Chapter 5

A Comparative Study on Innovation Enabling Ecosystems of Rwanda and Uganda

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Introduction

An innovation ecosystem is an environment that provides innovative actors and entities with opportunities to freely interact, exchange ideas, and support each other. This helps to create continuous innovation. An innovation ecosystem helps create an environment that identifies innovators and nurtures their ability to innovate and create solutions for social challenges. Thus, innovation ecosystems have been introduced widely in developing countries as an effective engine for empowering their economies and solving challenges facing low-income communities, who are also called base of the economic pyramid (BoP) communities[1].

An enabling ecosystem provides helps for innovation and potential actors to scale up. It is an environment that innovators and entrepreneurs with other stakeholders engage and interact and help innovators to link with potential partners and scale up their capacity. An innovation ecosystem and an enabling ecosystem present similar ideas though, the difference between two concepts are in which function of ecosystems we want to emphasize by using the term. An enabling ecosystem focuses more on enablers to scale up the innovations and an innovation ecosystem focuses more on an environment of the ecosystem itself.

However, the most challenging issue for innovation ecosystems is how to include low-income communities in a part of the innovation process. To do so, as Markman (2012) stated, we need to foster innovation by identifying capable innovators and nurturing their ability to generate creative practical solutions to new challenges. In developing countries, potential innovators are also found in low-income communities. The innovation

[1] Th definition of low-income communities and BoP communities will be discussed later in this paper (1.5. Low-income communities in Africa.).

ecosystem is formed by BoP communities and other surrounding players, such as universities, governments, enterprises, and funders. The innovators themselves, and other stakeholders, often have less capacity to form an effective innovation ecosystem. Thus the innovation ecosystem must enhance their capacity to interact and participate. It is an "enabling ecosystem," which enables innovators in low-income communities to interact with other actors and entities in the innovation ecosystem. The enabling ecosystem promotes innovation locally in developing countries by enhancing the economic capacity of the local population. It also needs support from outsiders.

We explore how the environment can be leveraged to lead an innovation ecosystem which benefits the poor, by looking into how existing innovation ecosystems can be upgraded to enabling ecosystems which enhance low-income communities' capacity to interact and participate in ecosystems. To answer this question, we focus on two East African countries, Rwanda and Uganda. Rwanda is a country which has a policy encouraging technology innovation as a key driver of its economic development. Uganda is a country with a broader market than Rwanda. Thus, Ugandan innovations have been driven by the private sector more than government policy. Both countries need to make use of innovation. Specifically, by reviewing the development of the enabling ecosystem surrounding tech hubs in Rwanda and Uganda, the paper aims to identify what contributes to success and what is required from innovation development to benefit the poor.

In section 1, we review discussions of innovation and enabling ecosystems by examining how innovation and development relate to each other. Next, in section 2, the research setting and approach are briefly presented. In section 3, we present the research results and findings. This discusses the current situation of the enabling ecosystem, stages of innovation, the innovation ecosystem, and the role of hubs in the two countries. Next, section 4 analyses findings from research results. The analysis will discuss the challenges that arise when leveraging an enabling ecosystem. This study will argue that human resource development, policies, regulations, financing mechanisms, and R&D are necessary to tackle these challenges. Finally, section 5 summarizes the conclusions drawn by the research project and outlines recommendations about how we should upgrade existing innovation ecosystems to ensure that low-income communities become a crucial component of a value chain of innovation.

1. Reviewing innovation and enabling ecosystems in the context of development

1.1. Innovation scales up the efficiency of development

Innovation has become a buzzword in development with increasing expectations of scaling-up aid effectiveness. However, innovation has various meanings depending on who uses it. J.A. Schumpeter in his book "The Theory of Economic Development" (Schumpeter, 2008: 66) presents five cases of innovation: (1) the introduction of a new good, (2) the introduction of a new method of production, (3) the opening of a new market, (4) the conquest of a new source of supply of raw materials of half-manufactured goods, and (5) the carrying out of the new organization of any industry.

"Innovation" in the development sector in general refers to the expansion of aid effectiveness by improving aid efficiency and extending aid by exploring new financial resources. Many so-called innovations in the aid sector are something with a focus on Science, Technology and Innovation (STI); yet, innovation does not need to accompany technological and scientific changes. Besides, innovation in the development sector in many cases involves private sector engagement, since the private sector is the place where innovation experts work. As such, businesses are the origins of innovation from both financial and non-financial perspectives. Bill Gates, during the G20 in 2011, strongly stated the paramount importance of innovation for development, including development aid, and suggested the promotion of innovation for development (Bill Gates, 2011). As such, private capital is a growing source of funds for development, and it provides funds through many different channels, including the philanthropic sector, impact investment, infrastructure funds, diaspora communities, and public capital to incentivize the research and development of new products. The number of enterprises that are considered a business, yet which solve social problems through innovation, and have entered what used to be considered the aid market, is increasing. Why does innovation matter, especially in developing countries? The next section discusses the relationship between innovation and development aid.

1.2. Innovation and development aid

Innovation is important in developing countries since it has an enormous potential to enable low-income communities to be included in economic development. Under such circumstances, innovation has become the prerequisite of development, especially in Africa. Many cases have already demonstrated how innovation can solve social challenges, expand employment opportunities, and improve services and goods while

driving economic growth in developing countries. Innovation has been recognized as necessary for development aid since the Millennium Development Goals (MDGs) era. The MDGs provided a clear message about the necessity of mobilizing private funds for the world to achieve these goals. It was mutually understood between development communities that official development assistance (ODA) alone was not enough to meet budgetary requirements of the MDGs; therefore, private funds would have to supplement ODA. Likewise, the Sustainable Development Goals emphasize the positive role of business entities more than ever. Innovation is, therefore, important for development. Likewise, the positive impact of innovation on development aid has drawn attention over the last few decades, especially after Bill Gates emphasized the importance of innovation in his above cited speech (Bill Gates, 2011).

In addition, the positive effect of innovation in development is recognized in the international arena. For instance, the Spanish Agency for International Development Cooperation (AECID), with two other institutes, found that AECID's innovation interventions had a greater positive impact on the living conditions of impoverished populations than other types of interventions (Barcelona Institute for Global Health, 2017). The European Union has strongly noted the contribution of innovation to tackling social challenges by stating that "A growing movement of tech entrepreneurs and innovators in civil society are now developing inspiring digital solutions to social challenges." In particular, the African Summit stated that innovation is the perquisite of development for African countries and is required to enable Africans to develop solutions to developmental challenges, such as poverty, health, energy supplies, water supplies, productivity, competitiveness, economic diversification, food security, climate change, and the governance issues the continent is facing[2]. The next section explores the kind of environment that is necessary for developing innovation.

1.3. Innovation ecosystem

An innovation ecosystem is an environment that provides innovative actors and entities with opportunities to freely interact, exchange ideas, and support each other. This helps to create continuous innovation. Thus, the idea has been promoted in developing countries by different actors, including local government, academia, and development agencies. A previous study identified how an innovation ecosystem "models the economic rather than the energy dynamics of the complex relationships that are formed between actors or

[2] African Summit (n.d.). (http://www.africainnovationsummit.com/about, accessed June 10, 2018).

entities whose functional goal is to enable technology development and innovation" (Jackson, 2011). The actors include "the material resources (funds, equipment, facilities, etc.) and the human capital (students, faculty, staff, industry researchers, industry representatives, etc.) that make up the institutional entities participating in the ecosystem (e.g., the universities, colleges of engineering, business schools, business firms, venture capitalists, industry, university research institutes, federal or industrial supported Centers of Excellence, and state and/or local economic development and business assistance organizations, funding agencies, policy makers, etc.)." Markman (2012) stated that, in general, we can foster innovation if we can identify talented innovators and nurture their ability to generate creative practical solutions to emerging problems. An innovation ecosystem works as a center of innovation to help investors identify talented innovators and nurture their ability to generate new tools, products, and/or processes to solve problems.

1.4. Enabling ecosystems to scale up innovation in Africa

An enabling ecosystem provides opportunities for innovation to scale up. In 2018, the Africa Innovation Summit kicked off in Kigali, Rwanda on June 6th. The Executive Secretary of the UN Economic Commission for Africa, Ms. Vera Songwe, called upon governments and entrepreneurs to scale up innovation on the continent (ECA, 2018). In order that innovation contributes to solve various social problems, scaling up was required. One way to scale up innovation is to build enabling ecosystems. An enabling ecosystem takes place in a so-called enabling environment, and it comprises a set of interrelated conditions that impact on the capacity of potential actors in a sustained and effective manner (Thindwa, Monico, & Reuben, 2003). Furthermore, enabling ecosystems to engage innovators and entrepreneurs with other stakeholders and help innovators and entrepreneurs link locally with a broad range of partners is essential (Cañeque & Hart, 2015). In a place like Africa, where 70% of consumers and 90% of the total population are in BoP communities, companies often lack the resources and capacity to scale up on their own. Thus, an enabling ecosystem that engages innovators and entrepreneurs with other stakeholders and provides opportunities to build partnerships, share resources, and risks as well as profits through participation in the value chain process is fundamental for businesses scaling-up in Africa.

A "hub" is a place where potential entrepreneurs can find innovation enablers who help scale-up innovation. The hub nurtures innovation ecosystems by encouraging the scaling-up of innovation by attracting innovators and entrepreneurs. Among the systems that encourage innovation, the hubs, especially the so-called tech hubs, are places where

technology startups and entrepreneurs like programmers, developers, hackers, and technologists, engage with people, ideas, and technologies (Gathege & Moraa, 2013). Furthermore, innovation hubs contribute to the modernization of societies by generating innovation that leads to economic growth (Jiménez & Zheng, 2018). Likewise, technology or innovation hubs are spaces where entrepreneurs and software developers innovate, network, and start businesses. As such, hubs are critical for promoting entrepreneurship and fostering startups and local entrepreneurship communities by bringing together key stakeholders (Obeysekare et al., 2017). They are especially critical in the ICT domain.

1.5. Low-income communities in Africa

This section explains who the low-income communities are that this paper refers to. They are also referred to as the BoP communities. According to the International Finance Corporation's (IFC) definition, the BoP is the section of the population who live on less than $8 per day (about less than $3,000 per year) when adjusted for local purchasing power (purchasing power parity: PPP). In 2005 PPP, about 4.5 billion people in developing countries were classified as low income and living on $8 a day or less (Hammond, Kramer, Katz, Tran, & Walker, 2007). As reported by IFC's recent Global Consumption Database (IFC, 2018), the broad definition of BoP was $8.4 per day at 2005 PPP.

2. Research methodology

2.1. Research setting and approach

This research is based on data collected from field visits in Rwanda and Uganda. The field visits were conducted from May 20, 2018 to May 23, 2018 in Kigali, Rwanda and from May 24, 2018 to May 29, 2018 in Kampala, Uganda. Data was collected from different stakeholders in the ICT innovation ecosystem in both countries through face to face interviews. Principally, interviews were conducted using semi-structured questionnaires and notes made during observation. Participants were recruited using a combination of convenience sampling and snowball sampling. First, the most relevant individuals, or key informants, were selected through research and approached by email and the telephone. These participants were asked to introduce other relevant stakeholders to participate in an interview. Target interviewees included academics, private business owners, ICT development consultants, donor agencies, employees from the ICT

supported industries sector, foreign government agencies, government officials, hub implementers, and hub users, such as business operators and entrepreneurs and individual workers from the ICT sector, international organizations, NGOs, and so on.
Table 1 and Table 2 show the groups of participants, number of interviewees, and short descriptions of groups.

Table 1. Rwanda interview participant groups

Participant Group	Number of Interviewees	Description
Academia	1	University and research institutes
Business	10	Private businesses
Consultant	1	Consulting business
Donor Agency	11	Official external donor including UN Agencies
Foreign Government Agency	2	Foreign government agency including embassies
Government Official	2	Government official
Hub Implementer	4	Hub founder and staff member
Hub User (Business)	1	Enterprise Hub user
Hub User (Entrepreneur)	4	Solo entrepreneur Hub user
Hub User (NGO)	1	NGO Hub user
Individual Worker (@supporting industry)	3	Individual worker in supporting industry
International Organization	2	International agency
Total	**42**	

(Source) Developed by the author

Table 2. Uganda interview participant groups

Participant Group	Number of Interviewees	Description
Business	18	Private businesses
Donor Agency	2	Official external donor including UN Agencies
Employee (of supporting industry)	3	Employed worker in supporting industry
Hub Implementer	6	Hub founder and staff member
Hub User (Business)	6	Enterprise Hub user
Hub User (Entrepreneur)	2	Solo entrepreneur Hub user
Hub User (NGO)	1	NGO Hub user
Individual Worker (@supporting industry)	4	Individual worker in supporting industry
Lawer	1	Lawer
Media	1	Media including web news paper
NGO	1	NGO
Total	**45**	

Source: Developed by the author

2.2. Research question

The objective of this paper is to explore the role of innovation ecosystems in two East African countries, Rwanda and Uganda. Empirically, we will describe the enabling

ecosystems in the two countries by exploring how they can be leveraged to promote local development. We explore the enabling ecosystem model in both countries, what has contributed to success, and what is required from innovation-led economic development to benefit the poor.

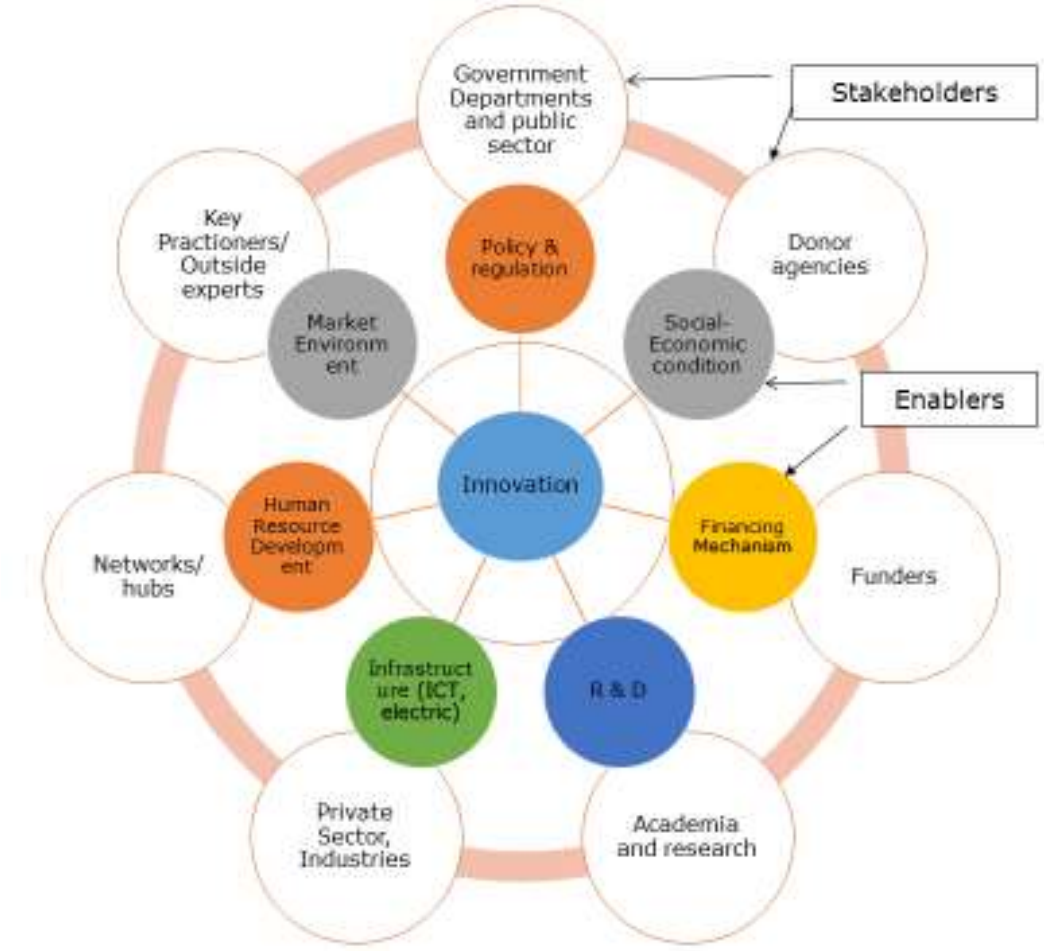
3. Findings

3.1. Enabling ecosystem in Rwanda and Uganda

This section explains what the enabling ecosystems in East African countries look like. In both Rwanda and Uganda, a variety of stakeholders have been urged to work hard to establish an active "ecosystem" of innovation. Different stakeholders, including public, private, and practitioners, are collaborating to nurture effective enablers within communities where entrepreneurs and innovators are generating innovation. Figure 1 below depicts an enabling ecosystem in a conceptual diagram that we developed based on our data, experts' opinions collected during the field visit, and the seven stages of innovation (European Commission, 2016). It presents a conceptual picture of enablers who support entrepreneurs and innovators generating innovation as well as stakeholders who provide and/or nurture enablers, entrepreneurs, and innovators. An enabling ecosystem supports stakeholder collaborations and nurtures enablers who support the development of innovation.

Enablers include polices and regulations, social-economic conditions, financing mechanisms, R&D, infrastructure (ICT, electric), human resource development, and the market environment. Stakeholders include (1) government departments and public agencies: those who have responsibility for meeting key areas of social need through innovation and collaborative working; (2) donor agencies: those who provide funds and technical assistance for development needs; (3) funders: those who have a large grant capacity and an interest in providing funds to generate and scale up innovation using market approaches; (4) academics and researchers: those who have an interest and are proficient in innovation and other key areas of social needs; (5) the private sector and industries: companies with an interest in supporting innovation incubation; (6) networks and hubs: facilities and networking groups that are already active in innovation generation or nurturing innovators and entrepreneurs; and (7) key practitioners: those who have been developing enabling ecosystems for innovation and have particular knowledge and experience within specific innovation sectors.

Figure 1. Enabling Ecosystem Conceptual Diagram



Source: Developed by author based upon insights from data collected during fieldwork interviews

3.2. Eight stages of innovation

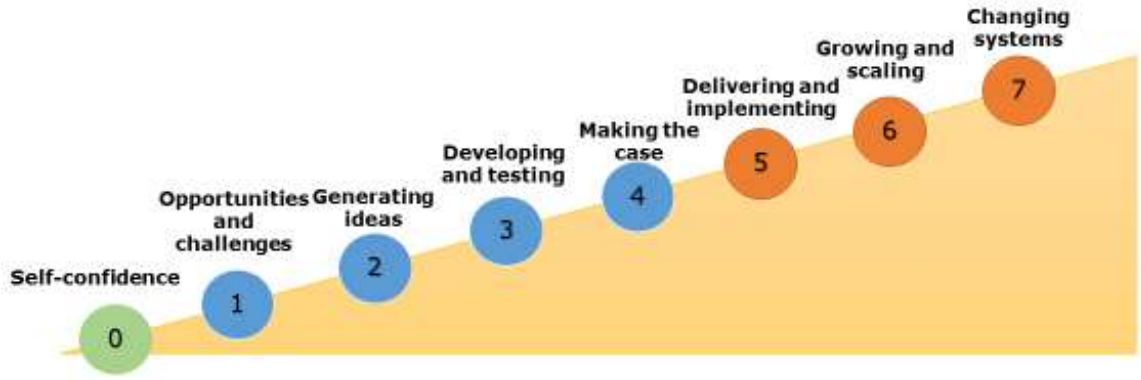
The growth model of innovation requires certain preconditions in Rwanda and Uganda; the self-confidence of potential innovators and entrepreneurs needed to innovate and take risks. The growth model in these countries is different form the model applied in developed countries. Thus, the stages of innovation are different from those in developed countries. While knowing that we cannot verify a linear development model since entrepreneurs and innovators will experience different setbacks and/or failures prior to success, this paper presents eight developmental stages of innovation in Rwanda and Uganda, by reflecting upon the findings from the field of research. These eight stages have been developed based on the seven stages of innovation (European Commission, 2016) which Nesta developed, which in turn was based on the six stages of the social innovation spiral (Murray, Caulier-Grice, & Mulgan, 2010). The seven innovation stages

include opportunities and challenges, generating ideas, developing and testing, making the case, delivering and implementing, growing and scaling, and changing systems. Our eight stages of innovation has an additional stage "zero," which is "the self-respect gained via learning experience," prior to the first of the seven innovation stages.

The eight stages of innovation that we draw upon in this paper has a stage zero at the base of the seven stages of innovation. Rwanda and Uganda are developing countries in East Africa. The innovation environments in these countries are different from the environment presumed by Nesta in a European context. In order that potential entrepreneurs in these countries to find opportunities and challenges in a local market, they need to be ready for it. In other words, they need the self-confidence to take actions. This self-confidence can be gained through experiencing self-awareness, education, and/or training. Without such self-awareness, a person would not recognize him/herself as capable of generating innovation. Thus, we include this process prior to the process of identifying opportunities and challenges. Figure 2 depicts the eight stages of innovation.

The stage of innovation the entrepreneurs or innovators occupy impacts how they interconnect with an enabling ecosystem and which type of support they need. For this reason, when we think about how enabling ecosystems can be leveraged to promote innovation in East Africa, we need to identify which stage of innovation is relevant to the discussion.

Figure 2. Eight stages of innovation



Source: Developed by author based on data and experts' opinions collected during fieldwork and the seven stages of innovation (European Commission, 2016).

3.3. Overview of innovation ecosystem of Rwanda and Uganda

Overall, enabling ecosystems in both countries have been well developed and upgraded; however, it does not necessarily help a low-income community to be included in that system. In general, low-income communities do not meet the prerequisite condition for entering the system. They need to enhance their capacity to interact and benefit from enabling ecosystems. In our discussion of the current situation of enabling ecosystems in Rwanda and Uganda, we identify the following actors: (1) those leading innovation ecosystems; (2) the current situation of stakeholders in enabling ecosystems; and (3) those benefiting from enabling ecosystems and how they are benefiting from enabling ecosystems.

3.3.1. Who are those leading innovation ecosystems?

The leading player in the innovation ecosystem in Rwanda is the state. The president Paul Kagame, with his strong commitment to lead innovation and the development of the innovation ecosystem in Rwanda, has focused on the utilization of ICT. It has a policy encouraging technology innovation as a key driver of its economic development. Its development program includes the Vision 2020[3] and the SMART Rwanda Master Plan 2015–2020 (Republic of Rwanda, 2015), which were built on the past National Information and Communications Infrastructure Plan (NICI). It also has the ICT sector strategic plan (2018–2024). In addition, the Japan International Corporation Agency (JICA) has launched a technical cooperation project with the ICT Innovation Ecosystem Project in Rwanda (JICA, 2017), "promoting the development of the ICT innovation ecosystem." Rwanda has been ranked second in the ease of doing business index among Sub-Saharan African countries, after Mauritius (World Bank, 2018).

Conversely, in Uganda, the market is leading the development of the innovation ecosystem, while the state is keen to generate an innovative environment. The country has been ranked the world's most entrepreneurial country, and the 2014/15 Global Entrepreneurship Monitor (GEM) report announced that 28% of adults in Uganda own or co-own a new business rather than being employed (GEM, 2015). Uganda has been recognized as the most entrepreneurial country in the world. This is partly due to the limited number of job opportunities in the country. We met many local "solo-entrepreneurs" or "self-made business leaders" rather than owners of registered

[3] A vision to transform Rwanda's economy into a middle-income and knowledge-based society with an annual growth rate of at least 11.5% with high levels of savings and private investment, thereby reducing the country's dependence on external aid.

companies during the field visit. It seems that most of those entrepreneurs run informal-sector or small-scale businesses without paying tax or registering their businesses. Naturally, those entrepreneurs generate innovation. The number of hubs helping the enabling ecosystem to scale-up total more than 16, and the number of entrepreneurs reflects the number of Ugandan potential employees who cannot find jobs; thus, there is no other way to earn a living than starting their own business.

3.3.2. Current situation of stakeholders in enabling ecosystems

This section discusses the current situation of each stakeholder in these enabling ecosystems. First, government departments and public agencies in both Rwanda and Uganda are positive about actively formulating policies and regulations. However, in Uganda, there are frequent changes in policies and regulations, which cause confusion. Meanwhile, donor agencies in Rwanda are actively supporting the development of innovation ecosystems, especially in ICT, as is the case with JICA. In Uganda, donors are also supporting innovation ecosystem development through utilizing innovative tools, such as mobile money to fund development projects. In Rwanda, funders are providing more start-up grants and seed money. Funding is more diverse in Uganda; from grants to loans and capital investment; although, the quantities and choices are insufficient to meet market needs. In Rwanda, the number of academics and researchers need to be increased, yet the country has succeeded in attracting world ranking university to open Carnegie Mellon University Africa in Kigali, Rwanda. However, in Uganda, the number of academics and researchers are insufficient due to the limited budget available to nurture the sector. Next, both in Rwanda and Uganda, private sector companies that intend to strengthen innovation and nurture ecosystems are few; however, in Uganda, thanks to the market driven environment, businesses are promoting innovation through their business operations. The networks and hubs in Rwanda and Uganda play a central role in the enabling ecosystem; however, their main function is limited to co-working space. Incubation and/or accelerator functions are insubstantial; moreover, hubs in Uganda offer more options than Rwanda, which enables entrepreneurs to choose a hub depending on their preferences and needs. Meanwhile, the key practitioners are foreign NGOs and foreign entrepreneurs, in Rwanda and Uganda, respectively. Table 3 shows the results of this research.

Table 3. Overview of innovation ecosystems in Rwanda and Uganda

Question	Rwanda	Uganda
1 **Who are leading innovation ecosystems?**	The government : Government-led development of ecosystem of innovation with utilizing ICT has been promoted (i.e., It has policy document such as, SMART Rwanda Master Plan 2015-2020 and ICT SECTOR STRATEGIC PLAN (2018-2024)).	Market : The market is leading Uganda's innovation ecosystem development. Spontaneous growth of business-centered ecosystem has begun. Jumia, the largest e-commerce service in Africa and Uber, a private taxi service, are also on the move.
2 **What is current situation of stakeholders?**		
① **Government departments and public agencies**	◎ : Active in formulating relevant policies and regulations.	△ : Uganda ICT Association(ICTAU) are active, though there are frequent changes in policies and regulation which cause confusion.
② **Donor agencies**	◎ : Active in supporting ICT ecosystem development(i.e., JICA has been engaging technical cooperation Project for the ICT Innovation Ecosystem Project in Rwanda).	△ : Utilizing ICT as a tool for ODA projects. i.e., Refugee support.
③ **Funders**	△ : More funds are provided for start-up grants and seed money.	○ : More widely diverse from grant to loan and capital investment.
④ **Academia and researchers**	△ : It is not enough though, it has succeeded in attracting world top rank university to open Carnegie Mellon University Africa in Kigali, Rwanda.	× : The number and quality of academia and researchers are not enough with limited budget to nurture the sector.
⑤ **Private sector and industries**	△ : Companies that intend to strengthen innovation and nurture ecosystems are not many.	△ : Companies that intend to strengthen innovation and nurture ecosystems are not many.
⑥ **Networks and hubs**	△ : The main functions are limited to co-working space. Incubation and/or accelerator functions are not substantial.	○ : It has more diverse choices than Rwanda that enable entrepreneurs can choose depending on their preference and needs. △ : Incubation and/or accelerator functions are not substantial.
⑦ **Key practitioners**	○ : Receiving support from foreign NGOs and entrepreneurs.	○ : Foreign entrepreneurs.

Source: Developed by the author

3.3.3. Who is benefiting from these enabling ecosystems and how?

This section explores whether entrepreneurs and innovators from the so-called BoP communities are benefiting from enabling ecosystems. Hubs provide start-up entrepreneurs with opportunities to gain information and networks to scale-up their businesses. They offer easy access to many entrepreneurs. Thus, we focus on hub functions to answer the question above and to observe how low-income communities are utilizing hubs.

In both Rwanda and Uganda, the main beneficiaries of enabling ecosystems are diasporas with experiences working in major consulting and investment companies, and foreigner entrepreneurs who have access to plural enablers and stakeholders from the enabling ecosystems mentioned in Figure 1. Their experiences and networks in developed countries enable them to fully utilize enablers with the cooperation of stakeholders. In

particular, they know how to access foreign funds, which is vital for local entrepreneurs to expand their businesses, since local enabling ecosystems do not have adequate financial resources. In the case of Uganda, Safeboda (https://www.safeboda.com/) and Tugende (https://www.gotugende.com/) are examples of companies which succeeded in attracting foreign finance.

While entrepreneurs with experience abroad are benefiting from the enabling ecosystems, low-income communities are not. They face a lack of capacity to access and utilize hubs. Many interviewees in Rwanda pointed out that the enabling ecosystem in Rwanda excludes those who need support the most, i.e., low-income communities. It was observed that enabling ecosystems for innovation in both countries do not exclude low-income communities purposely; rather, due to their limited capacity, these communities cannot enter the ecosystem. As a result, middle-income and educated entrepreneurs or businesses are benefiting from enabling ecosystems but not individual low-income entrepreneurs. Most members of low-income communities in both Rwanda and Uganda are at the zero stage of innovation and need empowering with the confidence needed to access further innovation stages. In Uganda, although individuals in low-income communities are not directly benefiting from the enabling ecosystem, low-income communities are indirectly benefiting by participating as a part of the value chain of businesses benefiting from the ecosystem. For example, thanks to Safeboda's stable business, their BoP drivers indirectly benefit from the ecosystem.

3.4. Hubs' role

Most hubs in both countries function mainly as co-working spaces where entrepreneurs build local networks and exchange information through seminars and other events. Basically, hubs are working spaces for entrepreneurs who cannot afford office spaces. Hubs provide work facilities and opportunities to create innovation by connecting with other entrepreneurs. Besides offering co-working spaces, some hubs function as accelerators, which provide intensive fixed-term special programs to established businesses, and provide scaling-up opportunities through mentoring and creating chances to pitch to investors. Likewise, some hubs functions as incubators, which provide mentoring or training services to selected entrepreneurs and develop their capacity. Most hub services are fee-based, except for those funded by the government or public sector.

3.4.1. Hubs in Rwanda

Most hubs in Rwanda function as co-working spaces where registered users do their works at the workspace office. We did not see any office rental space for individual companies. Social interaction among hub users was poor. We asked if users had ever talked with other unknown users in the hub before, and most of them answered "no." Spontaneous social interaction among users was very limited. Some experts said that it is due to cultural and historical background; the ordinary people of Rwanda do not like to share their ideas and plans with strangers, according to local experts.

The tech innovation hub, kLab (https://klab.rw/) was founded in Kigali in 2012 and a fabrication laboratory FabLab (https://www.fablabs.io/labs/FabLabRwanda) was founded in 2016. Both tech hubs are funded by the public sector and users can access the facilities for free. At kLab and FabLab, we met many university students and solo-entrepreneurs who said that they liked to use these hubs because they have high-speed internet access free at any convenient time. We met a solo-entrepreneur who made fabricated products using the computers and machinery at FabLab and earned about 200 USD per month. He had been using FabLab facilities since 2016. He expressed great appreciation for being able to use these facilities. We also met foreign architects and local engineers who designed buildings for a local industrial park and made heavy equipment at FabLab. At Impact Hub, which provided co-working space for free, we met solo-entrepreneurs and employees of SMEs and foreign NGOs. Most of the hub users were between stage zero of the eight stages of innovation; "generating ideas" to stage three; "developing and testing business plans." Most entrepreneurs and companies were establishing businesses or within a few years of establishing a business. In addition, the companies that we met were small businesses with no more than five employees.

3.4.2. Hubs in Uganda

Most hubs in Uganda function as a co-working spaces for a fee, unlike Rwanda. The monthly fee for an individual user starts at less than 100 USD. Unlike Rwanda's case, most hubs in Uganda provide office spaces to companies, not just individuals. Hive Colab (http://hivecolab.org/) provides incubation and accelerator functions to office registered companies and uses a selective review process to allocate office space to companies, while other hubs did not have selection processes for office space use. Each hub had different selling points, although almost all hubs supported entrepreneurs by developing their social networks through organizing networking events and seminars. Some hubs also provided mentoring services and special training programs for setting up businesses.

Meanwhile, most hub users belonged between stage zero of the eight stages of innovation; generating ideas to stage four; making the case for the business. Although most solo-entrepreneurs were at an early stage of business development, the stages businesses occupy were varied. This is different from Rwanda where most of hub users were at a very early stage of the business development and most solo-entrepreneurs were thinking of establishing businesses or were within a few years of establishing a business.

Hubs in Uganda that attract entrepreneurs and companies at different stages contribute to fostering a firm enabling ecosystem. There are many small and medium size companies that utilize hubs as office spaces with high-speed internet access, a convenient commuting address, and user friendly rental fees and conditions. Design Hub Kampala (https://designhubkampala.com/) for instance, attracts various companies and entrepreneurs, including a company founded nearly 20 years ago as well as entrepreneurs that are establishing businesses. The largest company had more than 20 employees. Each tenant can change the design of the rented space freely; therefore, the office space was different from one company to another and had become a very attractive working space. We heard many voices at Design Hub saying that it provides an environment that enables both entrepreneurs and employees of companies using the office space to interact and identify new business solutions.

4. Discussion

This section discusses how the enabling ecosystems in two countries could be leveraged to promote development. As mentioned above, enabling ecosystems in both countries have not included those who need support the most: low-income communities. Furthermore, many of interviewees pointed out the shortage of skilled talent who can meet market demands. For example, there is limited talent with high quality engineering skills and experience to serve immediate market needs, and very few international higher education institutions nurture young people's skills. Moreover, many young entrepreneurs and innovators did not have the capacity to develop business plans based on their ideas or even identify opportunities for business. There are insufficient education and training systems to foster entrepreneurs in addition to limited talent to manage companies when scaling up businesses.

During interviews, experts stated that wider society needed to develop the capacity of potential entrepreneurs and innovators, especially the young ones. In addition to that, there are very limited funding resources for the early innovation stages of zero to four.

This problem should be solved because potential entrepreneurs do not have the capacity to attract or utilize funds to expand their businesses. Although there are many young people who identify themselves as solo-entrepreneurs, due to their limited individual capacities and funding sources, most of their businesses are not generating any profit. During the field visit, we met a few solo-entrepreneurs who were generating a profit, yet only slightly more than their cost of living.

4.1. Challenges in leveraging enabling ecosystems

Many interviewees claimed that the most challenging problem in leveraging enabling ecosystems in Rwanda and Uganda was the development of the human capacities of individual entrepreneurs. They also claimed that since many entrepreneurs lack the fundamental capacities needed to develop a business, they were stuck at the very early stage of innovation. Furthermore, the hub as a platform was expected to provide growth opportunities to entrepreneurs through developing local networks and necessary supports. These did not function well due to the absence of a key person to manage these functions. For these reasons, most hubs were recognized as co-working spaces rather than incubators and/or accelerators, although most hubs claimed to serve both of those functions.

From the seven enablers presented above in Figure 1[4], interviewees mentioned human resource development as the most important, followed by policy & regulation, financing mechanisms, and R&D. Other enablers including social-economic conditions, infrastructure and the market environment are also important enablers; however, their importance was not highly emphasized by interviewees. The following discusses the details of each challenging area.

4.1. 1. Human resource development

Human resource development was key for the majority of innovators in Rwanda and Uganda who were plagued by the lack of fundamental human skills needed to step-up from the very early stage of the innovation process. The majority of the innovators in Rwanda and Uganda were at the early stage of innovation and as a result, most could not step-up from the very early stage of innovation.

[4] Seven enablers are policy & regulation, social-economic condition, financing mechanism, R&D, Infrastructure, human resource development and market environment.

Interviewees stated that potential entrepreneurs needed to develop human skills to engage in all eight stages of innovation presented in Figure 2 above. Those skills included self-confidence, teamwork, finance skills, presentation skills, and basic workplace organization skills like the Five Ss: Seiri, Seiton, Seiso, Seiketsu, and Shitsuke (sort, set in order, shine, standardize, and sustain in English) as well as others. Interviewees claimed that different human skills were necessary at each stage. During the earliest stage of identifying ideas and executing pilot projects, interviewees claimed that research skills to identify business opportunities and issues, business planning skills, IT and engineering skills, and marketing and business designing skills were needed. At the actual stage of starting a business, the ability to operate the project smoothly, such as business management skills using appropriate key performance indicators (KPIs), team management, project management, marketing & sales, were mentioned. At the stage of expanding the business due to additional investment, in addition to the capabilities listed at previous stages, leadership skills to nurture team members' commitment, and an adequate number of managers at higher levels were identified as necessary business management skills. Furthermore, some interviewees who were managing business operations in Rwanda stated that they could not expand their businesses due to the limited abilities of their employees.

4.1. 2. Policy and regulation

Respondents expected the government to create a business-friendly environment which motivates entrepreneurs to start their own businesses. For example, one of the interviewees in Uganda said that he was not happy with the government's behavior, which hinders business operations due to changing tax policy on mobile money and ICT related businesses. Most interviewees expressed similar opinions.

4.1.3. Financing mechanism

Respondents pointed out that different innovation stages needed different types of funding resources, such as grants, loans, investment, and other funding. Likewise, respondents claimed that innovators needed sufficient sources of funding at least until they could start a pilot project. Many respondents, including owners of businesses, academics, and hub implementers, noted the limitation of funds. For example, there are competitions whose winners receive small grants ranging from thousands to tens of thousands of US dollars. However, the amounts are too small to foster real start-up companies. They claimed that innovators needed between half and one million US dollars to start their businesses. Otherwise, the small grants awarded to competition winners in thousands of US dollars

are easily used up as living expenses. This happens because innovators in these countries usually do not have any financial support from their families and do not have enough money to survive.

4.1.4. R&D

Respondents stressed that governments should lead R&D strategies to foster internationally competitive engineers in each country. For example, a respondent from a local NGO who used to work at one of the best national universities in Uganda claimed that universities in Uganda neither have the capacity to do R&D based on researchers' own strategies nor the country's strategy, but they work on "budgeted research projects" which are contracted from development aid agencies. Therefore, the R&D capacity of the country is not being fully nurtured. This is due to the fact that universities' budgets are too small to develop their own R&D capacities. Universities are the center of R&D in any country and should be strengthened to foster high quality local engineers.

Table 4 describes actions recommended during interviews with four enablers at each of the eight innovation stages.

Table 4. Actions recommended by four enablers at each of the eight innovation stages

Innovation Stage		Human Resource Development		Policy & regulation	Financing Mechanism	R & D
0	**Self-respect gained via learning experience**	Ability to trust him or herself.	<Necessary for all stages> Human skills, self confidence, appropriate behavior to deal with a business, such as keeping deadlines and promises, and work as a team. Skills, knowledge and experience of developing and implementing a real business. This includes financial skills. Presentation skills to efficiently speak about impact of his or her own business.	Overall support from the government to form necessary policy and regulation to develop business friendly market environment, infrastructure, and social-economic condition.	Public or private grant funding.	R&D institutes as a foundation to foster internationally competitive young engineers, such as high level educational institutes and world top class universities.
1	**Opportunities and challenges**	Basic skills to find opportunities and challenges. Research skills for exploratory work.				
2	**Generating ideas**	Basic skills to generate ideas from opportunities and challenges on the ground. Also, IT and Engineering skills.				
3	**Developing and testing**	Marketing, business development, designing, and IT, Engineering and implementation skills.			Public or private grant funding, convertible grants and loans.	
4	**Making the case**	Business development and evaluation skills.			Public or private grant funding, crowd funding and investment.	
5	**Delivering and implementing**	Team management, business implementation, and project management skills.			Programme funds, equity, loans, grants, and angel investors.	
6	**Growing and scaling**	Leadership, team management, business implementation, project management, marketing and sales skills.			Equity loans, social impact bonds, and seed capitals.	
7	**Changing systems**	Leadership, team management, project management, marketing and sales, and nurturing staff members' capacity skills.			venture capital financing and private equity investors.	

Source: Developed by the author

Conclusion

Our research aimed to explore how existing innovation ecosystems could be upgraded to enabling ecosystems, which enhance low-income communities' capacity to interact and participate and as a result, contribute to poverty alleviation. Our results suggest that enabling ecosystems, with support from a variety of enablers in Rwanda and Uganda, are helping innovators to enhance their capacity and have opportunities at different stages of innovation.

We identified enablers of innovation ecosystems include polices and regulations, social-economic conditions, financing mechanisms, R&D, infrastructure (ICT, electric), human resource development, and the market environment. Likewise, we identified stakeholders include government departments and public agencies, donor agencies: those who provide funds and technical assistance for development needs, funders, academics and researchers, the private sector and industries, networks and hubs: facilities and networking groups that

are already active in innovation generation or nurturing innovators and entrepreneurs, and key practitioners. The results also suggest that there is fundamental precondition for local innovators in Rwanda and Uganda to enter innovation spiral and growth model of innovation: self-confidence. Therefore, we established eight stages of innovation for both countries to include this stage prior to the first stage of Nesta's seven stages of innovation.

The most challenging issue for innovation ecosystems is how to include low-income communities in a part of the innovation process. The involvement of low-income communities in enabling ecosystems remained marginal. There are disparities between low-income communities' capacities and what the innovation systems expect them to have for them to be able to benefit from enabling ecosystems. Although there are number of hubs which help local innovators to enter enabling ecosystems, due to the limited resources at hand, the majority of hubs remain co-working spaces.

Finally, we note some theoretical implications. One strategic implication for low-income communities in Rwanda and Uganda is the need to develop human resources to meet local market needs; for example, to foster fundamental business development skills and engineering skills of potential entrepreneurs and innovators, especially the young ones. This also includes fundamental interpersonal skills. Another strategic implication is the importance of appropriate policy and regulations to foster inclusion. Furthermore, financing resources and R&D to support generating innovations are also needed. These are essential for enabling ecosystems to leverage development in Rwanda and Uganda. With these efforts, functioning innovation ecosystems would have an enormous potential to include low-income communities in the economy and contribute to innovation and overall development.

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