members and neighbors. In the past, if I receive an SMS, I used to take my phone to my son or daughter when they were living together with me. But now, I ask my neighbors or the M-PESA agent across the street to help me read the message and

> receive the cash or even sometimes to use M-PESA to send money to others. (2017.01.20)

A research survey conducted on some 350 Kenyan women has indicated that beyond business, Kenyan women heavily rely on M-PESA services for the sustenance of their families (Kombo, 2017). One of the initial selling points of M-PESA was enabling people to send money home. The survey result indicates, 95 percent of the women responded that they use M- PESA to send money to their relatives, 62 percent of this money was used by their relatives to buy food, 14 percent to pay for bills while 3 percent was spent on getting medication. These transactions not only help strengthen their families against various economic challenges, but also enhance the family and social interaction. It was reported that users of M-PESA sent money far more frequently in which, M-PESA users made five remittance transfers per month on average (Kombo, 2017).

Internal migration, motivated by employment and other opportunities has made families and social networks in Kenya to be dispersed over large distances (Jack & Suri, 2014). Thus, systems such as mobile money platforms that work easily across distances can produce a linking role among members of family or society. According to a survey conducted on 3,000 randomly selected households by Jack et al. (2013), households with M-PESA users exhibit more remittance activity than those without. Specifically, households with at least one M-PESA user are 37.4 and 34.3 percentage points more likely to receive and send remittances, respectively, within their personal networks than nonuser households (Jack, Ray, & Suri, 2013). The researchers found out that access to M-PESA increases the frequency, intensity, distance traveled, and reciprocity of transfers within personal networks. Access to M-PESA allowed individuals to protect

themselves against income and health risks. Individuals could draw on a wider network of social support, and they received more remittances more quickly from more different types of people in response to negative shocks.

With regard to the way in which M-PESA promoted social interaction in a way that benefits users, the Morawczynski and Pickens (2009) state that the use of M-PESA among rural Kenyan women empowered them in the sense that it was thereby easier for them to solicit money from contacts of theirs who lived in urban areas. Therefore, they experienced more autonomy given that they did not have to solicit money from their husbands to the same extent as they did prior to their use of M-PESA (Morawczynski & Pickens, 2009).

Margaret (who is in her 60s) lives in a rural town in Kirinyaga. She tells that she is not able to use the M-PESA services by herself. She says, "I never have a mobile device before. I do not use M-PESA for myself. Whenever I need the service, what I do is ask my son-in-law to receive or send money instead of me using his M-PESA account. I am too old, and my eyes have problems to use mobile services." (2017.02.20) She further explained that she feels much closer to the rest of her relatives than ever before, since they have been supporting her living costs by sending her money through M-PESA. She adds,

> "…thanks to the mobile system [Safaricom] and the M-PESA. These days, I can hear more frequently than before from my family and relatives who are living far away. Not only when we are broke, but also whenever we have a house event, wedding or graduation ceremonies or whenever it is a holiday, we come together to show our care by sending small contribution to family members." (2017.02.20)

Hence, M-PESA has had a significant impact on the ability of households to share risk, and this is attributable to the strengthening of social interaction and network.

Besides, the above-mentioned researches have indicated that mobile money appears to increase the effective size of, and number of active participants in, risk-sharing networks, seemingly without exacerbating information, monitoring, and commitment costs.

5.4.2. Ushahidi

Studies point out that mobile internet and mobile apps allow for a greater degree of interaction and participation from and among users (Bunar & Isagah, 2016). Ushahidi, though not a purely mobile participation project since it is rather an instrument and outside of the formal policy-making process, provides the leveraging power of SMS, cell phones, and interactive mapping to empower citizens to better hold governments and telecom service providers accountable. Hence, Ushahidi is also known as an innovative grassroots program, a term that refers to community-led solutions for sustainability that can offer promising new ideas and practices, but often struggle to scale up and spread beyond small niches (Gigler & Bailur, 2014). Ushahidi demonstrates that new technologies and crowdsourcing approaches have the potential to fundamentally alter the relationship between citizens, civil society, and governments and donors alike by playing important role to act as an "accelerator" for closing the accountability gap (Gigler & Bailur, 2014). Improved accountability and responsiveness are critical for reaching the goals of eliminating extreme poverty and promoting shared prosperity with a focus on improving the well-being of the most vulnerable and marginalized groups in society.

Nat Manning, who is appointed as interim Executive Director of Ushahidi in 2017, suggests that the innovative platform has altered the dynamics of international development, causing what was formerly a 'one-way street' as regards the relationship between IOs and contexts such as Kibera, for example, into a 'two-way street'. In this situation, the collective identity of residents at the local level is transformed in that they are empowered in the experience. In other words, Ushahidi is an innovation that enhances not only interaction between local residents but also local residents' interaction with international development agencies:

> In light of all that is going on in Nairobi, I took a step back and started thinking about what it is we do here at Ushahidi, beyond the products, the code, and the community. We often get lumped into this greater industry of International Development, even though we talk about ourselves as a non-profit tech company. So, I decided to try and dive a bit deeper, and try and suss out just how Ushahidi fits into this broader discussion of International Development. International Development - I was surprised when I looked up this term and found the definition to be, 'improvement of the quality of life of humans;' pretty simple actually, for the biggest issues facing the world. Historically, international development involves giving financial capital from developed to developing nations, to build roads or hospitals, or giving human capital, to respond to a crisis, or teach at a school. This is important work, but it tends to be a one-way street. But I find that technology is adding another dimension. Mobile phones, computers, they are lighting up the world. Technology is disrupting international development by shifting this one-way street to a two-way street. When people have access, they are plugged into a world of democratized information and can use this data to solve problems. (Manning, 2013)

Paul Massey, Executive Vice President of Social Impact, explains about the potential impact of crowdsourcing in support of social change that crowdsourcing adds value to delivering long-lasting solutions. According to him, "crowdsourcing is appealing for a number of reasons – it surfaces new perspectives, invites people from nontraditional sources to contribute, and infuses real energy into the process of generating ideas and content." (Day, 2011). He goes on to call crowdsourcing

empowering and engaging communities. It is a sentiment that some people have come around to, when crowdsourcing all kinds of important information and ideas became possible.

5.4.3. ECX

It has been discussed that commodity exchange can play a major role for agricultural development as an instrument to bring efficient agricultural market by providing lower transaction cost, efficient and transparent means for price discovery, managing risks related with prices volatility and provide a forum for exchanging information about supply and demand condition. In addition, new ways of commodity exchange play important role in enhancing social interaction. ECX has provided marginalized farmers with a means of accessing information relating to the central market and hence social interaction between agricultural producers, merchants, and exporters was enhanced.

The advent of ECX in Ethiopia has been thought to have resulted in the implementation of market mechanism that provides efficiency, safety and economic benefits. This has generated a situation in which traditional modes of interaction between social groups would start an adaptation process as a result of new market practices. Thus, the expectation is that farmers and traders as well as exporters opt to build trust to each other due to the removal of constraints in the traditional way trading.

Mr. Anwar Ambasmbi is the Customer relations Director of EACWSE Jimma branch. He has been in ECX service for eight years. He explains that ECX's reputation has been good as regards to efficiency and also transparency.

> The farmers are happy more than anyone else. They have a guaranteed service provided to them through a series of network relations to the central market. They get an open service and transparent. They receive their payment on time without any delay. Gradually they learn more about the usage of the system and increase their participation in exporting their produces. Whenever there is a failure in the system, it is easily tracked and solved accordingly. They are satisfied more than ever before. It has made them work harder to supply quality products to the market. They also organized themselves in associations to receive a better service. There are more than 70 associations here in this zone. Associations can export directly without passing through the central market. (2017.01.11)

Evidently, the implementation of ECX has stimulated a process for the improvement of Ethiopia's agricultural commodity markets. The platform has provided a balance in trade in which the private sector could continue to make a profit, and farmers could manage to improve their livelihoods by incorporating favorably into the chain. Moreover, the Government ensures a secure trade along with a steady revenue and foreign currency inflow. However, there are still issues in disputes over measuring the quality and the extent to which ECX has benefited smallholder farmers as well as the effective functioning of ECX and the warehouse system. Mr. Asefa (who is in his 50s) is a coffee farmer in Jimma area. He explains that due to ECX, relations between farmers and market suppliers do not seem to show much improvement. According to him, trust among market players has decreased even though business transaction is done through a smooth communication.

It has been reported recently that there are some issues with the functioning of this system, partly due to the political circumstances in Ethiopia (Economist (The), 2017; Gustafson & Hernandez, 2017). The strict regulations set by the government has been

mentioned as an obstacle to the full-functioning of ECX, especially in rural areas. This is partly due to the state-led market system run by the government, which might be at odds with the market-led capitalist mode of commodity exchange system. Furthermore, the purpose of introducing ECX in Ethiopia is now seen as the government's effort to control illegal commodity exports, and thereby maximize tax revenue in order to expand the economy as a whole, which is the government's main agenda. This makes ECX look more like a state marketing board than an exchange. As a result, the situation and needs of local small-scale farmers have been ignored, to some extent. In sum, even though ECX was established to become a Public-Private enterprise, it is now virtually a government-run entity utilized merely for governmental advantages. From the perspective of the open development approach, the current political situation is therefore impeding the effectiveness of development at the local level.

5.5. Summary

This chapter discusses how the three initiatives under discussion have shown a difference in their impacts on the users. While in some cases the expected impact has been traced, there are situations in which the impacts in the field were found to have been weaker. Some recent literature has also shown that the impacts were less viable than those mentioned in the documents at the initial establishment stages of the cases, such as in ECX. It was evident that traditional modes of trading are being altered for the better through farmers', suppliers', and exporters' involvement in ECX. This takes place due to the social interactions between them using a platform that increases efficiency, transparency and ultimately trust. People who were formerly somewhat marginalized are included and brought into the center of economic activity in the nation concerned.

This implies the strengthening of civil society. However, ECX is becoming a tool used by the government to fulfill its policies by ignoring the benefits of smallholder farmers. In the case of M-PESA, although money transactions between family members and friends is not always large, transactions are usually very frequent, thus strengthening civil society. Also, older people are not limited by their physical mobility to make financial transactions. Women do not have to solicit funds from their spouses, since M-PESA enables them to make transactions with other friends and acquaintances in urban areas for example. Therefore, autonomy and empowerment of certain groups in society is promoted.

Since Ushahidi operates outside of the official political system it represents a means for citizens to mobilize in a bottom up manner. Thereby, local community decision-making leads to local policy formation. Furthermore, crowdsourcing enables people of limited means to raise significant sums of money for purposes of their own choice, thus further strengthening social cohesion. It was also described that Ushahidi can alter the dynamics of development, in the sense that, in the words of Ushahidi's interim Executive Director, it becomes a 'two-way street, whereby the terms of development are no longer dictated by richer nations.

The question whether these cases fit older development definitions of benefits arises here leading to a disagreement, in some literature, about how to evaluate the efficacy of the benefits of these new "open development" cases. This is complicated by the fact that, in many cases, it is possible to look at some benefits through both lenses, so there is reinforcement to judge open development cases through old social development measures. But this does not detract from the notion that it can also be

judged through new ways and that, in fact, it may be better judged through network effects.

Chapter VI. Discussion and Conclusion

This study has examined whether the cases under consideration fit the application of open development, based on the characteristics of the cases revealed through the data analyzed. All three cases were selected due to the common characteristics they share among themselves. The cases were found to be related to locally-derived base ideas initiated as solutions to local problems. Local knowledge, mostly at the introduction stage of the projects, was applied, along with the collaboration between local and transnational agencies offering global expertise and support. Knowledge is conceived as embedded in the lives and experiences of the poor themselves. The cases demonstrate the fact that local people can solve their problems themselves by coming together and sharing what they have. Their unity is their biggest asset in solving their problems. Technology allows them to increase their ability to come together and act in unity. Ideas were built after observing the problems and the timely situation of the communities by which some kind of knowledge was produced and built to become public goods that are shared through network-enabled systems. The solutions brought up by the cases were technological and designed for local context to satisfy local needs.

The results and analysis of this study contribute to the current literature with conceptual and evidential background on the recent ideological shift of development approach. This study may provide insights on the newly emerging cases that define the new development agenda. The main features of the open development cases together with the characteristics of the cases under study become the bases for the analysis of their impact on communities reveal practical illustration of open development at work. Moreover, it provides suggestions to the ongoing development program plans by donor countries or institutions in developing countries. All participants in development

(agencies and institutions) benefit by observing a comparison between the processes and outcomes of open models and that of traditional approaches. National governments also get positive insights of effective policy directions during in the design process of country development plans. In what follows, discussion on the major finding and other ancillary outcomes are described.

6.1. Discussion

Historically, traditional practices in international development have involved the donation and implementation of financial capital from developed to developing nations, mainly for the purpose of establishing infrastructure, or the provision of human capital, to respond to a natural or man-made crisis, or teach at a school. However, this approach has been shown to be insufficient in bringing impact or changing the lives of millions of poor Africans (Ilon, 2015; Tikly, 2004). The new approach to international development through the open development cases is becoming an emerging set of possibilities to catalyze positive change through open and collaborative information-networked activities. There have been various such initiatives, including those analyzed in the present study, that give evidence to support the observation that these cases are in line with the theoretical framework and concept at question, namely, open development (Bentley & Chib, 2016; Smith & Reilly, 2013).

Systems which are networked in design tend to be fast-growing with the support of IT based technology in action. One of the most important features of open development is that it is networked in design and consequently grow fast through the network with which they are connected. The connection could be wired or non-wired

networks as well as socially characterized networks. According to Manning (2013), in order for information technology, to solve local problems, the first thing people need is infrastructural access to the web upon which a foundation can be built. Then, they need tools, such as open source software and hardware like computers or phones. Finally, they need the raw material: the data that building block of technological innovation. And together these elements create a platform that I think of as information capital, different than money and extra hands, but instead the information, the connection, the data, to build solutions. And when a community has that foundation, the desired solution to the local problem will appear.

The aim of the whole process is making sustainability of life development the chief concern and readjusting development goals so as to ensure the wellbeing and basic needs of humankind valued and prioritized. So far, the open development cases differ from each other in their form, content and outcome. Open development can be best explored by examining various emerging open information network structures and activities that bring both promise and peril for the processes of international development. There are several lines of evidence that support the new development approach in developing countries based on the theories of the knowledge economics. Lundvall et. al (2011) explains the importance of innovation in developing countries by stating that a primary way that innovation has been adding to productivity is through the adoption of technology through social entrepreneurship, and in Africa, having adopted new technology, people utilize it in creative ways, as in the participants in the three cases examined in the present study.

According to McFarlane (2006), knowledge is a socially produced entity. Various forms of interaction amongst individuals and organizations, from formal meetings to

chats over coffee and through e-mails, contribute to making sense of information. Knowledge is a product of social, cultural, economic, and political conditions. Knowledge is conceived as embedded in the lives and experiences of the poor themselves. Innovation systems of open development work better where flows are two-way with feedback loops from users to researchers and vice versa.

Open development is about innovative cases that are from a locally-derived idea base which result in the societal development and ensuing knowledge is built and shared as a public good. The outcomes are evaluated in terms of the knowledge that grew collectively through networks and whether the communities or societies benefit by increasing their learning capabilities and knowledge access. Since knowledge or ideas have different characteristics to other economic goods, such as physical resources, in that they are often non-rivalrous, non-excludable, and can spill over even to those that did not create it (Ilon, 2015), social growth can be understood differently. The conclusion of this study is proposed to gain familiarity, increase understanding, and to help to better formulate future open development cases, exploration questions and approaches. The underlying principles of the open development approach include the shift in the sets of value from industrial capital to human innovation and knowledge, the redefining of development goals and social networks for collaboration. Open development requires new theoretical tools that focus on real world problems, consider a variety of solutions, and recognize the complexity of local contexts. The provision of favorable conditions to people to bring the solutions and adequately satisfy their needs while protecting the wellbeing of all life forms needs to be the primary purpose of development agendas. All of these features of the open development approach were

reflected in the results of the empirical research of the present study, as summarized in what follows.

The three cases studied in this research differ in form, content, and outcome, but all of them draw on the power of human cooperation and contain some combination of aspects inherent to the sharing of ideas and knowledge consistent with the principles of open development. These initiatives have their roots locally designed in local context to produce local solutions. M-PESA was devised largely in Kenya for Kenyan people to get access to financial services using simple telecom networks. It became a remarkable mobile payment innovation due to the fact that it does not require as much physical infrastructure or paperwork as conventional banking systems. Thus, M-PESA ensured that millions of people who had access to a mobile phone but no bank account could send and receive money. The crisis mapping platform, Ushahidi, used the concept of crowdsourcing to promote social activism and public accountability, as well as crisis response, human rights reporting, and election monitoring, by allowing users to submit reports using their mobile phones and the internet. In a similar way, ECX was introduced to solve the local farmers' problems concerning access to the central market through the provision of timely information and connection system, although the anticipated impact has been obscured by administrative ineffectiveness of the Ethiopian government.

The three innovative initiatives greatly have witnessed to expand in terms of size and number of users through networks and collaborative technology platforms, leading users to become collaborators leading each other to new ideas, sources, opportunities, information problem solving and societal advancement. The resulting ideas are built and

shared within the network, thus bringing about societal development. The creativity of human beings who can think of new ways of using their physical resources and new services creates the stimulus for a society to progress or to deal with threatening situations. If the citizenry can freely discuss major issues facing their society, thus building new collective knowledge and acting on this new understanding, the society will be able to avoid or mitigate major disasters.

The interviews, observations, and document analysis of the present study revealed that the three cases, ECX, M-PESA and the Ushahidi project all served to mitigate social problems and to transform and benefit the society according to the principles of the open development approach. For example, in the case of ECX, farmers testified that they were able to gain access to information concerning the central market, and suppliers could have a secure payment system and an efficient warehouse operation. However, in recent years ECX has been evaluated not to fulfill its mission in focusing its aims in supporting smallholder farmers. With regard to M-PESA, users could gain access to a secure money transaction service and could benefit from the affordable credit services M-PESA provides, thus promoting an increase in the amount of entrepreneurial activity in the contexts examined. Through the of the Ushahidi platform, which is primarily meant to assist citizens in dealing with crisis situations with crisis mapping, participants can report in real-time on situations as they unfold. Therefore, the platform promotes humanitarian efforts to reach the vulnerable. In addition, through the sharing of knowledge on the part of local residents, Ushahidi promotes local community development in the sense that citizens are empowered to collectively use local knowledge to influence local policy decision-making as well as through other synergistic spin-off technologies that are derived from Ushahidi, such as the BRCK,

which is a portable router is designed to ensure a constant connection to the internet in locations with unreliable internet connections. Nevertheless, this also changes the development dynamic in that it is no longer a ‘one-way street’. The value of knowledge sharing at the local level creates a two-way street and thereby avoids the common problem as regards traditional development models which only benefit local communities for the period of time during which projects are actually taking place. In what follows, the main findings of the present research are described in terms of the ways in which they reflect the principles of open development.

This research has been limited only to three cases in East Africa. Further study on how the theory supports the application of open development in a vast area of field and more globalized geographical locations is required. Particularly, detailed and integrated analysis of open development application on innovative models and platforms need additional exploration with empirical evidence revealing their impacts on local communities. This can also comprise further research and implementation to connect open development based initiatives and collaborative approaches for solving challenges in international development.

6.2. Impacts and implications of the researched platforms

The present study’s findings are consistent with the concept of open development in that they are representative of the newly developing possibilities that can accelerate progressive changes through platforms that promote open information sharing through networked activities. This study explored initiatives that are currently being put into action in East Africa to investigate whether the cases reflecting the open development

approach foster the envisioned societal advances. The analysis was done based on the outcomes, in order to determine whether they successfully fit the theoretical framework of open development. The four categories were chosen based on analysis of the data and were found to have made positive impacts on the local communities concerned at the individual and group level.

The cases were observed to have diverse functions other than the original purpose of their invention. The services and items of interest have been seen to diversify in several ways since the launching of the systems. ECX has become a system to include more types of agricultural commodities to get access to the central market. ECX is associated with a comprehensive system for disseminating information about market prices to more peripheral regional markets in the country. More specifically, traders in local markets can now receive market information via SMS, Interactive Voice Response, Internet, other media (radio, television and newspaper), or via electronic tickers placed in rural markets that display real time prices of all commodities traded on the platform. ECX also has a comprehensive legal framework, and an advanced system for clearing and settlement of contracts in order to guarantee payment and delivery, for example by requiring all trading members to have prepaid credit accounts. In an attempt to shorten the supply chain, primary transaction centers have been established at designated trading places, where smallholder producers and cooperatives on the one hand, and coffee suppliers on the other hand trade. Moreover, a number of warehouses connected to the ECX have been established in surplus areas. Nonetheless, recent developments have indicated that ECX has been losing its position as an initiative that stands for the benefit of the smallholders by being used as a tool used by the government to maneuver the agricultural market of the country. Following this, it has been reported that the

managerial board of ECX has carried out an in-depth evaluation on the performance of ECX and the board is aimed at identifying the weaknesses and reforming ECX (Yewondwossen, 2017). Some of the key measures taken include changing the CEO and the reuniting of ECX and the warehouse division EACWSE, which spun-off from ECX about three years ago.

M-PESA has diversified its services and uses from being a simple money transaction system to an overall platform for bill payments, purchases at point of sale, transferring money to bank accounts and repaying loans (from microfinance institutions) ever since it was launched ten years ago. It is now building an online market in which buyers and sellers can easily get access to electronic commercial trade through the M-PESA interface. The Ushahidi platform has also widened its utilization from being a crisis mapping system into a diverse humanitarian and development assistance tool through its expansion globally. This open-source and publicly accessible platform enables users around the world to submit various kinds of information, digital images, and video recordings through SMS-enabled mobile phones, smart phones, and a Web site. The Ushahidi platform takes information that people submit via mobile messages (SMS) or through the Internet, and then plots it according to the geo-location of the message on an online map. The open source nature of the platform and the ease of adaptability were key to its rapid deployment around the world by local actors seeking to tackle a variety of issues. Originally created to report on, monitor, and respond to post-election events in Kenya, Ushahidi has grown to enable users across regions to track the global swine flu outbreak, and observe earthquake relief in Chile and Haiti. It is also used to monitor human rights abuses, help enforce environmental regulation, and strengthen social accountability across many development activities.

Another common impact of the cases was that the projects were found to provide secure and safe services that helped participants reduce additional costs, in ways that they could not prior to the introduction of the solutions. Before ECX was utilized, buyers and producers in Ethiopia did not have a broad and coordinated market to trade their agricultural products. Transaction costs due to lack of storage and telecommunication and transportation infrastructure were also high, prices were not transparent, and smallholder farmers often did not have market information on prices. Furthermore, multiple intermediaries at every stage of the market chain further eroded farmers' profits. Similarly, prior to the advent of M-PESA, citizens had to waste much time and energy travelling long distances to get financial services or use intermediary people to get risky alternative services. Now, users of M-PESA were better able than non-users to manage to get insurance and health services as well as to withstand any financial challenge by being able to access funds from their social network more quickly and at a lower cost.

Moreover, many citizens become beneficiaries of economic advantage through the inclusion into the system in the cases studied through this research. ECX has reached small-scale farmers in rural areas of Ethiopia by providing them with an integrated system of central trading, warehousing, product grade certification, clearing, settlement, market information and dissemination, while M-PESA has become a channel to reach some of the poorest and marginalized families in Kenya with financial services and social protection payments. It was found that a considerable number of members of the local communities benefited socio-economically, so that many could come out of poverty, as the review of the relevant literature reveled. Communication was made easier and social interaction of citizens has been strengthened among those living in the

rural as well as urban areas. In the same way, Ushahidi has become a social community of shared views and a collectively-built community through the diversity of its software developers, researchers, designers, activists, translators, students, journalists, and other people, most of whom are volunteers, all working towards the same goals from various parts of the world. Shared motivations and knowledge thereby build a background for the emergence of common perceptions and value systems upon which innovations and developmental gains can be generated.

6.3 Open development in the context of the research model

This study began asking the question whether the open development approach foster the envisioned societal advances. In addition, the research inquired about the key characteristics of open development approach and how well the activities fit the key characteristics as well as what the local impacts of the cases under study outlined by the open development approach are. It was explained that open development derives from the endogenous growth theory and the concepts of knowledge as a resource with the underlying principles of putting into practice social networks for collaboration and increased access to information networks, learning and communication possibilities, as well as new forms of participation and collaboration results in social, economic and political development. In general, the open development approach is about innovative initiatives that employ knowledge that is built and shared collectively and networked in design with a locally-derived idea to be applied to local context and needs. The key characteristics of the approach reveals that ideas have evolved out of the opportunities afforded by emerging technologies, networks and learning and provided the opportunity to solve local problems. They are also networked in design and grow extensively within

the networks. In addition, knowledge is built and shared collectively which eventually results in societal benefits. This helps provide for favorable conditions for people to bring the solutions themselves and adequately satisfy their needs while protecting their wellbeing.

The analysis of the outcomes of this societal development ranges from whether the communities or societies benefit from the use of this approach through the impacts on their lifestyle, to increasing the openness of access to knowledge and information. The impacts of the open development approach as discovered from the study indicates that services provided by the cases are diversified; and they provide secure and enhanced efficiency by being inclusive to marginalized groups and promoting social cohesion. Even though the provision of expanded resources analyzed from their impact on economical livelihood and mitigation of poverty of the beneficiaries has shown difference for the cases, overall the analysis shows an important social change in the lives of the beneficiaries.

There is no guarantee that the benefits flowing from open development models are always more positive or more evenly distributed than those of less-open traditional models (Smith & Reilly, 2013, p. 33). And nor are the impacts always quantifiable in a way that old approaches to development evaluate them. Societal benefits could be in the form of expanded resources that encompass either expanding opportunities or expanded resilience. According to the analysis of data collected from the cases, it was indicated that impacts were not felt equally across all members of the society as in the ECX's case or empirically regressive as in the case of Ushahidi. The possibilities that flow from such initiatives depend highly on the conditions that shape the possibilities for the

reality of the open development characteristics. The network effects produced by the initiatives of the cases have led to clear evidence of expansion of opportunities or resilience as in the findings.

The three initiatives chosen for the exploration of the open development approach were not limited to domestic applications. Since its emergence, M-PESA has undergone an explosive growth to become a ubiquitous tool in the lives of people in Kenya by contributing significantly to financial inclusion and access to financial services. The success in promoting a cashless society has helped support a local technology startup scene in Kenya and has attracted international partners, making Kenya one of Africa's leading tech hubs. M-PESA's impact in Kenya made mobile money services extremely popular, and the subsequent proliferation of similar services can be credited to this success. However, M-PESA's adoption in other developing countries, has not been as effective as in Kenya. The service has had varying degrees of success in the countries in which it has been introduced and it even has failed in South Africa. That failure was largely attributed to the fact that possessing a conventional bank account is much more common in South Africa than in the rest of the continent. Interestingly, in countries where banking services are well established, mobile payments have struggled to gain traction, with most people preferring physical charge cards or paper money. This was the reason why the service has failed to take off in South Africa, which has a higher formal banking access than other countries in Sub-Saharan Africa. Some countries like Tanzania already have a thriving mobile money service of their own. In the context of the present study, this state of affairs reflects the fact that M-PESA is a system that was conceived as a solution to a problem in a specific locality, in this case, Kenya. It may

therefore not serve as a solution in *any* context, in other words, as a one-size-fits-all solution.

Openness suggests the potential involvement of any agents and collectives, including corporations that have a profit motive, and this can also lead to negative or at least unsatisfactory outcomes. An example is Vodaphone, which is a European company whose subsidiary in Kenya is Safaricom, meaning that a large proportion of the profits from M-PESA return to Europe. This is clearly a possible limitation of open development and open systems in general. It therefore also needs to be taken into consideration, in order that scholars of open development do not present a dangerously one-sided point of view regarding projects of the type discussed in the present study. For example, the fees and conditions that are associated with the services provided to M-PESA users are considered by some to be excessive, and this notion finds support in the analysis of interview data for the present study.

On the other hand, ECX was established as an exchange to serve local needs by becoming one of the modern global commodity market exchanges, serving as an example to other developing nations wishing to establish their own commodity exchanges. It was designed to involve all the relevant parties (from the global trading community to the government of Ethiopia and local merchants, traders, and growers), and reflects local agricultural market traditions. However, its efficiency has been seen to tumble to stay behind the global market changes. There has been a change but this did not turn into an adequate transformation due to the way it is handled by government. This may leave a question mark on the efficiency of government-run exchanges.

On the contrary, the Ushahidi platform, which was first launched to monitor a disputed election in Kenya, is now being used for mapping in various fields throughout the world, including: to map water and refuge sources during Hurricane Sandy, the Haitian earthquake; to map sexual harassment incidents during the Arab Spring, power outages in India, gender-based violence in Pakistan, prejudice and hate crimes in South America, and women's tech startups in Africa. Ushahidi has distinctive characteristics to the other two cases under discussion in that it is a software platform along with other synergistic spin-off innovations such as the internet access connectivity device BRCK.

Therefore, political actors cannot easily interfere in whatever activities that users of Ushahidi engage in because governments are not required to facilitate those activities. It is clear that the effectiveness of Ushahidi depends largely on the capacity of users to utilize the software to solve a particular problem in a particular locality. It is not a tool that can be used to directly solve problems relating to poverty and other social problems by itself, but it can be used to identify a problem swiftly in the first place, so that individuals and groups, including governmental organizations, who have the power and resources to solve such problems can do so.

In sum, open development has certain unique strengths, namely, its networked-design makes it more inclusive and collaborative than traditional methods, and is driven by the very people that will be the beneficiaries of the projects they undertake. Furthermore, the open development approach can challenge existing configurations of power, due to the way in which the information networks that underlie this approach function. The open development approach alters models of production, ownership, control and regulation of activity in favor of regular citizens that participate. One of the

strengths of the open development approach as reflected in the three cases analyzed is that it enables communities to face (or even embrace) uncertainty. This is not generally considered to be a feature of the traditional development approach, which, in the words of Smith and Reilly (2013:11), "lays out a series of preplanned outputs and intermediate outcomes on the path to a project's impact". In contrast, the findings of the present study contribute to the growing body of research that proves, "the ability of open models to enhance freedoms, to open up new opportunities, and to build capacity" (Smith & Reilly, 2013:39-40).

This study is believed to have contributed to the theoretical advancing of the open development approach in two aspects. *First*, it helps to avoid the ambiguity and misinterpretation by some in conflating the concept of open development with concepts like open source, crowdsourcing or ICT education. It is possible to find such concepts in some examples of open development practices; however, the open development concept needs to be understood beyond its roots in ICTs, in theory and practice with its core principles of knowledge that is built and shared collectively and networked in design with an inclusive locally-derived idea innovation. Anchoring the concept of open development in ICTs specifically, as opposed to innovation systems more broadly, limits its potential to explain models of openness driven by socio-economic as well as or instead of technological factors. *Second*, the study has contributed in filling the gap by locating a theoretical connection with existing theoretical work on open development and setting its roots within the general concepts of the endogenous growth theory. The theory provides the explanation of growth through endogenous technical progress models. Open development extends the focus of the endogenous growth theory into a set of possibilities to catalyze positive change through open information-networked

activities in international development with applications of positive externalities and spillover effects of a knowledge-based economy which lead to economic development. Moreover, other synergistic spin-off innovations such as free internet access apparatus, connectivity devices as well as free public WiFi network systems allow open development to progress in a way that is different than the classically defined endogenous growth theory. Multifunctional devices such as the BRCK are physically robust that enable to connect to multiple networks, a hub for all local devices, with enough backup power to survive a blackout which will alter the way people connect to the internet. The experiences with the various platforms discussed would be the sources of solutions through the identification of what problems and realities exist on the ground when doing data collection in difficult environments in the developing world. The combination of local knowledge and ideas built and shared collectively with the technological solutions from the global realm through a networked design will lead to the required societal advances and inclusive development.

The present study addresses one of the issues concerning the open development to date, which is that work in this area mostly focuses on the 'openness' aspect of open development, rather than the development aspect. In contrast, the present study focuses on the approach's impact in terms of development in specific localities. The literature asserts that the main driver of the open development should be transformational aims. However, it should be pointed out that, while the positive impacts of open development projects are beginning to be felt within communities that initiate them, there is still at this point a shortage of empirical evidence concerning its societal benefits, an issue that the present study goes some way toward addressing. Furthermore, in terms of relevant academic work in this area, there is not yet a clear research agenda with regard to open

development. However, the present study suggests that endogenous growth theory can serve as a strong theoretical basis for open development but, equally importantly, presents empirical evidence of its positive impacts in terms of societal development.

Theoretical limitations of the study include that just as the current endogenous growth models are difficult to validate by empirical evidence, so are open development models. Despite the clear societal advances analyzed in this study and other recent attempts in looking for quantitative explanation on assumptions regarding ideas or knowledge, there seems to be a lack of concrete empirical evidence in the literature involving efficacy of open models. Besides, the present study was confined to the task of testing and analyzing, within the limits of three case studies, the efficacy of this approach. One of the purposes of this study stands in identifying and adding a practical application of the open development approach to the conceptual ground with evidences from the field and the relevant literature about open development initiatives. In addition, this study has attempted to forward a different explanation on how those models have proved to gain recognition and acceptance among the practitioners. Despite the lack in a solid empirical evidence in the result of the impacts of the study, externalities and spill-overs that arise from the innovations alongside with the platforms could be the next targets of analysis in explaining quantitative impacts. As mentioned earlier, the analysis of the cases under this study have indicated that non-governmental open development initiatives seem to be less limited and in line with the theoretical proposition than the initiatives under conglomerates or under the government.

Despite all this, there still is clearly a strong motivation for encouraging innovations that are based on the open development approach for solutions to local

problems. The world is transitioning from the ICT digital revolution era into the advent of the Fourth Industrial Revolution that encompasses artificial intelligence, blockchain, as well as big data and cloud storages. Innovations that enable poor countries to access information and knowledge through increasingly powerful networking systems can be the source of raising income levels and improvement of the quality of lives. Millions of people in Africa are now being connected by mobile devices with unprecedented processing power, storage capacity, and being able to access unlimited knowledge. All these possibilities will be multiplied by emerging technology breakthroughs in various fields so that governments and firms are urged to invest in innovative ideas and solutions.

Although the benefits of open systems have been discussed at length in the present study, it should also be mentioned that the debate as to the extent to which openness is beneficial to society as a whole is an important one. Firstly, open platforms, by definition, involve the sharing of information virtually without regulation. It is well documented that this state of affairs can facilitate activities that are far from beneficial to society as whole. This poses a difficult dilemma. When control is exercised over the kinds of activities that be engaged in by users of a network, some users could be alienated and, even worse, opportunities for development may be closed down. Furthermore, given the threat to current political powers, conglomerates, and other commercial entities that is posed by open systems, such agents may have an incentive to limit or impede the drive toward ever more openness because of the loss of power that it may entail, from their perspective. In sum, the unfortunate consequence of a substantial proportion of the citizenry participating in open systems could be that the backlash against them from powerful stakeholders causes the conditions for egalitarian

governance and innovation to actually deteriorate. All such considerations need to be addressed when weighing up the positive outcomes of open development projects that are anticipated.

References

Ahmed, M. (2017). Ethiopia commodity exchange: Marketing prospects and challenges in focus. *African Journal of Marketing Management*, *9*(3), 18–24. https://doi.org/10.5897/AJMM2015.0458

Akiyama, T., & Baffes, J. (2001). *Commodity market reforms: lessons of two decades* (No. 22024) (p. 1). The World Bank. Retrieved from http://documents.worldbank.org/curated/en/455351468767093015/Commodity-market-reforms-lessons-of-two-decades

Alemu, D., & Meijerink, G. (2010). *The Ethiopian Commodity Exchange (ECX): An overview*. Wageningen University, The Netherlands. Retrieved from https://www.wur.nl/upload_mm/1/2/5/7d3089b2-a92a-4b3b-a2b7-c1f7074365c0_Report4Alemu280610.pdf

Andersson, C., Bezabih, M., & Mannberg, A. (2017). The Ethiopian Commodity Exchange and spatial price dispersion. *Food Policy*, *66*, 1–11. https://doi.org/10.1016/j.foodpol.2016.11.003

Araya, D., & Peters, M. A. (2010). *Education in the Creative Economy: Knowledge and Learning in the Age of Innovation*. New York: Peter Lang.

Archibugi, D., & Lundvall, B.-Å. (Eds.). (2002). *The Globalizing Learning Economy*. Oxford: Oxford University Press. https://doi.org/10.1093/0199258171.001.0001

Arndt, H. W. (1987). *Economic Development: The History of an Idea*. Chicago: University of Chicago Press.

Bailard, C. S., & Livingston, S. (2014). Crowdsourcing Accountability in a Nigerian Election. *Journal of Information Technology & Politics*, *11*(4), 349–367. https://doi.org/10.1080/19331681.2014.947056

Bankelele. (2012, October 29). Who Created M-Pesa? Retrieved from http://bankelele.co.ke/2012/10/who-created-m-pesa.html

Barron, B. (2006). Interest and Self-Sustained Learning as Catalysts of Development: A Learning Ecology Perspective. *Human Development*, *49*(4), 193–224. https://doi.org/10.1159/000094368

Baudet, F., Braat, E., Woensel, J. van, & Wever, A. (2017). *Perspectives on Military Intelligence from the First World War to Mali: Between Learning and Law*. New York: Springer.

Bedigian, D. (2003). Evolution of sesame revisited: domestication, diversity and prospects. *Genetic Resources and Crop Evolution*, *50*(7), 779–787. https://doi.org/10.1023/A:1025029903549

Bekele, A., & Daibo, O. (2017, May 24). The Ethiopia Commodity Exchange Connects Farmers and Buyers — and Boosts Economic Growth. Retrieved November 15, 2017, from https://medium.com/@IFC_org/the-ethiopia-commodity-exchange-connects-farmers-and-buyers-and-boosts-economic-growth-78baadb2f01c

Bellù, L. G. (2011). *Development and Development Paradigms A (Reasoned) Review of Prevailing Visions* (Issue Papers) (p. 49). Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/docs/up/easypol/882/defining_development_paradigms_102en.pdf

Benkler, Y. (2006). *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. New Haven, Conn: Yale University Press.

Bentley, C. M. (2014). Exploring Information Ethics for Inclusive Open Development. *Electronic Journal of Information Systems in Developing Countries*, *62*(2), 1–21.

Bentley, C. M., & Chib, A. (2016). The impact of Open Development initiatives in lower-and middle-income countries: A review of the literature. *Electronic Journal of Information Systems in Developing Countries*, *74*(6), 1–20.

Bereiter, C. (2002). Design Research for Sustained Innovation. *Cognitive Studies*, *9*(3), 321–327. https://doi.org/10.11225/jcss.9.321

Birdsall, N., Ross, D., & Sabot, R. (1995). Inequality and Growth Reconsidered: Lessons from East Asia. *The World Bank Economic Review*, *9*(3), 477–508.

Black, K. (2009). *Business Statistics: Contemporary Decision Making* (6 edition). Hoboken, NJ: Wiley.

Blakeley, N., Lewis, G., & Mills, D. (2005). *The Economics of Knowledge: What Makes Ideas Special for Economic Growth?* (New Zealand Policy Perspectives Paper No. PP 05/05). Retrieved from http://www.treasury.govt.nz/publications/research-policy/ppp/2005/05-05/

Bott, M., & Young, G. (2012). The Role of Crowdsourcing for Better Governance in International Development. *PRAXIS, The Fletcher Journal of Human Security*, *XXVII*. Retrieved from /paper/The-Role-of-Crowdsourcing-for-Better-Governance-in-Bott-Young/2b4b9e693aa12ecf66635bd2c7b080d340d90513

Boyd, R., Richerson, P. J., & Henrich, J. (2011). The cultural niche: Why social learning is essential for human adaptation. *Proceedings of the National Academy of Sciences*, *108*(Supplement 2), 10918–10925. https://doi.org/10.1073/pnas.1100290108

Brandusescu, A., & Sieber, R. E. (2017). The spatial knowledge politics of crisis mapping for community development. *GeoJournal*, 1–16. https://doi.org/10.1007/s10708-017-9784-9

Brandusescu, A., Sieber, R. E., & Jochems, S. (2014, February 6). *Crisis Mapping, Time and Community Development*. Proceedings of Spatial Knowledge Information Canada, Banff. Retrieved from http://rose.geog.mcgill.ca/ski/system/files/fm/2014/brandusescu2.pdf

Bright, J. (2017, March 8). Kenyan startup BRCK launches SupaBRCK device to solve Africa's internet equation. Retrieved from http://social.techcrunch.com/2017/03/08/kenyan-startup-brck-launches-supabrck-device-to-solve-africas-internet-equation/

Bright, J., & Hruby, A. (2015, July 23). The Rise of Silicon Savannah and Africa's Tech Movement. Retrieved from http://social.techcrunch.com/2015/07/23/the-rise-of-silicon-savannah-and-africas-tech-movement/

Brynjolfsson, E., & Hitt, L. (1993). Is Information Systems Spending Productive? New Evidence and New Results. *ICIS 1993 Proceedings*. Retrieved from http://aisel.aisnet.org/icis1993/43

Bunar, C., & Isagah, T. (2016). Assessing Mobile Participation: A Case Study of iCitizen, Buycott and USHAHIDI. In *Electronic Government and Electronic Participation: Joint Proceedings of Ongoing Research, PhD Papers, Posters and Workshops of IFIP EGOV and EPart 2016* (Vol. Volume 23: Electronic Government and Electronic Participation, pp. 3–10). IOS Press.

Castells, M. (2000). *The Rise of The Network Society: The Information Age: Economy, Society and Culture*. New Jersey: Wiley.

Chan, J. (2013). *The role of Social media in crisis preparedness, response and recovery* (Vanguard). Singapore: RAHS Programme Office (RPO). Retrieved from

http://www.oecd.org/governance/risk/The%20role%20of%20Social%20media%20in%20crisis%20preparedness,%20response%20and%20recovery.pdf

Chan, L., & Gray, E. (2013). Centering the Knowledge Peripheries through Open Access: Implications for Future Research and Discourse on Knowledge for Development. In *Open development: networked innovations in international development. Edited by Matthew L. Smith, and Katherine M.A. Reilly* (pp. 197–222). MA, USA: MIT Press / IDRC. Retrieved from https://tspace.library.utoronto.ca/handle/1807/44099

Chan, S. (2001). Complex Adaptive Systems. ESD.83 Research Seminar in Engineering Systems. Retrieved from http://web.mit.edu/esd.83/www/notebook/Complex%20Adaptive%20Systems.pdf

Chichilnisky, G. (1998). The knowledge revolution. *The Journal of International Trade & Economic Development*, *7*(1), 39–54. https://doi.org/10.1080/09638199800000003

CHS. (2003). *Human Security Now | UN Trust Fund for Human Security* (Final Report) (p. 168). New York: Commission on Human Security (CHS). Retrieved from http://www.un.org/humansecurity/content/human-security-now

Chunara, R., Andrews, J. R., & Brownstein, J. S. (2012). Social and news media enable estimation of epidemiological patterns early in the 2010 Haitian cholera outbreak. *The American Journal of Tropical Medicine and Hygiene*, *86*(1), 39–45. https://doi.org/10.4269/ajtmh.2012.11-0597

Communications Authority of Kenya (CA). (2017). *First quarter sector statistics report for the financial year 2017/2018 (july-september 2017)*. Retrieved from

http://www.ca.go.ke/images/downloads/STATISTICS/Sector%20Statistics%20Report%20Q1%20%202017-18.pdf

Cortright, J. (2001). *New Growth Theory, Technology and Learning: A Practitioners Guide* (No. 4). Reviews of Economic Development Literature and Practice. Retrieved from http://philo.at/wiki/images/Growth-theory-cortright.pdf

Costanza, R., Hart, M., Talberth, J., & Posner, S. (2009). Beyond GDP: The Need for New Measures of Progress. *The Pardee Papers*. Retrieved from http://pdxscholar.library.pdx.edu/iss_pub/11

Coulter, J., & Onumah, G. (2002). The role of warehouse receipt systems in enhanced commodity marketing and rural livelihoods in Africa. *Food Policy*, *27*(4), 319–337. https://doi.org/10.1016/S0306-9192(02)00018-0

Creswell, J. (2007). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Thousand Oaks,. CA: SAGE Publications.

Creswell, J., & Miller, D. (2000). Determining Validity in Qualitative Inquiry. *Theory Into Practice*, *39*(3), 124–130. https://doi.org/10.1207/s15430421tip3903_2

Dawson, S. (2017, January 18). Why Does M-PESA Lift Kenyans Out of Poverty? Retrieved from http://www.cgap.org/blog/why-does-m-pesa-lift-kenyans-out-poverty

Day, J. (2011, June 7). Humanitarian Crowdsourcing. Retrieved from https://ideascale.com/humanitarian-crowdsourcing/

de Beer, J. (2017). *Open Innovation in Development: Integrating Theory and Practice Across Open Science, Open Education, and Open Data* (SSRN Scholarly Paper No. ID 3008675). Rochester, NY: Social Science Research Network. Retrieved from https://papers.ssrn.com/abstract=3008675

De Waal, A. (1991). *Evil Days: Thirty Years of War and Famine in Ethiopia*. New York: Human Rights Watch.

Deane, P. M. (1979). *The First Industrial Revolution*. Cambridge, England: Cambridge University Press.

Diamond, L. (2010). Liberation Technology. *Journal of Democracy*, *21*(3), 69–83.

Downes, S. (2010). Learning Networks and Connective Knowledge. In H. H. Yang & S. C.-Y. Yuen (Eds.), *Collective Intelligence and E-Learning 2.0: Implications of Web-Based Communities and Networking*. IGI Global.

Drucker, P. F. (1993). *Post-capitalist society*. NY: Routledge.

Duffy, M. J. (2011). *Networked Journalism and Al-Jazeera English: How the Middle East Network Engages the Audience to Help Produce News*. Journal of Middle East Media, Zayed University Abu Dhabi, UAE. Retrieved from http://www2.gsu.edu/~wwwaus/Duffy.pdf

Eaton, T. (2013). Internet activism and the Egyptian uprisings: Transforming online dissent into the offline world. *Westminster Papers in Communication and Culture*, *9*(2). Retrieved from http://www.westminsterpapers.org/articles/10.16997/wpcc.163/print/

Economist (The). (2015, March 2). Why does Kenya lead the world in mobile money? *The Economist*. Retrieved from https://www.economist.com/blogs/economist-explains/2013/05/economist-explains-18

Economist (The). (2017, February 2). Ethiopia's state-of-the-art commodity exchange. *The Economist*. Retrieved from https://www.economist.com/news/finance-and-economics/21716036-not-transformative-its-founders-hoped-ethiopias-state-art-commodity

ECX. (2008). Directives of the Ethiopia commodity exchange authority. Ethiopia Commodity Exchange Authority, 2nd Edition. Addis Ababa, Ethiopia.

ECX. (2014, July 8). ECX Achieves Record Performance. Retrieved August 15, 2017, from http://www.ecx.com.et/downloads/whatsNew/20140715164117916ECX%20Achieves%20Record%20Performance%20(News).pdf

ECX. (2016). Ethiopia Commodity Exchange | Company Profile. Retrieved July 15, 2017, from http://www.ecx.com.et/CompanyProfile.aspx

Ethiopian Ministry of Agriculture. (1973). *Final Report of the Crop Condition Survey for the 1972– 1973 Harvest*. Addis Ababa: Imperial government.

Everitt, L. (2012, December 13). How Africa's first commodity exchange revolutionised Ethiopia's economy. *The Guardian*. Retrieved from http://www.theguardian.com/global-development/2012/dec/13/africa-commodity-exchange-ethiopia-economy

Foray, D., & Lundvall, B.-A. (1996). The knowledge-based economy: from the economics of knowledge to the learning economy. In *Unemployment and growth in the knowledge-based economy*. Retrieved from https://infoscience.epfl.ch/record/53022

Founder (The). (2017, May 5). Is M-Pesa really Kenyan Invention or British? We compare the stories to dig up the truth. Retrieved from https://thefounder.co.ke/is-m-pesa-really-kenyan-invention-or-british-we-compare-the-stories-to-dig-up-the-truth/

Fowler, J. H., & Christakis, N. A. (2010). Cooperative behavior cascades in human social networks. *Proceedings of the National Academy of Sciences*, *107*(12), 5334–5338. https://doi.org/10.1073/pnas.0913149107

Francesconi, G. N. (2009). *Cooperation for Competition: Linking Ethiopian Farmers to Markets*. Wageningen, Netherlands: Wageningen Academic Publishers. Retrieved from https://books.google.co.kr/books?id=66iA7jqNF9wC&printsec=frontcover#v=onepage&q&f=false

Francesconi, G. N., & Heerink, N. (2011). Ethiopian Agricultural Cooperatives in an Era of Global Commodity Exchange: Does Organisational Form Matter? *Journal of African Economies*, *20*(1), 153–177. https://doi.org/10.1093/jae/ejq036

Friedman, M., & Friedman, R. (1990). *Free to Choose: A Personal Statement* (LATER PRINTING edition). San Diego: Mariner Books.

Fung, A., Gilman, H. R., & Shkabatur, J. (2015). Technology for Democracy in Development: Lessons from Seven Case Studies. In *Deliberation and Development: Rethinking the Role of Voice and Collective Action in Unequal Societies* (Vols. 1–0, pp. 229–236). The World Bank. https://doi.org/10.1596/978-1-4648-0501-1_ch11

Gabre-Madhin, E. (2003, July). *Why is Ethiopia facing another famine? On markets and market failure*. Presented at the Workshop for World Food Programme (WFP) and World Bank Staff on the Current Role of Food Aid, World Bank, Washington, DC.

Gabre-Madhin, E. (2006). *Building Institutions for Markets: The Challenge in the Age of Globalization*. Presented at the Paper presented at the Employment, Growth and Development Initiative (EGDI) Policy, Poverty and Agricultural Development in Sub-Saharan Africa Workshop, Frösundavik, Sweden.

Gabre-Madhin, E. (2007a). *A commodities exchange for Ethiopia*. Retrieved from https://www.ted.com/talks/elene_gabre_madhin_on_ethiopian_economics

Gabre-Madhin, E. (2007b). The Ethiopian Commodity Exchange (ECX): Making the market work for all. In *Expert Meeting on the Trade and Development Implications of Financial Services and Commodity Exchanges (Part I)*. Retrieved from http://unctad.org/sections/wcmu/docs/c1em33p10_en.pdf

Gabre-Madhin, E. (2009, April). *Commodity Exchanges: Setting the Rules of the Game*. Technology presented at the Ethiopian Development Research Institute(EDRI) and IFPRI Ethiopia Strategy Support Program 2 (IFPRI-ESSP2) Seminar Series. Retrieved from https://www.slideshare.net/essp2/commodity-exchanges-setting-the-rules-of-the-game

Gabre-Madhin, E. (2012). A market for Abdu: creating a commodity exchange in Ethiopia. International Food Policy Research Institute (IFPRI). Retrieved from http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/126833/filename/127044.pdf

Gabre-Madhin, E. (2017, September 19). Ethiopia: Everything Must Change - a View of Ecx From Within, Without. *Addis Fortune (Addis Ababa)*. Retrieved from http://allafrica.com/stories/201709191123.html

Gabre-Madhin, E., & Goggin, I. (2005). *Does Ethiopia Need a Commodity Exchange? An Integrated Approach to Market Development* (EDRI-ESSP Policy Working

Paper No. 4). Ethiopian Development Research Institute EDRI. Retrieved from http://www.ifpri.org/publication/does-ethiopia-need-commodity-exchange

Gabriel, H. D. (2012). Warehouse Receipts and Securitization in Agricultural Finance. *Uniform Law Review*, *17*(1–2), 369–376. https://doi.org/10.1093/ulr/17.1-2.369

Gagliardone, I. (2016). *The Politics of Technology in Africa*. Cambridge, England: Cambridge University Press.

Gashaw, G. (2015, November 30). Ethiopia: Innovation to Make a Difference. *The Ethiopian Herald (Addis Ababa)*. Retrieved from http://allafrica.com/stories/201511300525.html

Gellers, J. C. (2016). Crowdsourcing global governance: sustainable development goals, civil society, and the pursuit of democratic legitimacy. *International Environmental Agreements : Politics, Law and Economics; Dordrecht*, *16*(3), 415–432. http://dx.doi.org/10.1007/s10784-016-9322-0

George, G., McGahan, A. M., & Prabhu, J. (2012). Innovation for Inclusive Growth: Towards a Theoretical Framework and a Research Agenda. *Journal of Management Studies*, *49*(4), 661–683. https://doi.org/10.1111/j.1467-6486.2012.01048.x

Gigler, B.-S., & Bailur, S. (2014). *Closing the Feedback Loop: Can Technology Bridge the Accountability Gap?* Washington, D.C.: World Bank Publications.

Gikunda, R. M., Abura, G. O., & Njeru, S. G. (2014). Socio-economic Effects of Mpesa Adoption on the Livelihoods of People in Bureti Sub County, Kenya. *International Journal of Academic Research in Business and Social Sciences*, *4*(12), 348–360.

Giridharadas, A. (2010, March 14). Africa's Gift to Silicon Valley: How to Track a Crisis. *NYTimes.Com*, p. WK3.

Githongo, J., & Drummond, J. (2010, January 28). The time is now for a bottom-up poverty plan. Retrieved from https://www.theglobeandmail.com/opinion/the-time-is-now-for-a-bottom-up-poverty-plan/article1208067/

Gore, C. (2000). The Rise and Fall of the Washington Consensus as a Paradigm for Developing Countries. *World Development*, *28*(5), 789–804.

Granger, L. (2014, February 26). From iHub to the BRCK: how Ushahidi became an African success story. Retrieved from http://ventureburn.com/2014/02/from-ihub-to-the-brck-how-ushahidi-became-an-african-success-story/

Gustafson, S., & Hernandez, M. (2017, May 19). The Ethiopia Commodity Exchange: A coffee success story? Retrieved July 29, 2017, from https://www.ifpri.org/blog/ethiopia-commodity-exchange-coffee-success-story

Hagen, E. (2011). Mapping Change Community Information Empowerment in Kibera. *Innovations: Quarterly Journal Published by MIT Press*, *6*(1). Retrieved from http://mapkibera.org/wiki/images/4/42/INNOVATIONS-6-1_Hagen.pdf

Haile, A. B., Rehermann, T., & Volk, A. T. (2017). *Creating agricultural markets: how the Ethiopia commodity exchange connects farmers and buyers through partnership and technology* (No. 115706) (pp. 1–4). International Finance Corporation (IFC), World Bank Group. Retrieved from http://documents.worldbank.org/curated/en/314711500630465638/Creating-agricultural-markets-how-the-Ethiopia-commodity-exchange-connects-farmers-and-buyers-through-partnership-and-technology

Hamel, J.-Y. (2010). *ICT4D and the Human Development and Capability Approach: The Potentials of Information and Communication Technology* (Human Development Research Paper No. 2010/37). United Nations Development Programme (UNDP). Retrieved from http://hdr.undp.org/en/content/ict4d-and-human-development-and-capability-approach

Hanna, N. K. (2012). Open, Smart and Inclusive Development: ICT for transforming North Africa | Eldis. African Development Bank Group (AfDB). Retrieved from http://www.eldis.org/document/A64642

HarassMap. (2017). HarassMap | Stop sexual harassment, together. Retrieved October 17, 2017, from https://harassmap.org/en

Heeks, R. (2010). Development 2.0: The IT-enabled Transformation of International Development. *Communications of the ACM*, *53*(4), 22–24. https://doi.org/10.1145/1721654.1721665

Heinzelman, J., & Waters, C. (2010). *Crowdsourcing Crisis Information in Disaster-Affected Haiti* (No. Special Report 252). United States Institute of Peace www.usip.org. Retrieved from http://preparecenter.org/sites/default/files/crowdsourcing_crisis_information_in_disaster-affected_haiti.pdf

Hernandez, M., Lemma, S., & Rashid, S. (2015). *The Ethiopian Commodity Exchange and the coffee market: Are local prices more integrated to global markets?* (2015 Conference, August 9-14, 2015, Milan, Italy No. 211732). International Association of Agricultural Economists. Retrieved from https://ideas.repec.org/p/ags/iaae15/211732.html

Hesse, M. (2010, January 16). Crisis mapping brings online tool to Haitian disaster relief effort. Retrieved from http://www.washingtonpost.com/wp-dyn/content/article/2010/01/15/AR2010011502650.html

Hickey, V. (2013, January). *Open Development and the World Bank*. Presented at the 11th Annual World Bank Group European PSLO Retreat, Brussels. Retrieved from http://siteresources.worldbank.org/EXTEOS/Resources/575134-1316086157992/8148378-1358160892181/9006015-1358160906386/Valerie_Open_Development_WB.pdf

Howe, J. (2008). *Crowdsourcing: How the Power of the Crowd is Driving the Future of Business*. New York: Random House Business.

Hughes, N., & Lonie, S. (2007). M-PESA: Mobile Money for the "Unbanked" Turning Cellphones into 24-Hour Tellers in Kenya. *Innovations: Technology, Governance, Globalization*, *2*(1–2), 63–81. https://doi.org/10.1162/itgg.2007.2.1-2.63

Humanitarian Tracker. (2013, January). *Syria Tracker: Crowdsourcing Crisis Information*. Technology. Retrieved from https://www.slideshare.net/humanitariantracker/syria-tracker-crowdsourcing-crisis-information

IBM Analytics. (2016). Ethiopia Commodity Exchange: Sowing the seeds of sustainable economic growth. Retrieved from http://ecc.ibm.com/case-study/us-en/ECCF-IMC14990USEN

IFC. (2010, June 15). M-Money Channel Distribution Case – Kenya SAFARICOM M-PESA. International Finance Corporation, The World Bank Group. Retrieved from

http://www.ifc.org/wps/wcm/connect/4e64a80049585fd9a13ab519583b6d16/tool+6.7.+case+study+-+m-pesa+kenya+.pdf?mod=ajperes

Ilon, L. (2015). *The Cost of Not Educating the World's Poor: The new economics of learning*. London: Routledge.

IMF. (2011). *Regional Economic Outlook, October 2011: Sub-Saharan Africa: Sustaining the Expansion*. Washington, D.C.: International Monetary Fund; African Dept.

Investment Climate Facility for Africa. (2013, December 12). *ECX to Launch Online Trade Operations*. Press Release, Dar es Salaam. Retrieved from http://www.icfafrica.org/news/ecx-to-launch-online-trade-operations

Islam, S. M. N., & Clarke, M. (2002). The Relationship between Economic Development and Social Welfare: A New Adjusted GDP Measure of Welfare. *Social Indicators Research*, *57*(2), 201–229. https://doi.org/10.1023/A:1014481414637

Jack, W., Ray, A., & Suri, T. (2013). Transaction Networks: Evidence from Mobile Money in Kenya. *American Economic Review*, *103*(3), 356–361.

Jack, W., & Suri, T. (2011). *Mobile Money: The Economics of M-PESA* (Working Paper No. 16721). National Bureau of Economic Research. https://doi.org/10.3386/w16721

Jack, W., & Suri, T. (2014). Risk Sharing and Transactions Costs: Evidence from Kenya's Mobile Money Revolution. *American Economic Review*, *104*(1), 183–223. https://doi.org/10.1257/aer.104.1.183

Jidenma, N. (2011, October 24). Local transactions by Kenya's mobile money service, M-Pesa exceeds Western Union's global transactions. Retrieved from

https://thenextweb.com/africa/2011/10/24/local-transactions-by-kenyas-mobile-money-service-m-pesa-exceeds-western-unions-global-transactions/

Jones, C. I. (2004). *Growth and Ideas* (Working Paper No. 10767). National Bureau of Economic Research. https://doi.org/10.3386/w10767

Joost, D. L. (2005, August). *Moral Hazard and Costly Monitoring: The Case of Split Migrants in Kenya*. Job Market Paper, Brown University, Providence RI. Retrieved from https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=NEUDC2005&paper_id=233

Joseph, M. (2017, March 6). M-Pesa: the story of how the world's leading mobile money service was created in Kenya. Retrieved from http://www.vodafone.com/content/index/what/technology-blog/m-pesa-created.html#

Kahrmann, D. (2015, November 12). *ECX Launches Independent Food Traceability System | Press Release | Ethiopia | USAID*. Retrieved from https://www.usaid.gov/ethiopia/press-releases/ecx-launches-independent-food-traceability-system

Kamau, M. (2014, February 6). 'Kenyan did not invent famed M-Pesa'. Retrieved from https://www.standardmedia.co.ke/article/2000104088/kenyan-did-not-invent-famed-m-pesa

Kamel, S. H. (2013). The Value of Social Media in Egypt's Uprising and Beyond. *The Electronic Journal of Information Systems in Developing Countries*, *60*(0).

Kibera: Africa's largest slum. (2005, July 7). Retrieved October 16, 2017, from http://affordablehousinginstitute.org/blogs/us/2005/07/kibera_africas.html

Kim, J. (2017). ICT Uptake and Technology Linkages in Rural Africa. *International Journal of Education*, *9*(3).

Kivlan, T. (2016). *Foreign Assistance Across the Developing World: A Personal Account of 40 Years*. NJ: BookBaby.

Knowledge@Wharton. (2013, January 22). Ushahidi: The African Software Platform Helping Victims in Global Emergencies. Retrieved from http://knowledge.wharton.upenn.edu/article/ushahidi-the-african-software-platform-helping-victims-in-global-emergencies/

Kombo, L. (2017, March 21). Mobile money is growing women's empires in Kenya. Retrieved November 28, 2017, from http://msurvey.co.ke/blog/2017/3/21/mobile-money-is-growing-womens-empires-in-kenya

Komen, L. J. (2016). M-PESA: A Socio-Economic Assemblage in Rural Kenya. *Networking Knowledge: Journal of the MeCCSA Postgraduate Network*, *9*(5). Retrieved from https://ojs.meccsa.org.uk/index.php/netknow/article/view/458

KPMG. (2016). KPMG True Value Case Study - Safaricom Limited. KPMG International Cooperative. Retrieved from https://home.kpmg.com/content/dam/kpmg/pdf/2016/07/case-study-safaricom-limited.pdf

Kuma, T., Dereje, M., Hirvonen, K., & Minten, B. (2018). Cash Crops and Food Security: Evidence from Ethiopian Smallholder Coffee Producers. *The Journal of Development Studies*, 1–18. https://doi.org/10.1080/00220388.2018.1425396

Land, M., & Meier, P. (2012). *#ICT4HR: Information and Communication Technologies for Human Rights*. Washington, D.C.: World Bank Publications.

Lawson, B. (2012, October 21). Why did northern Ethiopian peasants starve in the 1973-1974 famine? Retrieved September 27, 2017, from https://perspectivesonafrica.wordpress.com/2012/10/21/why-did-northern-ethiopian-peasants-starve-in-the-1973-1974-famine/

Lin, J. (2012). Ushahidi - Crowdsourcing Democracy, from Kenya to the World. Retrieved December 1, 2017, from https://ieet.org/index.php/IEET2/more/lin20121018

Liu, W., Sidhu, A., Beacom, A. M., & Valente, T. W. (2017). Social Network Theory. In *The International Encyclopedia of Media Effects* (pp. 1–12). American Cancer Society. https://doi.org/10.1002/9781118783764.wbieme0092

Logan, S. (2017, January 4). M-pesa has completely transformed Kenya's economy, this is how... Retrieved from https://www.cnbcafrica.com/news/east-africa/2017/01/04/mpesa-economic-impact-on-kenya/

Luckham, R. (2001). *Conflict and poverty in Sub-Saharan Africa: an assessment of the issues and evidence*. United Kingdom: Institute of Development Studies.

Lundvall, B.-Å., Joseph, K. J., Chaminade, C., & Vang, J. (2011). *Handbook of Innovation Systems and Developing Countries: Building Domestic Capabilities in a Global Setting*. UK: Edward Elgar Publishing.

Lungati, A. O. (2014a, April 8). Humanitarian Tracker: Crowdsourcing Syria Crisis since 2011. Retrieved from https://www.ushahidi.com/blog/2014/04/08/humanitarian-tracker-crowdsourcing-syria-crisis-since-2011

Lungati, A. O. (2014b, July 9). BRCK raises $1.2M to connect the last mile to the internet. Retrieved October 16, 2017, from

https://www.ushahidi.com/blog/2014/07/09/brck-raises-1-2m-to-connect-the-last-mile-to-the-internet

Macrae, C. (2015, April 3). 60 seconds on Ushahidi. Retrieved from http://myeconomics.ning.com/forum/topics/60-seconds-on-ushahidi-ihub-joywo-and

Maina, S. (2017, March 7). KPMG Dissects M-PESA's Social Value As The Platform Hits 10 Years. Retrieved August 28, 2017, from http://www.techweez.com/2017/03/07/kpmg-report-mpesa-10-years/

Manning, N. (2013, September 25). Wide-angle lens – Thoughts on what Ushahidi has to do with International Development. Retrieved from https://www.ushahidi.com/blog/2013/09/25/wide-angle-lens-thoughts-on-what-ushahidi-has-to-do-with-international-development

Manning, N. (2016, May 6). How Ushahidi Helped Thousands of Peoples' Votes Count in the 2012 USA Election. Retrieved October 17, 2017, from https://www.ushahidi.com/blog/2016/05/06/how-ushahidi-helped-thousands-of-peoples-votes-count-in-the-2012-usa-election

Mansell, R. (2014). Power and Interests in Information and Communication and Development: Exogenous and Endogenous Discourses in Contention. *Journal of International Development*, *26*(1), 109–127. https://doi.org/10.1002/jid.1805

Masinde, J. (2016, December 28). Kenya's M-Pesa platform is so successful regulators worry it could disrupt the economy. Retrieved from https://qz.com/873525/safaricoms-m-pesa-has-kenyas-government-worried-what-happens-in-the-event-of-a-crash/

McClellan, C. B. (2014, April 5). Less coin to purloin: A cashless economy leads to a safer society. *The Economist*, (Cash and crime). Retrieved from https://www.economist.com/news/finance-and-economics/21600149-cashless-economy-leads-safer-society-less-coin-purloin

McVety, A. K. (2012). *Enlightened Aid: U.S. Development as Foreign Policy in Ethiopia*. USA: Oxford University Press.

Meier, P. (2010, June 16). Think You Know What Ushahidi Is? Think Again. Retrieved January 12, 2018, from https://irevolutions.org/2010/06/16/think-again/

Meier, P. (2011, November 16). *Do "Liberation Technologies" Change the Balance of Power Between Repressive Regimes and Civil Society?* (Doctoral dissertation). The Fletcher School of Law and Diplomacy. Retrieved from https://irevolutions.org/2011/11/15/copy-of-dissertation/

Meier, P. (2012, July 2). How Crisis Mapping Saved Lives in Haiti. Retrieved from http://newswatch.nationalgeographic.com/2012/07/02/crisis-mapping-haiti/

Meijerink, G., Bulte, E., & Alemu, D. (2014). Formal institutions and social capital in value chains: The case of the Ethiopian Commodity Exchange. *Food Policy*, *49*, 1–12.

Minney, T. (2017, September 8). Do African commodities exchanges achieve the desired results? Retrieved November 14, 2017, from http://www.africancapitalmarketsnews.com/3472/do-african-commodities-exchanges-achieve-the-desired-results/

Minten, B., Assefa, T., & Hirvonen, K. (2017). Can Agricultural Traders be Trusted? Evidence from Coffee in Ethiopia. *World Development*, *90*, 77–88. https://doi.org/10.1016/j.worlddev.2016.08.018

Minten, B., Dereje, M., Engida, E., & Tamru, S. (2018). Tracking the Quality Premium of Certified Coffee: Evidence from Ethiopia. *World Development*, *101*(Supplement C), 119–132. https://doi.org/10.1016/j.worlddev.2017.08.010

Mojo, D., Fischer, C., & Degefa, T. (2017). The determinants and economic impacts of membership in coffee farmer cooperatives: recent evidence from rural Ethiopia. *Journal of Rural Studies*, *50*(Supplement C), 84–94. https://doi.org/10.1016/j.jrurstud.2016.12.010

Monks, K. (2017, February 24). M-Pesa: Kenya's mobile success story turns 10. Retrieved from http://www.cnn.com/2017/02/21/africa/mpesa-10th-anniversary/index.html

Morawczynski, O., & Miscione, G. (2008). *Exploring Trust in Mobile Banking Transactions: The Case of M-PESA in Kenya*. USAID Microlinks. Retrieved from https://www.microlinks.org/library/exploring-trust-mobile-banking-transactions-case-m-pesa-kenya

Morawczynski, O., & Pickens, M. (2009). *Poor People Using Mobile Financial Services: Observations on Customer Usage and Impact from M-PESA* (CGAP Brief). Washington, DC.: World Bank. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/9492/503060BRI0Box31MPESA1Brief01PUBLIC1.pdf?sequence=1&isAllowed=y

Morrow, N., Mock, N., Papendieck, A., & Kocmich, N. (2011). *Independent Evaluation of the Ushahidi Haiti Project*. Retrieved from https://sites.google.com/site/haitiushahidieval/news/finalreportindependentevaluationoftheushahidihaitiproject

Mtshali, K. (2017, August 3). The world's top mobile money operator will launch an e-commerce store next year. Retrieved October 17, 2017, from https://qz.com/1044779/safaricom-is-launching-the-e-commerce-platform-masoko-which-will-join-the-ranks-of-kilimall-international-olx-and-jumia/

Munga, G. N. (2010). *The imapct of mobile banking: a case study of M-Pesa in the Kenyan society* (Thesis). University of Nairobi, Kenya. Retrieved from http://erepository.uonbi.ac.ke:8080/xmlui/handle/11295/5647

Mungai, C. (2015, November 15). New tech solution for Ethiopia Commodity Exchange; and ECX continues to be a beacon for Africa. Retrieved from http://mgafrica.com/article/2015-11-14-new-tech-solution-for-ethiopias-acclaimed-commodity-exchange/

Muthiora, B. (2015, February 12). Enabling Mobile Money Policies in Kenya: Fostering a Digital Financial Revolution. GSMA. Retrieved from https://www.gsma.com/mobilefordevelopment/programme/mobile-money/enabling-mobile-money-policies-in-kenya-fostering-a-digital-financial-revolution

Mutiga, M. (2016, January 5). Kenya's smart greenhouse texts when your tomatoes need watering. *The Guardian*. Retrieved from http://www.theguardian.com/global-development/2016/jan/05/kenya-smart-greenhouse-tomatoes-watering-farming

Ndemo, B., & Weiss, T. (2016). *Digital Kenya: An Entrepreneurial Revolution in the Making*. New York: Springer.

Nelson, A. (2011). Ground Truth from the Grassroots. *Innovations*, *6*(1).

Nelson, A., Sigal, I., & Zambrano, D. (2010). *Lessons from Haiti: Media, Information Systems and Communities*. John S. and James L. Knight Foundation.

Newsome, M., & Parkinson, N. (2016, April 18). Ethiopian coffee farmers full of beans as barcodes promise better business. *The Guardian*. Retrieved from http://www.theguardian.com/global-development/2016/apr/18/ethiopia-coffee-farmers-barcodes-business

Nieves, J., & Osorio, J. (2013). The role of social networks in knowledge creation. *Knowledge Management Research & Practice*, *11*(1), 62–77. https://doi.org/10.1057/kmrp.2012.28

Nobelprize.org. (1987, December 8). Robert M. Solow - Prize Lecture: Growth Theory and After. Retrieved October 17, 2017, from https://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/1987/solow-lecture.html

Nwuneli, N. O. (2016). *Social Innovation In Africa: A Practical Guide for Scaling Impact*. London: Routledge.

NYUCTED. (2013, April 30). Coffee Prices & The Ethiopian Commodities Exchange (ECX) – Building and Sustaining Markets Program. Retrieved from http://www.nyucted.org/event-items/building-and-sustaining-markets-program

OHCHR. (2008). *Report from OHCHR Fact-finding Mission to Kenya, 6-28 February 2008 (EXECUTIVE SUMMARY)* (p. 19). GENEVE: United Nations Office of the UN High Commissioner for Human Rights (OHCHR). Retrieved from http://www.ohchr.org/Documents/Press/OHCHRKenyareport.pdf

Okolloh, O. (2009). Ushahidi or “testimony”: Web 2.0 tools for crowdsourcing crisis information (PLA 59). *Participatory Learning and Action*, *59*(1), 65–70.

Omwansa, T., & Sullivan, N. (2012). *Money, Real Quick: The Story of M-PESA*. UK: Guardian Books.

Osmani, S. R. (2017). *The Capability Approach and Human Development: Some Reflections* (2016 UNDP Human Development Report). New York: United Nations Development Programme (UNDP). Retrieved from http://hdr.undp.org/en/content/capability-approach-and-human-development-some-reflections

Pasquier, M. (2014, July 21). Kenyan Entrepreneurship. Retrieved from http://www.innovationiseverywhere.com/build-kenyan-entrepreneurship/

Pedroncelli, P. (2017, September 18). Safaricom Upgrades M-Pesa Platform to Enable Mobile E-Commerce Payments. Retrieved September 19, 2017, from http://afkinsider.com/140796/safaricom-upgrades-m-pesa-platform-ahead-of-enhanced-features/

Peter, M., Samuel, M., Happiness, O., Gabriel, M., Majigo, M., Patience, K., … Lennie, K. (2015). Adaptive Scenarios in Quality Improvement (QI): a Case Study of an International Health Development and Research Organization Embracing Change. -. *International Journal of Health Sciences and Research (IJHSR)*, *5*(11), 285–291.

Petty, B. (2010). Ethiopia Commodity Exchange (ECX) as seen by the Communications Consultant. In *Agriculture for Development* (Vol. 9, pp. 25–27).

Plyler, M., Haas, S., & Nagarajan, G. (2010). *Community-Level Economic Effects of M-PESA in Kenya: Initial Findings* (Case study). Financial Services Assessment. Retrieved from https://www.microfinancegateway.org/library/community-level-economic-effects-m-pesa-kenya-initial-findings

Poblet, M. (2015, April 9). Mobile Governance: Empowering Citizens to Promote the Rule of Law. Retrieved August 24, 2017, from https://www.researchgate.net/publication/266355805_Mobile_Governance_Empowering_Citizens_to_Promote_the_Rule_of_Law

Porteous, D. (2006). *The Enabling Environment for Mobile Banking in Africa* (Paper). DFID. Retrieved from https://www.microfinancegateway.org/library/enabling-environment-mobile-banking-africa

Rakotomalala, L. (2010, December 3). Uchaguzi: Technology for Transparency Network. Retrieved August 24, 2017, from http://transparency.globalvoicesonline.org/project/uchaguzi

Rapsomanikis, G. (2015). *The economic lives of smallholder farmers: An analysis based on household data from nine countries*. Rome: Food and Agriculture Organization (FAO) of the United Nations. Retrieved from www.fao.org/3/a-i5251e.pdf

Rashid, S. (2015). Commodity Exchanges and Market Development: What Have we Learned? In *Agriculture in an Interconnected World* (p. 33). Retrieved from http://ageconsearch.umn.edu/record/212488

Riessman, C. K. (1993). *Narrative Analysis*. Thousand Oaks, California: SAGE Publications.

Rockefeller Foundation. (2013). *Market change: Ethiopia commodity exchange (ECX)* (Catalytic Innovations in African Agriculture: Centennial Series). Retrieved from http://eleniexchanges.com/wp-content/uploads/2013/09/ECX-brochure-Oxfam-Rockefeller-2013.pdf

Romer, P. (1990). Endogenous Technological Change. *Journal of Political Economy*, *98*(5), 71–102.

Romer, P. (1992). Two Strategies for Economic Development: Using Ideas and Producing Ideas. *The World Bank Economic Review*, *6*(suppl_1), 63–91. https://doi.org/10.1093/wber/6.suppl_1.63

Rossel, C. (2013, June). *Empowering Development: Why Open is Right for Development*. Education presented at the The World Bank CERN Workshop on Innovations in Scholarly Communication (OAI8). Retrieved from https://www.slideshare.net/World_Bank_Publications/cern-oa18-june-2013-geneva

Rucker, A. (2013, October 24). FrontLines: What is Open Development? | USAID Impact. Retrieved from https://blog.usaid.gov/2013/10/frontlines-open-development-and-defense/

Runde, D. (2015, August 12). M-Pesa And the Rise of the Global Mobile Money Market. Retrieved from http://www.forbes.com/sites/danielrunde/2015/08/12/m-pesa-and-the-rise-of-the-global-mobile-money-market/

Russo, C. (2016, April 24). MIT Professor Talks M-Pesa Mobile Money Service in Africa. Retrieved October 16, 2017, from http://bcheights.com/2016/04/24/mit-professor-talks-mobile-money-africa/

Safaricom. (2017a). M-PESA Rates, M-PESA Tariffs, M-PESA Withdrawal Charges, M-PESA Transaction Fees. Retrieved November 15, 2017, from https://www.safaricom.co.ke/personal/m-pesa/getting-started/m-pesa-rates

Safaricom. (2017b). M-Shwari, KCB M-PESA Account, KCB M-PESA Loans, M-Shwari Lock Savings Account. Retrieved November 28, 2017, from

https://www.safaricom.co.ke/personal/m-pesa/do-more-with-m-pesa/loans-and-savings

Safaricom. (2017c). Safaricom - Our Story. Retrieved August 15, 2017, from https://www.safaricom.co.ke/about/about-safaricom/who-we-are/our-story

Safaricom. (2017d). *Safaricom Annual Report and Financial Statements 2017* (Annual Report) (p. 144). Nairobi, Kenya: Safaricom. Retrieved from https://www.safaricom.co.ke/images/Downloads/Resources_Downloads/Safaricom_2017_Annual_Report.pdf

Sangster, G. (2014, April). *Crowdsourcing International Development*. Retrieved from http://scholarworks.umt.edu/gsrc/2014/oralpres1d/3

Santana-Boado, L. (2010, February). *Closing Session: Looking forward: What are the stakes for Africa?* Presented at the ECX-UNDP Knowledge Forum on "On the Making of a Market: Global Learning from Commodity Exchange Experiences," Addis Ababa, Ethiopia. Retrieved from http://slideplayer.com/slide/7265148/

Sawyer, K. (2008). *Group Genius: The Creative Power of Collaboration*. New York: Basic Books.

Schenk, E., & Guittard, C. (2011). *Towards a characterization of crowdsourcing practices* (Post-Print). HAL. Retrieved from https://econpapers.repec.org/paper/haljournl/halshs-00439256.htm

Sen, A. (1995). Rationality and Social Choice. *American Economic Review*, *85*(1), 1–24.

Sen, A. (1999). *Development as Freedom*. Oxford University Press.

Sen, A. (2009). Development as Capability Expansion. In *Fukuda-Parr S and Shiva Kumar A K (eds). Handbook of Human Development: Concepts, Measures, and Policies*. Oxford, New York: Oxford University Press.

Shaver, L. (2009). *Intellectual Property, Innovation and Development: The Access to Knowledge Approach* (SSRN Scholarly Paper No. ID 1437274). Rochester, NY: Social Science Research Network. Retrieved from https://papers.ssrn.com/abstract=1437274

Shiferaw, A. (2015, September 5). ECX spins off warehouses, quality operations. *The Ethiopian Herald (Addis Ababa)*. Retrieved from http://www.ethpress.gov.et/herald/index.php/news/national-news/item/2011-ecx-spins-off-warehouses-quality-operations

Shirky, C. (2009). *Here Comes Everybody: The Power of Organizing Without Organizations*. NY: Penguin Press USA.

Siemens, G. (2006). *Knowing Knowledge*. Winnipeg, Manitoba: Lulu.com.

Smith, M., Elder, L., & Emdon, H. (2011). Open Development: A New Theory for ICT4D. *Information Technologies & International Development*, *7*(1), iii–ix.

Smith, M., & Reilly, K. (Eds.). (2013). *Open Development: Networked Innovations in International Development*. MA: MIT Press.

Solow, R. M. (1957). Technical Change and the Aggregate Production Function. *The Review of Economics and Statistics*, *39*(3), 312–320. https://doi.org/10.2307/1926047

Solow, R. M. (2000). *Growth Theory: An Exposition* (Second Edition). Oxford, New York: Oxford University Press.

Stiglitz, J. (1987). Learning to learn, localized learning and technological progress. In P. Dasgupta & Stoneman (Eds.), *Economic Policy and Technological Performance* (pp. 122–153). Cambridge: Cambridge University Press.

Stiglitz, J. (1999). Knowledge as a global public good. In *Global Public Goods: International Cooperation in the 21st Century* (Vol. 9(1), pp. 308–326). Oxford University Press.

Stiglitz, J. (2011). Rethinking Development Economics. *World Bank Research Observer*, *26*(2), 230–236. https://doi.org/10.1093/wbro/lkr011

Stiglitz, J., & Greenwald, B. (2014). *Creating a Learning Society: A New Approach to Growth, Development, and Social Progress*. NY: Columbia University Press.

Stiglitz, J., Sen, A., & Fitoussi, J.-P. (2010). *Mismeasuring Our Lives: Why GDP Doesn't Add Up*. NY: The New Press.

Stogyte, G. (2013). *The influence of technology developers' cultural values on ICT design for crisis communication: A case study of the Ushahidi platform*. Communication and Information Sciences Faculty of Humanities, Tilburg University, Tilburg. Retrieved from http://arno.uvt.nl/show.cgi?fid=130769

Suri, T., & Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science*, *354*(6317), 1288–1292. https://doi.org/10.1126/science.aah5309

Tedre, M., Sutinen, E., Kähkönen, E., & Kommers, P. (2006). Ethnocomputing: ICT in Cultural and Social Context. *Commun. ACM*, *49*(1), 126–130. https://doi.org/10.1145/1107458.1107466

Temple, J. (1999). The New Growth Evidence. *Journal of Economic Literature*, *37*(1), 112–156. https://doi.org/10.1257/jel.37.1.112

Tesfaye, M. (2016, October 4). ECX to Launch First Trading Centre Out of Addis. *Addis Fortune*, *17*(857). Retrieved from https://addisfortune.net/articles/ecx-to-launch-first-trading-centre-out-of-addis/

Thomas, A, Pande, V., & Totapally, S. (2016). *Global Landscape Study on Digitising P2G Payments* (Paper) (p. 148). Karandaaz Pakistan. Retrieved from https://www.microfinancegateway.org/library/global-landscape-study-digitising-p2g-payments

Thomas, Alan. (2000). Development as practice in a liberal capitalist world. *Journal of International Development*, *12*(6), 773–787. https://doi.org/10.1002/1099-1328(200008)12:6<773:AID-JID716>3.0.CO;2-7

Thompson, M. (2008). Ict and development studies: Towards development 2.0. *Journal of International Development*, *20*(6), 821–835. https://doi.org/10.1002/jid.1498

Tikly, L. (2004). Education and the new imperialism. *Comparative Education*, *40*(2), 173–198. https://doi.org/10.1080/0305006042000231347

Todaro, M., & Smith, S. (2003). *Economic development*. Boston MA: Addison Wesley.

UNDP. (2010, March 17). Promoting African commodity exchanges. Retrieved from http://www.undp.org/content/undp/en/home/presscenter/pressreleases/2010/03/17/promoting-african-commodity-exchanges.html

UNDP. (2017). *Human Development Report 2016: Human Development for Everyone*. NY: United Nations Publications.

UNECA. (2016, March). Country Profile - Kenya. United Nations Economic Commission for Africa (ECA), Addis Ababa, Ethiopia.

United Nations. (2009). Human Security in Theory and Practice. United Nations, Human Security Unit. Retrieved from

http://www.un.org/humansecurity/sites/www.un.org.humansecurity/files/human_security_in_theory_and_practice_english.pdf

USAID. (2013, January 31). *USAID and Ethiopian Commodities Exchange to Strengthen Coffee Trading and Marketing*. U.S. Agency for International Development, Press Release, U.S. Embassy, Addis Ababa, Ethiopia. Retrieved from https://2012-2017.usaid.gov/ethiopia/press-releases/usaid-and-ethiopian-commodities-exchange-strengthen-coffee-trading

Ushahidi. (2012). Ushahidi one Pager. Ushahidi.com. Retrieved from https://www.globalgiving.org/pfil/6203/projdoc.pdf

Ushahidi. (2017). About Ushahidi. Retrieved from https://www.ushahidi.com/about

Ushahidi Staff. (2010a, June 28). Read This If You Don't Know What Ushahidi Is. Retrieved January 12, 2018, from https://www.ushahidi.com/blog/2010/06/28/read-this-if-you-dont-know-what-ushahidi-is

Ushahidi Staff. (2010b, August 2). Uchaguzi: An Ushahidi deployment for Kenya's 2010 Constitutional Referendum. Retrieved August 24, 2017, from https://www.ushahidi.com/blog/2010/08/02/uchaguzi-an-ushahidi-deployment-for-kenyas-2010-constitutional-referendum

Ushahidi Staff. (2011, May 24). Syria Tracker: Crowdsourcing Crisis Information. Retrieved from https://www.ushahidi.com/blog/2011/05/24/syria-tracker-crowdsourcing-crisis-information

Ushahidi Staff. (2012a, January 12). Haiti and the Power of Crowdsourcing. Retrieved from https://www.ushahidi.com/blog/2012/01/12/haiti-and-the-power-of-crowdsourcing

Ushahidi Staff. (2012b, March 14). #UgandaSpeaks: Al-Jazeera uses Ushahidi to Amplify Local Voices in Response to #Kony2012. Retrieved December 1, 2017, from https://www.ushahidi.com/blog/2012/03/14/ugandaspeaks-al-jazeera-uses-ushahidi-to-amplify-local-voices-in-response-to-kony2012

Ushahidi Staff. (2013, May 30). HarassMap: Help Reach the Tipping Point. Retrieved October 17, 2017, from https://www.ushahidi.com/blog/2013/05/30/harassmap-help-reach-the-tipping-point

Ushahidi Staff. (2015, March 11). Harassmap's Research "Effectiveness of Crowdsourced Data." Retrieved October 17, 2017, from https://www.ushahidi.com/blog/2015/03/11/harassmaps-research-effectiveness-of-crowdsourced-data

Ushahidi Staff. (2017, August 10). Ushahidi's global Uchaguzi partnership crowdsourcing Kenyan election incidents shows a mostly orderly election. Retrieved October 7, 2017, from https://www.ushahidi.com/blog/2017/08/10/ushahidis-global-uchaguzi-partnership-crowdsourcing-kenyan-election-incidents-shows-a-mostly-orderly-election

Vodafone Group. (2016, April 25). Vodafone M-Pesa reaches 25 million customers milestone. Retrieved October 8, 2017, from http://www.vodafone.com/content/index/media/vodafone-group-releases/2016/mpesa-25million.html#

von Braun, J., & Olofinbiyi, T. (2012). Famine and food insecurity in Ethiopia. In *Case Studies in Food Policy for Developing Countries: Domestic Policies for Markets,*

Production, and Environment. Cornell University Press. Retrieved from http://agris.fao.org/agris-search/search.do?recordID=QB2015103043

Weinberger, D. (2011). *Too Big to Know: Rethinking Knowledge Now That the Facts Aren't the Facts, Experts Are Everywhere, and the Smartest Person in the Room Is the Room*. New York: Basic Books.

Whitehead, E. (2013, July 30). Africa's agriculture commodity exchanges take root. Retrieved from http://www.thisisafricaonline.com/Analysis/Africa-s-agriculture-commodity-exchanges-take-root

Wokabi, C. (2012a, October 29). An idea that got the taxman interested. Retrieved from http://www.nation.co.ke/lifestyle/smartcompany/An-idea-that-got-the-taxman-interested/1226-1605672-5foecz/index.html

Wokabi, C. (2012b, October 29). Tech giant Kenya shines abroad with little for local innovators. Retrieved from http://www.nation.co.ke/lifestyle/smartcompany/Why-apps-developers-are-not-making-money/1226-1605670-x0bnbl/index.html

Worku, H. A. (2014). Assessing the Opportunity and Challenges of Ethiopia Commodity Exchange for the Members of Agricultural Product Export. *International Journal of Economics & Management Sciences*. https://doi.org/10.4172/2162-6359.1000193

World Bank. (2005a). *Agriculture Investment Sourcebook*. Washington, D.C.: World Bank Publications.

World Bank. (2005b). *Empowering people by transforming institutions: social development in World Bank operations* (No. 31494). The World Bank. Retrieved from

http://documents.worldbank.org/curated/en/563751468780547056/Empowering-people-by-transforming-institutions-social-development-in-World-Bank-operations

World Bank. (2011). *A new era for open knowledge* (No. 65194) (pp. 1–24). Washington DC: The World Bank. Retrieved from http://documents.worldbank.org/curated/en/411111468315324671/A-new-era-for-open-knowledge

World Bank. (2017a). *Global Economic Prospects, June 2017: A Fragile Recovery*. Washington, DC.: World Bank Group. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/26800/9781464810244.pdf?sequence=14&isAllowed=y

World Bank. (2017b). Kenya | Data. Retrieved February 1, 2018, from https://data.worldbank.org/country/kenya

Yates, D., & Paquette, S. (2011). Emergency knowledge management and social media technologies: A case study of the 2010 Haitian earthquake. *International Journal of Information Management*, *31*(1), 6–13. https://doi.org/10.1016/j.ijinfomgt.2010.10.001

Yewondwossen, M. (2017, April 17). Warehousing Enterprise to re-merge with ECX. Retrieved from http://capitalethiopia.com/2017/04/17/warehousing-enterprise-re-merge-ecx/

Yin, R. K. (1994). *Case study research: design and methods*. Sage Publications.

Appendices

Appendix 1. National Commission for Science, Technology and Innovation (NACOSTI) research permit

NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/77291/15412**

Date:
14th February, 2017

Bethel Gherima Ghebru
Seoul National University
SOUTH KOREA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"An exploration into open development: Project evaluation in East Africa,"*** I am pleased to inform you that you have been authorized to undertake research in **all Counties** for the period ending **11th February, 2018.**

You are advised to report to **the County Commissioners and the County Directors of Education, all Counties** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioners
All Counties.

The County Directors of Education
All Counties.

Appendix 2. Collaborative Institutional Training Initiative (CITI)

CERTIFICATE OF COMPLETION

CITI KOREA | Collaborative Institutional Training Initiative Program

The Collaborative Institutional Training Initiative(CITI) Program
at the University of Miami

We present this certificate to

Bethel Ghebru

Seoul National University

In recognition of successful completion of the requirements for

Responsible Conduct of Research (Research Ethics)

Completion Report No. : K-2014-12757445
Date Completed : May 26, 2014
Year of Birth : 1979

Paul G. Braunschweiger, Ph.D.
Professor
University of Miami
CITI Program Co-founder

B. I. Choe, M.B.A., LL.M., Ph.D.
Professor of Bioethics
The Catholic University of Korea
CITI-KOREA Program Director

CERTIFICATE OF COMPLETION

CITI KOREA | Collaborative Institutional Training Initiative Program

The Collaborative Institutional Training Initiative(CITI) Program
at the University of Miami

We present this certificate to

Bethel Ghebru

Seoul National University

In recognition of successful completion of the requirements for

Social & Behavioral Research

Completion Report No. : K-2014-12757444
Date Completed : June 1, 2014
Year of Birth : 1979

Paul G. Braunschweiger, Ph.D.
Professor
University of Miami
CITI Program Co-founder

B. I. Choe, M.B.A., LL.M., Ph.D.
Professor of Bioethics
The Catholic University of Korea
CITI-KOREA Program Director

Appendix 3. Seoul National University Institutional Review Board (IRB) Approval

심의결과 통보서

수신

책임연구자	이름: Bethel Ghebru (베텔)	소속: 사범대학 글로벌교육협력	직위: 박사과정
지원기관	해당없음		

과제정보

승인번호	IRB No. 1612/003-002		
연구과제명	개방형 개발 이론에 대해서 탐색: 동아프리카 프로젝트 중심으로		
연구종류	학위 논문 연구, 관찰연구, 면담(FGI 포함)		
심의종류	신속심의		
심의일자	2016-12-20		
심의대상	연구계획서(재심의), 연구참여자용 동의서 또는 동의서 면제 사유서		
심의결과	승인		
승인일자	2016-12-20	승인유효기간	2017-12-19
정기보고주기	12개월		
심의의견	1. 심의결과 제출하신 연구계획에 대해 승인합니다. 2. 연구자께서는 승인된 문서를 사용하여 연구를 진행하시기 바라며, 만일 연구진행 과정에서 계획상에 변경사항 (연구자 변경, 연구내용 변경 등)이 발생할 경우 본 위원회에 변경신청을 하여 승인 받은 후 연구를 진행하여 주십시오. 3. 유효기간 내 연구가 끝났을 경우 종료 보고서를 제출하여야 하며, 승인유효기간 이후에도 연구를 계속하고자 할 경우, 2017-11-19까지 지속심의를 받도록 하여 주십시오.		

2016년 12월 20일

서울대학교 생명윤리위원회 위원장

본 위원회가 승인한 연구를 수행하는 연구자들은 다음의 사항을 준수해야 합니다.

1. 반드시 계획서에 따라 연구를 수행해야 합니다.
2. 위원회의 승인을 받은 연구참여자 동의서를 사용해야 합니다.
3. 모국어가 한국어가 아닌 연구참여자에게는 승인된 동의서를 연구참여자의 모국어로 번역하여 사용해야 하며 번역본은 인증 및 위원회의 승인을 거쳐야 합니다.
4. 연구참여자 보호를 위해 불가피한 경우를 제외하고는 연구 진행중의 변경에 대해서는 위원회의 사전 승인을 받아야 합니다. 연구참여자의 보호를 위해 취해진 응급상황에서의 변경에 대해서는 즉각 위원회에 보고해야 합니다.
5. 위원회에서 승인 받은 계획서에 따라 등록된 연구참여자의 사망, 입원, 심각한 질병에 대하여는 위원회에 서면으로 보고해야 합니다.
6. 임상시험 또는 연구참여자의 안전에 대해 유해한 영향을 미칠 수 있는 새로운 정보는 즉각 위원회에 보고해야 합니다.
7. 위원회의 요구가 있을 때에는 연구의 진행과 관련된 사항에 관하여 위원회에 보고해야 합니다.
8. 연구참여자 모집광고는 사용 전에 위원회로부터 승인을 받아야 합니다.
9. 강제 혹은 부당한 영향력이 없는 상태에서 충분한 설명에 근거하여 연구참여자로부터 동의를 받아야 하며, 잠재적인 연구참여자에 대해서 연구 참여 여부를 숙려할 수 있도록 충분한 기회를 제공해야 합니다.

Appendix 4. Kenyatta University Research Affiliation document

KENYATTA UNIVERSITY
OFFICE OF DEPUTY VICE-CHANCELLOR RESEARCH, INNOVATION AND OUTREACH

Ref: DVCR/AFF/VOL.1/21

P.O. Box 43844-00100
Nairobi. Kenya
Tel: 020-8710901/19 Ext. 3026
E-mail: dvc-rio@ku.ac.ke

Mr. Bethel Gebru
College of Education,
Seoul National University
Seoul.
South Korea

21st December, 2016

Dear Mr. Ghebru

RE: REQUEST FOR AFFILIATION TO KENYATTA UNIVERSITY

This is to inform you that your application for affiliation to Kenyatta University dated 1st December, 2016 for the purpose of undertaking research in Kenya has been considered and approved by the Vice-Chancellor. It is noted that your affiliation period is 23rd December, 2016 to 6th March, 2017 and you wish to be affiliated to the Department of Gender and Development Studies.

With this approval, you are requested to proceed to pay affiliation fee and complete the process of requesting for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI).

We look forward to interacting with you during the period of your affiliation. Please contact my office on arrival in Kenya to enable us arrange for your KU identity Card.

Yours Sincerely,

Prof. F. Q. Gravenir
Deputy Vice-Chancellor
Research, Innovation and Outreach

Appendix 5. Kenyatta University Research Completion Clearance

KENYATTA UNIVERSITY
SCHOOL OF HUMANITIES & SOCIAL SCIENCES
DEPARTMENT OF GENDER AND DEVELOPMENT STUDIES

==========

P. O. BOX 43844 – 00100
NAIROBI
Tel: 8710901 ext. 3501

March 03, 2017

KU/GEND/SA/F27/VOL 3/150

Dear Sir/Madam,

This is to certify that (Mr.) Bethel Ghebru, a doctoral research student from the College of Education of Seoul National University, South Korea, has successfully completed his field research as a visiting scholar affiliated to the Department of Gender and Development Studies at Kenyatta University from Dec 2016 till Mar 2017. This is also to make him clear of any liabilities and requirements of the institution.

KENYATTA UNIVERSITY
CHAIRPERSON
DEPT. OF GENDER &
02 MAR 2017
DEVELOPMENT STUDIES
P. O. Box 43844 – 00100,
NAIROBI

Dr. Mildred Lodiaga
Chairperson,
Department of Gender & Development Studies

Prof. Agnes Gathumbi
Director,
Center for International Programs and Collaborations

KENYATTA UNIVERSITY
P.O. BOX 43844 - 00100
NAIROBI
06 MAR 2017
OFFICE OF THE DIRECTOR
CENTRE FOR INTERNATIONAL
PROGRAMMES & COLLABORATION

Appendix 6. Research Consent

IRB No. 1612/003-002 **유효기간: 2017년 12월 19일**

Consent form for the interview to project participants

Subject of a research: **An Exploration into Open Development: Project Evaluation in East Africa**

Chief of research: Bethel Ghebru (Doctoral candidate, Global Education Cooperation program, Seoul National University).

This research is about attempt to examine whether the projects under examination can lead to development processes and outcomes that are derived by local ideas, networked and transformative. A conducting researcher Bethel Ghebru who belongs to Seoul National University would explain to participants about the research. The research will be conducted only for the participants who voluntarily reveal intention of involvement and before your decision is made it is important to understand contents and purpose of the research. Please after you read this form carefully, you may ask any questions you may have before agreeing to be part of the interview.

1. Purpose of the research:

The main purpose of this study is to inquire into few development projects and examine if they fit into the open development models. This could basically be explained by examining whether the underlying ideas of the development projects under analysis are in line with the core concepts of open development and whether the consequent outcomes are successful in benefiting communities as to the arrangements.

2. Content of the Interview:

If you agree to be in this study, I will conduct an interview with you. The interview will include questions about your understanding of the development projects at hand, what you know about the project, how the project has affected your living or thinking, whether the project indirectly affected the living or thinking of other people who are not directly project participants. The interview will take about 45-60 minutes to complete. With your permission, I would also like to tape-record the interview. I may also walk around the project areas to observe and take notes on working sites, offices, fields etc. with prior informed consent from project manager or facilitator.

3. Risks and benefits:

There is no anticipated risk of discomfort to you participating in this study as the interview will focus on the constructive aspect of the projects with respect to how knowledge is produced, built and shared through networks to bring solutions to community problems and on your person experience with the projects.

4. Confidentiality

The records of this study including all personal information gathered while processing this research will be kept private and confidential. In any sort of report I make public, I will not include any information that will make it possible to identify you. Research records will be kept in password locked file; only the researcher will have access to the records. If I tape-record the interview, I will destroy the tape after it has been transcribed, which I anticipate will be within one year of its taping. If the research is reported to academy or academy journal, your name and other personal information will not be presented.

5. Taking part is voluntary:

Participation in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide not to take part or to skip some of the questions, it will not affect your current or future relationship with any of the projects. If you decide to take part, you are free to withdraw at any time.

6. Inquiry about the research

If you have questions: The researcher conducting this study is Bethel Ghebru. If you have any question related to the research, or if there is any problem related to the research, please contact me at bethel@snu.ac.kr or +82-10-9373-6699.

You can also contact my academic advisor, Professor Lynn Ilon at lynnilon@snu.ac.kr or +82 10-4517-0985. If you have any questions or concerns regarding your rights as a participant in this study, you may contact the Seoul National University Institutional Review Board (SNUIRB) Contact: +82-2-880-5153, email: irb@snu.ac.kr or access their website at http://snuethics.snu.ac.kr. You will be given a copy of this form to keep for your records.

IRB No. 1612/003-002 유효기간: 2017년 12월 19일

Consent form

1. I read the instruction above thoroughly, and discuss with the member in charge about the issue.
2. I learn about the risk and advantage related to the research participation and I get content answer for my inquiry.
3. I agree voluntarily participating in the research.
4. I agree of collection and processing any personal information gathered during the research within the bounds of existing legislation and regulation of Institutional Review Board.
5. I agree to accessing personal information which kept secured in the case of managing and processing a result of research by principal researcher or agent and in the case of fact-finding by SNU Institutional Review Board, University authority or sanitation authority.
6. I understand that I withdraw the participation of the research whenever I want and this case, any risk will not be posed.
7. My agreements means that I receive the copy of consent form and I promise to keep the copy 'til the end of the research.
8. I agree that my voice will be recorded and will be kept confidential.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date _____

Your Name (printed) _____

In addition to agreeing to participate, I also consent to having the interview tape-recorded.

Your Signature _____ Date _____

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____ Date _____

This consent form will be kept by the researcher for at least one year beyond the end of the study and was approved by the IRB on _____.

IRB No. 1612/003-002 유효기간: 2017년 12월 19일

(Oral) Consent form for the interview to project participants

Subject of a research: **An Exploration into Open Development: Project Evaluation in East Africa**

Chief of research: Bethel Ghebru (Doctoral candidate, Global Education Cooperation program, Seoul National University).

This research is about attempt to examine whether the projects under examination can lead to development processes and outcomes that are derived by local ideas, networked and transformative. A conducting researcher Bethel Ghebru who belongs to Seoul National University would explain to participants about the research. The research will be conducted only for the participants who voluntarily reveal intention of involvement and before your decision is made it is important to understand contents and purpose of the research. Please after you read this form carefully, you may ask any questions you may have before agreeing to be part of the interview.

1. Purpose of the research:

The main purpose of this study is to inquire into few development projects and examine if they fit into the open development models. This could basically be explained by examining whether the underlying ideas of the development projects under analysis are in line with the core concepts of open development and whether the consequent outcomes are successful in benefiting communities as to the arrangements.

2. Content of the Interview:

If you agree to be in this study, I will conduct an interview with you. The interview will include questions about your understanding of the development projects at hand, what you know about the project, how the project has affected your living or thinking, whether the project indirectly affected the living or thinking of other people who are not directly project participants. The interview will take about 45-60 minutes to complete. With your permission, I would also like to tape-record the interview. I may also walk around the project areas to observe and take notes on working sites, offices, fields etc. with prior informed consent from project manager or facilitator.

3. Risks and benefits:

There is no anticipated risk of discomfort to you participating in this study as the interview will focus on the constructive aspect of the projects with respect to how knowledge is produced, built and

shared through networks to bring solutions to community problems and on your person experience with the projects.

4. Confidentiality

The records of this study including all personal information gathered while processing this research will be kept private and confidential. In any sort of report I make public, I will not include any information that will make it possible to identify you. Research records will be kept in password locked file; only the researcher will have access to the records. If I tape-record the interview, I will destroy the tape after it has been transcribed, which I anticipate will be within one year of its taping. If the research is reported to academy or academy journal, your name and other personal information will not be presented.

5. Taking part is voluntary :

Participation in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide not to take part or to skip some of the questions, it will not affect your current or future relationship with any of the projects. If you decide to take part, you are free to withdraw at any time.

6. Inquiry about the research

If you have questions: The researcher conducting this study is Bethel Ghebru. If you have any question related to the research, or if there is any problem related to the research, please contact me at bethel@snu.ac.kr or +82-10-9373 -6699.

You can also contact my academic advisor, Professor Lynn lion at lynnilon@snu .ac.kr or +82 10-4517-0985.If you have any questions or concerns regarding your rights as a participant in this study, you may contact the Seoul National University Institutional Review Board (SNUIRB) Contact: +82-2-880-5153, email: irb@snu.ac.kr or access their website at http://snuethics.snu.ac.kr. You will be given a copy of this form to keep for your records.

1. I have been read the instructions above thoroughly, and discuss with the member in charge about the issue.
2. I learned about the risk and advantage related to the research participation and I get content answer for my inquiry.
3. I agree voluntarily participating in the research.
4. I agree of collection and processing any personal information gathered during the research within the bounds of existing legislation and regulation of Institutional Review Board.

5. I agree to accessing personal information which kept secured in the case of managing and processing a result of research by principal researcher or agent and in the case of fact-finding by SNU Institutional Review Board, University authority or sanitation authority.
6. I understand that I withdraw the participation of the research whenever I want and this case, any risk will not be posed.
7. My agreements means that I receive the copy of consent form and I promise to keep the copy 'til the end of the research.
8. I agree that my voice will be recorded and will be kept confidential.

Name of Participant: _____

I certify that I have read out the above research description to the participants and answered all questions.

Name/Signature: _____ Date: _____

IRB No. 1612/003-002 유효기간: 2017년 12월 19일

Consent form for non-participant observation

Subject of a research: **An Exploration into Open Development: Project Evaluation in East Africa**

Chief of research: Bethel Ghebru (Doctoral candidate, Global Education Cooperation program, Seoul National University).

This research is about attempt to examine whether the projects under examination can lead to development processes and outcomes that are derived by local ideas, networked and transformative. A conducting researcher Bethel Ghebru who belongs to Seoul National University would explain to participants about the research. The research will be conducted only for the participants who voluntarily reveal intention of involvement and before your decision is made it is important to understand contents and purpose of the research. Please after you read this form carefully, you may ask any questions you may have before agreeing to be part of the interview.

1. Purpose of the research:

The main purpose of this study is to inquire into few development projects and examine if they fit into the open development models. This could basically be explained by examining whether the underlying ideas of the development projects under analysis are in line with the core concepts of open development and whether the consequent outcomes are successful in benefiting communities as to the arrangements.

2. Content of the Observation:

Non-Participation observation in this stage of the study requires no effort on the participant side beyond the normal participation in the assigned workspace. The researcher will be observing groups of people working at all stages of the project along with costumer service centers to see the tasks they undertake on a day-to-day basis. Observation of the project sites or workspaces may take up to an hour or so, two times per day for around a week. The observations will help the researcher to better understand the development projects at hand, what you know about the project, how the project has affected your living or thinking, whether the project indirectly affected the living or thinking of other people who are not directly project participants. Researcher will be observing and taking notes on naturally occurring interactions and conversations among clients or relevant stuff members. This research will not require additional time or activities from participants.

3. Observation is made upon permission:

The non-participant observation will be conducted completely through permission given by the relevant authority with the compliance that it will not affect the projects.

4. Confidentiality

The records of this non-participant observation including all personal information gathered while processing this research will be kept private and confidential. In any sort of report I make public, I will not include any information that will make it possible to identify personal information. Observation records will be kept for three years of the observation date.

5. Inquiry about the research

If you have questions: The researcher conducting this study is Bethel Ghebru. If you have any question related to the research, or if there is any problem related to the research, please contact me at bethel@snu.ac.kr or +82-10-9373-6699.

You can also contact my academic advisor, Professor Lynn Ilon at lynnilon@snu.ac.kr or +82 10-4517-0985. If you have any questions or concerns regarding your rights as a participant in this study, you may contact the Seoul National University Institutional Review Board (SNUIRB) Contact: +82-2-880-5153, email: irb@snu.ac.kr or access their website at http://snuethics.snu.ac.kr. You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information, and I consent to provide permission to the researcher to conduct observation at the following areas of the project.

Project name: _____

Authorizing Person: _____

Title: _____

Company/Organization: (if applicable) _____

Signature _____ Date _____

Signature of person obtaining consent _____ Date _____

This consent form will be kept by the researcher for at least one year beyond the end of the study and was approved by the IRB on _____.

IRB No. 1612/003-002 유효기간: 2017년 12월 19일

Consent form for using documents

Subject of a research: **An Exploration into Open Development: Project Evaluation in East Africa**

Chief of research: Bethel Ghebru (Doctoral candidate, Global Education Cooperation program, Seoul National University).

This research is about attempt to examine whether the projects under examination can lead to development processes and outcomes that are derived by local ideas, networked and transformative. A conducting researcher Bethel Ghebru who belongs to Seoul National University would explain to participants about the research.

The main purpose of this study is to inquire into few development projects and examine if they fit into the open development models. This could basically be explained by examining whether the underlying ideas of the development projects under analysis are in line with the core concepts of open development and whether the consequent outcomes are successful in benefiting communities as to the arrangements.

The researcher would like to ask the permission of using the following document. In signing this form, you certify that you are the sole and exclusive owner of the rights to the requested material.

Statement of Consent: Based on the above information, permission is granted to the researcher for the partial of full use of the following document which does not result in the breach of confidentiality.

Document name: _____

_____

Authorizing Person: _____

Title: _____

Company/Organization: (if applicable) _____

Signature: _____

Date: _____

Signature of person obtaining consent _____ Date _____

If you need additional information, please do not hesitate to contact me. Proper acknowledgement of title, author, copyright owner, and copyright date will be given. The researcher conducting this study is Bethel Ghebru. If you have any question related to the research, or if there is any problem related to the research, please contact me at bethel@snu.ac.kr or +82-10-9373-6699.

You can also contact my academic advisor, Professor Lynn Ilon at lynnilon@snu.ac.kr or +82-10-4517-0985. If you have any questions or concerns regarding your rights as a participant in this study, you may contact the Seoul National University Institutional Review Board (SNUIRB) Contact: +82-2-880-5153, email: irb@snu.ac.kr or access their website at http://snuethics.snu.ac.kr. You will be given a copy of this form to keep for your records.

Appendix 8. List of Interviewees

Kenya

	Name (Nick name)	Occupation	Gender	Age	Area	Interview Date
1	Opiyo	NGO employee	M	30s	Nairobi	2017.01.15
2	Nelson	M-PESA agent	M	34	Kiambu	2017.01.19
3	Faith	M-PESA agent	F	30s	Kiambu	2017.01.19
4	Leya	M-PESA agent	F	30s	Kiambu	2017.01.19
5	Molly	restaurant worker	F	30	Kiambu	2017.01.19
6	John	microfinance employee	M	30s	Nairobi	2017.01.20
7	Solomon	shop owner	M	40s	Nyeri	2017.01.20
8	Moses	psychology research officer	M	30s	Nyeri	2017.01.21
9	Martin	farmer (tea and grain)	M	60s	Nyeri	2017.01.21
10	Sarah	tea farmer	F	50s	Nyeri	2017.01.21
11	Jane	farmer	F	40s	Nyeri	2017.01.21
12	Nicholas	veterinary shop owner	M	34	Nyeri	2017.01.22
13	Joseph	public servant	M	35	Nyeri	2017.01.22
14	Charles	dairy farmer and restaurant owner	M	62	Nyeri	2017.01.22
15	Rebecca	house wife	F	50s	Nyeri	2017.01.23
16	Daquida	house wife	F	66	Nyeri	2017.01.23
17	Paul	bus driver	M	40s	Nyeri	2017.01.23
18	Charlie	farmer	M	66	Gatundu	2017.02.11
19	Raphael	farmer	M	60	Gatundu	2017.02.11
20	Christopher	restaurant worker	M	55	Gatundu	2017.02.11
21	Musa	farmer	M	46	Gatundu	2017.02.11
22	Edwin	M-PESA agent shop owner	M	41	Ruai	2017.02.26
23	Violet	shop retailer	F	32	Ruai	2017.02.26
24	Wilson	butcher shop owner	M	50s	Ruai	2017.02.26
25	George	student	M	20s	Kibera, Nairobi	2017.02.19
26	Sande	student and community leader	F	20s	Kibera, Nairobi	2017.02.19
27	Fred	student	M	20s	Kibera, Nairobi	2017.02.19
28	Peter	farmer	M	50s	Kirinyaga	2017.02.20
29	Margaret	house wife	F	60s	Kirinyaga	2017.02.20
30	Cecilia	juice shop worker	F	30s	Kirinyaga	2017.02.20
31	Pauline	juice shop worker	F	30s	Kirinyaga	2017.02.20
32	Lucy	juice shop worker	F	20s	Kirinyaga	2017.02.21
33	Julia	shop clerk	F	20s	Kirinyaga	2017.02.21
34	Jusphat	student and interpreter	M	20s	Kirinyaga	2017.02.21
35	Clementina	fish seller	F	40s	Naivasha	2017. 02.18
36	Princila	vegetable vendor	F	30s	Naivasha	2017. 02.18
37	Ann	fruit seller	F	50s	Naivasha	2017. 02.18
38	Samuel	banker	M	37	Naivasha	2017. 02.18
39	Patrick	business man	M	50s	Joska	2017. 02.16

40	Mary	bartender	F	30s	Joska	2017. 02.16
41	Peter	landlord and farmer	M	40s	Murang'a	2017. 02.14
42	Rosemary	farmer	F	40s	Murang'a	2017. 02.14
43	Jennifer	farmer	F	50s	Murang'a	2017. 02.14
44	Rosa	vegetable vendor	F	30s	Murang'a	2017. 02.14
45	Victor	photographer	M	40s	Murang'a	2017. 02.14
46	Emmanuel	pastoralist	M	40s	Magadi	2017. 02.15
47	Chris Mukuria – Hubs (of Ushahidi)	Innovation Engagement Officer	M		Nairobi	2017.02.03
48	Linda Kamau – Rollcall (of Ushahidi)	Lead Developer	F		Nairobi	2017.02.09
49	Angela Lungati – Ushahidi	Director of Community Engagement	F		Nairobi	2017.02.16
50	Angela Kabari – Ushahidi	Capacity Development Officer	F		Nairobi	2017.02.17
51	Esther M. Ondigo – Ushahidi	Operations Manager & Chief of Staff	F		Nairobi	2017.02.17
52	Staicy Gitau – South to South Lab	Innovation Engagement Officer	F		Nairobi	2017.02.17
53	Simon – Safricom	Communications and PR Team	M		Nairobi	2017.01.25
54	Josh – Safricom	Communications and PR Team	M		Nairobi	2017.01.25
55	Elizabeth Odhiambo – Safaricom	Head of Public relations department	F		Nairobi	2017.01.25

Ethiopia

	Name (Nick name)	Occupation	Gender	Age	Area	Interview Date
1	Mr. Mohammed	coffee supplier	M	30s	Jimma	2017.01.11
2	Mr. Dereje	private exporter	M	50s	Addis Ababa	2017.01.14
3	Mr. Messay	Coffee farmer	M	55	SNNP	2017.01.05
4	Mr. Tirusew	Supplier	M	30s	Adama	2017.01.10
5	Mr. Getu	Grain farmer	M	40s	Jimma	2017.01.11
6	Mrs. Tamire	Grain farmer	F	40s	Hawassa	2017.01.05
7	Mrs. Kebedech	Grain farmer	F	40s	Hawassa	2017.01.05
8	Mrs. Tsehaye	Grain farmer	F	40s	Hawassa	2017.01.05
9	Mr. Tesfaye	Grain farmer	M	45	Gondar	2017.01.03
10	Mrs. Kedija	Grain farmer	F	50s	Gondar	2017.01.03
11	Mrs. Jateni	Coffee farmer	F	50s	Jimma	2017.01.11
12	Mr. Asefa	Coffee farmer	M	50s	Jimma	2017.01.11
13	Mr. Ahmed	Coffee farmer	M	50s	Jimma	2017.01.11
14	Mr. Assefa	Coffee farmer	M	50s	Jimma	2017.01.11
15	Netsanet	ECX employee	F	20s	Addis Ababa	2016.12.26
16	Dawit	ECX employee	M	30s	Addis Ababa	2016.12.26
17	Ermias	ECX employee	M	30s	Addis Ababa	2016.12.26
18	Hirut	ECX employee	F	20s	Addis Ababa	2016.12.26

19	Mr. Hasen	coffee trader	M	30s	SNNP	2017.01.09
20	Seble	coffee trader	F	30s	SNNP	2017.01.09
21	Yimer	coffee trader	M	40s	SNNP	2017.01.09
22	Seifu	coffee trader	M	40s	SNNP	2017.01.09
23	Senbet	Grain trader	F	30s	SNNP	2017.01.09
24	Ermias Eshetu	CEO - ECX	M		Addis Ababa	2017.01.12
25	Belay Gorfu	Deputy Chief Executive Officer ECX	M		Addis Ababa	2017.01.12
26	Kunom Kelemu	ECEA - Senior Officer of Public relations	M		Addis Ababa	2016.12.27
27	Molla Gellaw	Market Linkage executive	M		Addis Ababa	2016.12.27
28	Zelalem Jiratu	Adama Branch Director	M		Adama	2017.01.10
29	Bayelign Zeray	Gondar Branch Director	M		Gondar	2017.01.03
30	Mezgebu Bekele	Gondar Warehouse Supervisor	M		Gondar	2017.01.03
31	Birhanu Molla	Gondar Customer relations director	M		Gondar	2017.01.03
32	Menale Ejigu	Gondar Zone Trade Department Head	M		Gondar	2017.01.03
33	Beyene Alemayehu	Jimma Branch Director	M		Jimma	2017.01.12
34	Anwar Ambasmbi	Jimma Customer relations director	M		Jimma	2017.01.11