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Drivers and Modalities of Collaborative Innovation among Nairobi's Mobile Tech Start-Ups

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Abstract
This article sets out findings from research into the collaborative modalities present in the innovation practices of mobile tech start-ups in the Kenyan capital, Nairobi. Drawing on findings from qualitative data collection from respondents at 25 start-ups in the Nairobi mobile tech ecosystem, the study explores the start-ups' participation in tech hubs, their internal collaborative activities, their external collaborations, their approaches to managing the knowledge and innovations they generate, and their approaches to the scaling of their enterprises. The study finds that three key drivers of the start-ups' collaborative innovation practices are openness, networking, and informality.

Keywords
mobile tech start-ups, tech hubs, innovation, collaboration, human resource development, knowledge governance, scaling, partnerships, networking, openness, informality, Nairobi, Kenya

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1. Introduction

Kenya has been hailed as Africa's "epicentre of innovation" (Moime, 2016), with its digital innovation activities in and around the capital, Nairobi, coming to be known as the "Silicon Savannah". Kenya's tech innovation start-up sector is, to a great extent, focused on innovations for use on mobile handsets. Since the launch of the M-PESA mobile money application (app) in 2007 by Kenyan mobile operator Safaricom, the country has seen the growth of a large and vibrant mobile app development ecosystem. Many start-ups leverage the M-PESA platform to create solutions in online financial services (fintech) and related sectors (Mwangi, 2017). At the same time,

Kenya's mobile tech start-ups are also engaged in developing mobile tech solutions in a wide range of other key sectors, including agriculture (see Karuga, 2013) and healthcare (see Lawrence-Brown & Nieminen, 2016).

Among the many factors seen as responsible for the rapid development and uptake of mobile technology innovation in Kenya, and across the African continent, is the proliferation of technology hubs (hereafter "tech hubs") (see Adesida et al., 2016; De Beer et al., 2017; Kaigwa, 2010; *The Economist*, 2012). These spaces provide business support in the form of mentorship, office facilities, networking opportunities, and seed funding. Through a tech hub, a mobile tech start-up is potentially able to receive support for its efforts to move from the idea stage to the minimum viable prototype stage, and then to take a product or service to market. In Kenya, perhaps the best-known tech hub is iHub, which has been singled out by numerous commentators as making a core contribution to the Kenyan mobile start-up scene (see, for example, *The Economist*, 2012).

Elements seen as central to innovation practices in many African settings are openness and collaboration (see, for example, De Beer et al., 2014; Pembroke, 2015; Smith & Reilly, 2013; Smith & Seward, 2020). Open and collaborative approaches to innovation, supported by flexible, non-exclusive approaches to knowledge governance, have been found to be central to the success, and efforts to scale, exhibited by many knowledge-based enterprises on the continent (see De Beer et al., 2014; Open AIR, 2020). With respect to start-ups, as Pembroke (2015) points out, there are so many challenges that none can succeed by going it alone, and, through collaboration, entrepreneurs can counter some of the inherent challenges of entrepreneurship (Pembroke, 2015).

The goal of this study was to explore the approaches to, and dimensions of, collaboration as being practised by Nairobi's mobile tech start-ups. We were also interested in the start-ups' approaches to knowledge governance and to scaling, as dimensions linked to their approaches to collaboration. Accordingly, we conducted a qualitative survey of the experiences and perceptions of representatives of 25 mobile tech start-ups engaged in the following sectors: fintech, bitcoin, community development, healthcare, hospitality, security, geospatial services, marketing, advertising, transportation, education, agriculture, real estate, software development, automation, IoT (internet of things), and outsourcing.

As is presented in this article, the data produced compelling findings on the drivers and modalities of the start-up innovators' collaborations, knowledge governance, and scaling. We were also able to identify, in the data, three cross-cutting dimensions that seem to be core animators of the start-ups' innovation practices: openness, networking, and informality.

2. Context

Kenyan start-ups

Start-ups in Kenya are, for the most part, micro and small enterprises (MSEs). In terms of the country's Micro and Small Enterprises Act of 2012 (hereafter "MSE Act"), *micro* enterprises have an annual turnover of less than KES500,000 (approximately USD4,600 in late 2020) and fewer than 10 employees, with small enterprises having an annual turnover of between KES500,000 and KES5 million (i.e., between USD4,600 and USD46,000) and between 10 and 50 employees (Republic of Kenya, 2012). In qualitative terms, we agree with Robehmed's (2013) conception of start-ups as entities "working to solve a problem where the solution is not obvious and success is not guaranteed".

Kenya's Vision 2030 development strategy recognises the need to strengthen start-ups and MSEs (GoK, 2007). The MSE Act, in line with Vision 2030, positions start-ups, particularly tech start-ups, as drivers of innovation. Start-up culture is characterised by "[a] workplace environment that values creative problem solving, open communication and a flat hierarchy" (Rouse, 2014). Such an environment aims, among other things, to provide an opportunity for the people working at the start-up to grow organically with it, even if employees ultimately decide to exit the company and, in many cases, launch their own start-ups. Start-up culture also typically involves flexible approaches to knowledge governance—i.e., innovative modes of knowledge-sharing and knowledge appropriation, often with an emphasis on informal modes. It has been found that the use of formalised intellectual property (IP) tools to appropriate knowledge among Kenya's knowledge-based businesses is minimal (Masinde, 2016; Rutenberg, 2013; WIPO, 2016).

In the period 2018 to 2019, funding of Kenyan tech start-ups was put at USD122 million (Disrupt Africa, 2019). Among the elements central to the growth of mobile tech innovation in Kenya are the aforementioned M-PESA mobile money platform and, in turn, the country's mobile money and fintech market (Mengistu & Imende, 2013; Pasquier, 2014; *The Economist*, 2012). Since the launch of M-PESA in 2007, and the subsequent opening of its application programming interface (API) to developers in 2015 (Mutegi, 2015), the Kenyan fintech sector has been transformed by numerous start-ups developing new M-PESA-linked products and services (see Adongo, 2015). In March 2020, Kenya, with a population of approximately 47.5 million, had 55.2 million active mobile subscriptions (a penetration of 116.1% of the population, with many users having more than one mobile SIM card); 29.1 million active mobile money subscriptions (61% penetration); and 202,102 active mobile money agents (CAK, 2020).

The emergence of Safaricom and its associated services, including M-PESA, was made possible by the deregulation of Kenya's telecommunications industry, starting in 1999. Several socio-economic factors have also contributed to the explosive uptake

of M-PESA and other mobile money transfer systems, including: the low number of Kenyans with bank accounts (and, in turn, credit cards); the high number of urban Kenyans who support relatives in rural areas; and security problems posed by transferring funds by hand or through intermediaries, e.g., via bus transport (Mengistu & Imende, 2013). Government support for Kenya's connections to international undersea fibre optic data cable projects, through strategic partnerships with the private sector, has also contributed by making broadband internet widely available and affordable (Mengistu & Imende, 2013).

Tech hubs and collaborative innovation

In mid-2019, according to one calculation, there were 681 active tech hubs across the continent (Giuliani & Adaji, 2019). Africa's tech hubs can be understood in terms of three prevailing hub "archetypes" (see De Beer et al., 2017):

- *cluster hub:* A small geographical region, e.g., a neighbourhood or urban corridor, containing a number of individual hub entities that frequently interact. Nairobi's Ngong Road is an example of a cluster hub, as it is home to iHub, Nailab, m:Lab East Africa, and Nairobi Garage.
- *company hub:* An individual hub entity serving a particular community of innovators, "interacting with the outside world in a manner similar to a company" (De Beer et al., 2017, p. 250) and operating either as part of a cluster hub or in a more stand-alone fashion.
- *country hub*: "a more macro view of a hub, where an entire country or region advertises itself as a progressive hub, and government policies guide the actions of the country or region" (De Beer et al., 2017, p. 250).

African tech hubs' culture of openness has generated support from many development partners, who believe that open collaboration holds the key to the success of start-ups on the continent, and who further believe that tech hubs can enable sustainable tech entrepreneurship. Tech hubs have been credited with fostering collaboration-enabling environments where start-ups can meet new people, find resources and investors, and test their business models (Pembroke, 2015). Since its establishment, Nairobi's iHub has sought to build an innovation community committed to sharing and collaboration, and these objectives were also central to the establishment of m:Lab in the same building as iHub (Gathege & Moraa, 2013). iHub seeks to create an environment for open innovation and collaboration between developers, academia, industry, venture capitalists, and investors (Gathege & Moraa, 2013). Its key vehicles for collaborative innovation are hackathons and competitions, during which ideas are openly shared. M-Farm and Rupu are among the start-ups that materialised after such iHub events. It has been argued that, as part of their internal collaboration processes, start-ups seeking to develop their human resources need to leverage the skills of current employees by ensuring that they serve as trainers (Bahrami, 2016).

For tech-based start-ups, a key form of collaboration is the interaction between individuals inside the organisation, where everyone works together to achieve a clear and shared aim in a specific context (Lopez Hernandez et al., 2018). The impact of collaboration on innovation is to some extent dependent on the nature of the partners involved in the process (Faems et al., 2005). In instances where collaboration is between a start-up and an established company, the value derived by each firm will be dependent on each actor's strengths (Steiber & Sverker, 2020). Organisations can harness collaboration in various ways, including internally through configuring their infrastructures in a manner that enables the sharing of ideas, and externally through their choices of location. Jiménez and Zheng (2018) argue that tech hubs' collaborative processes can contribute to human-centred development dimensions that are broader than employment and product development benefits.

Organisations can adopt closed or open models in their collaborative efforts. Closed innovation models are characterised by enterprises' efforts to, among other things, isolate their innovations and to keep them secret (De Beer, 2017, p. 17). Open collaboration models perform robustly not only in software innovation domains but also in many other types of ventures (Levine & Prietula, 2014). There is now a growing adoption of open collaborative models of innovation that can, for example, break down barriers to knowledge flows between enterprises (De Beer, 2017, p. 17). In Kenya, as mentioned above, the leading mobile telephone service provider, Safaricom, opened the application programming interface (API) for its M-PESA mobile money services in 2015. This opening was aimed at nurturing open innovation in Kenya (Safaricom, n.d.).

3. Research design

Methodology

The study used desk research to generate secondary data, and a survey questionnaire to produce primary data. In the desk research, basic information was gathered on all the start-ups that could be traced to Nairobi tech hubs, with contact information stored for the purposes of sourcing respondents for the administration of a semi-structured survey questionnaire, as outlined below. The desk research also yielded important background information on the start-up ecosystem in Kenya, including relevant reports, studies, and news articles. Based on the findings from the desk research, 25 start-ups in Nairobi were selected. Key resource persons at the start-ups were identified and contacted, and their inputs received through a semi-structured survey questionnaire administered via one of four means: an in-person interview, a phone interview, an online video interview, or respondent completion of the questionnaire in writing online. All interviews were audio-recorded and transcribed.

Questionnaire

The questionnaire (see Appendix) focused its questioning on the following elements of the 25 start-ups' mobile tech innovation practices:

- establishment, registration, duration of operations, human resources;
- sector(s), main products, types of problems addressed by innovations;
- organisation of workspaces, collaborations within the start-up, generation of business ideas;
- collaborations with external partners and stakeholders;
- sharing and protection of business knowledge and innovations; and
- approaches to the scaling of their enterprises.

Respondents

Table 1 below shows the sectors in which the 25 survey respondents' start-ups operated, the date on which the surveys were completed, and the survey mode used for each respondent.

Table 1: Respondents' sectors, survey dates, and survey modes

Respondent number	Start-up's sector(s)	Survey date	Survey mode
1	community development	9 March 2017	phone interview
2[1]	bitcoin, fintech	4 April 2017	online video interview
3	software development	20 February 2017	in-person interview
4	software development	22 February 2017	in-person interview
5	health	3 March 2017	in-person interview
6	digital marketing	31 March 2017	in-person interview
7	healthcare	8 June 2017	phone interview
8	outsourcing solutions	3 March 2017	in-person interview
9	software development	26 May 2017	phone interview
10	restaurants, leisure	17 April 2017	online questionnaire
11	IT solutions, security	2 May 2017	online questionnaire
12	IT solutions, geospatial services	9 May 2017	online questionnaire
13	IT solutions, advertising	15 May 2017	online questionnaire
14	IT solutions, machine automation	18 May 2017	online questionnaire
15	IoT (internet of things)	23 May 2017	online questionnaire
16	healthcare	24 May 2017	online questionnaire
17	transport and route mapping	26 May 2017	online questionnaire

1 This second response to the survey was provided cooperatively by two individuals from a single start-up, with each responding to the questions relevant to their area of expertise.

18	IoT (internet of things)	29 May 2017	online questionnaire
19	education	29 May 2017	online questionnaire
20	agriculture	30 May 2017	online questionnaire
21	real estate	6 June 2017	online questionnaire
22	fintech	9 June 2017	online questionnaire
23	healthcare	2 August 2017	in-person interview
24	healthcare	2 August 2017	in-person interview
25	fintech	3 August 2017	in-person interview

Table 2 shows the gender breakdown of the 25 respondents, and their roles in their respective start-ups.

Table 2: Respondents' gender, role/position

Characteristics	No. of respondents	% of respondents
Respondent's gender		
Male	19	76%
Female	5	20%
Did not say	1	4%
Respondent's role/position in start-up		
Founder/CEO	13	52%
Technical staff member	7	28%
Director	2	8%
Other	3	12%

Table 3 shows the core characteristics of the 25 start-ups that the respondents represented.

Table 3: Core characteristics of the 25 start-ups

Characteristics	No. of start-ups	% of start-ups
Number of employees in start-up		
1–3	3	12%
4–6	8	32%
7–9	5	20%
10–12	2	8%
13–15	3	12%
16 and above	4	16%
Legal status of start-up		
Sole proprietorship business	3	12%
Not-for-profit entity	1	4%
Limited liability partnership	2	8%
Limited liability company	19	76%
Location of start-up in Nairobi[2]		
Ngong Road	3	12%
Kilimani	4	16%
Westlands	4	16%
Juja	2	8%
Thika Road (Kenyatta University)	3	12%
Madaraka Area (Strathmore University)	6	24%
No physical space (online-based)	1	4%
City Centre	1	4%
Upperhill	1	4%
Months/years since start-up's establishment		
< 6 months	1	4%
6 months–1 year	3	12%
18 months–2 years	3	12%
24 months–3 years	4	16%

2 Respondent 9's start-up has offices in both Nairobi and Eldoret.

36 months–4 years	6	24%
48 months–5 years	4	16%
60 months–6 years	1	4%
72 months–7 years	3	12%
Company hub that start-up was based at or involved with at time of research		
Metta	1	4%
iHub	5	20%
iBiz Africa	6	24%
Chandaria BIIC	3	12%
KeMU Hub	1	4%
C4D Lab	2	8%
m:Lab East Africa	1	4%
Nairobi Garage	1	4%
SPRING accelerator	1	4%
Nailab	3	8%
Independent start-up (not involved with any company hub)		
Respondent 13	1	4%

4. Findings and analysis

We now present findings, drawn from the questionnaire responses, in terms of five themes:

- participation in tech hubs;
- internal collaboration;
- external collaboration;
- knowledge governance; and
- scaling.

Participation in tech hubs

Of the 25 start-ups surveyed, 10 were, at the time of the research, co-located with other start-ups in *company* hubs (according to the De Beer et al. (2017) company hub definition provided above); 14 had their offices in close proximity to other start-ups in a *cluster* hub (according to the De Beer et al. (2017) framing); and one was not interacting significantly with any hub.

In company hubs

For the 10 start-ups in company hubs, the hubs were said to provide benefit through numerous opportunities for networking and developing business ideas, in addition to affordable and serviced offices. The resident start-ups rely on the open and interactive spaces within the hubs in order to meet new tech entrepreneurs and investors, access mentorship opportunities, remain aware of tech trends, and explore business and networking opportunities with other start-ups. According to respondent 5, whose start-up was working out of the iBiz Africa company hub:

> iBiz Africa offers a platform where start-ups can share information, and the fact that [our] developers get to grow by sharing their challenges and technical problems with other developers at iBiz [is an added advantage]. This process [of interacting with other developers] helps our developers solve problems much faster.

A similar sentiment was provided by respondent 20, whose start-up has had substantial interactions with various tech hubs:

> Involvement in accelerators and tech hubs has been a huge factor in our success. We met our first angel and institutional investors at [an] accelerator, and have expanded the business through networks built at various accelerators and tech hubs.

According to respondent 6, the networking opportunities offered by company hubs are so crucial to business development that some start-ups seek to switch hubs once opportunities at one hub have been exhausted:

> We have been at iBiz for the past two years, and feel that we have exploited all the networking opportunities, including getting business from other start-ups working at iBiz, and have saturated that window of opportunity. Moving to a workspace with a similar set-up, such as Nairobi Garage, would afford us more networking opportunities and a chance to interact with other start-ups at the hub, including competitors that are in the same space, so as to understand the dynamics at play.

In cluster hubs

Among the 14 start-ups with offices in geographical clusters of start-ups, the two located in Westlands, a Nairobi suburb, cited the advantages of the area's many IT companies and IT start-ups, hence allowing easy interaction and exploration of ideas.

Also extolling the virtues of participation in a cluster hub was respondent 4, from a start-up located in the Ngong Road cluster hub:

> The area around Ngong Road and Kilimani is a cluster for tech hubs and tech start-ups. […] [We] had offices along Kilimani Road, Adams Arcade, and then moved to our current location on Ngong Road. [We] moved office as [we] scaled […]. The clustering of tech companies [increases] the ease of sharing experiences, networking, learning from shared experiences, and growing as a start-up/company.

Internal collaboration

Use of open-plan offices

All the interviewees extolled the virtues, for all or most of their internal activities, of open-plan office set-ups in which teams—in particular, developer teams—are able to work openly and collaboratively. In the words of respondent 20: "[we] have an open work [space where] all teams are mixed and work collaboratively". According to respondent 8, from a start-up based at the iBiz Africa company hub, an open-plan office "provides the opportunity to network and collaborate with other start-ups that operate from iBiz". Two of the start-ups had opted for closed offices for their senior management combined with open-plan areas for their tech developers, allowing developers to easily share ideas and collaboratively solve technical problems. Respondent 18's start-up had its offices in a townhouse where its founders lived and which had an open-plan office set-up. Respondent 21's start-up had previously been hosted in an incubator hub with shared offices. As the start-up grew in size, it needed more space, and it opted to move to a private space where, among other things, it was better able to establish its own company culture. In the new space, it had adopted "[an] open office setup, [but also] with separate quiet/thinking rooms" (respondent 21).

Use of online platforms

The start-ups carrying out substantial amounts of fieldwork also make extensive use of virtual open working environments. They tend to have physical meetings as a team only when absolutely necessary. Mostly they communicate and collaborate via online tools such as Slack, Scrum Agile, Jira, Trello, Basecamp, WhatsApp, and email. These tools have the necessary flexibilities, allowing for a mixture of in-office and remote collaborative working between the start-ups' founders, staff members (both part-time and full time), interns, and collaborators hired for specific tasks.

Collaborative development of human capital

On-the-job training, sometimes supplemented by the use of free online training resources, is the start-ups' preferred mode of human resource development. In addition to being a cost-effective form of human capital development for start-ups operating

under tight financial constraints while seeking to grow and scale, on-the-job training was said to have numerous additional benefits. In the words of respondent 13:

> [We] prefer on-the-job training and collaboration through learning. It offers a fulfilling experience for us. It also serves as an important avenue to spread the company culture while offering our interns a chance to grow from the ground up.

At respondent 23's start-up, one of the founders has developed a practical-oriented internal training programme targeted towards the specific needs of the start-up's trainees. Respondent 14's start-up uses YouTube Tutorials for any "heavy training" that members need. Respondent 18's start-up also uses YouTube as an online training resource, as well as free online courses offered on massive open online course (MOOC) platforms such as Coursera and edX. Training can also play an important role in product development at the start-ups—serving, in the words of respondent 13, "as an avenue to innovate around existing products while coming up with new ideas and processes". According to respondent 15,

> […] training programmes […] make the members of the start-up more resourceful, as well as better equipped to handle specific tasks that in turn would enable the members of the start-up to access their skills and knowledge in providing innovative client-based solutions. The training has also proved to be very useful to the members of the start-up in the competitive tech industry.

According to respondent 17, the knowledge acquired by Kenyan university students during their degrees is "[…] very theoretical and not practical enough". In the words of respondent 24, "[f]ormal education does not prove useful when running a start-up". According to respondent 7:

> The training offered [at respondent 7's start-up] is more hands-on, i.e., more practical. Despite the interns/students being in their final year of study [at university], they lack the hands-on skills required in the marketplace, which is very worrying. The students possess a lot of theoretical knowledge as opposed to practical skills.

Training can also have a strong personal empowerment dimension for employees. In the words of respondent 21, "training not only helps them get better at their individual roles, but also empowers their decision-making capabilities in their own personal lives".

Collaborative development of business ideas

The respondents generally saw their start-ups' business idea-generation processes as being collaborative, and typically following one of three approaches: a spontaneous approach, a human-centred design approach, or a "lean canvas" approach (Maurya, 2012). Six respondents indicated that their start-ups are, to a great extent, spontaneous, i.e., do not adopt any specific formal process, in their origination of business ideas. In the words of respondent 12: "[when] any idea comes up, we SWOT it [conduct a strengths, weaknesses, opportunities and threats analysis], do market research, [then] work on it". According to respondent 2:

> When an idea is pitched, a few of the team members will see if the idea is viable, and when the idea is deemed viable, they will map out the implementation of the idea into different phases. There is a communal system of sharing business ideas.

Ten respondents saw their start-ups' processes for developing business ideas as being primarily based on the observation of the needs and problems faced by potential customers, i.e., a human-centred design process. In the words of respondent 20, from a start-up targeting the agricultural sector: "[t]ypically, business ideas are ideated to solve a problem; either one we are facing or one our customers are facing. We ideate collaboratively, implement, test and refine the solution." According to respondent 18: "We do customer research by building simple websites, marketing them and seeing how much interest they pull from potential customers." Respondent 4 explained the process in this way:

> Ideas […] come from customers and the solutions created are bespoke solutions to cater for the clients' needs. The process to create these bespoke solutions involves requirement-gathering, analysis of the client's legacy system, and the development of a proposed solution to solve the customer's pain point.

Four of the surveyed start-ups use elements often associated with the lean canvas technique to develop business ideas. The lean canvas technique involves team members collectively brainstorming ideas, capturing the ideas on a one-page canvas or flipchart, and then writing down a model for the implementation of the ideas (Maurya, 2012). In the words of respondent 21, whose start-up was in the real estate sector: "[w]e use the lean canvas to brainstorm, and the validation board to experiment/go to market". According to respondent 2, whose start-up is in the bitcoin and fintech sector:

> [w]hen an idea is pitched, a few of the team members at [the start-up] will see if the idea is viable, and when the idea is deemed to be viable, they will map out the implementation of the idea into different phases. There is a communal system of sharing business ideas.

External collaboration

All the surveyed start-ups collaborate externally with other (non-rival) start-ups and individuals through various means, including joint ventures, strategic partnerships, consultancies, and contractual arrangements. For respondent 20's start-up, external collaborations are with a mix of both long-term partners and partners with whom the start-up engages on an as-needed basis:

> We have an extensive partnership ecosystem of organisations including data suppliers, farmer organisations, development organisations, and financial institutions. We also engage with external consultants on an ad hoc basis.

According to respondent 20, "[c]ollaboration allows us to remain a lean team, while accessing the resources and expertise we need to succeed". In the words of respondent 21 in the online questionnaire: "[we] get resources we wouldn't be able to afford [if it] weren't … for collaboration". And in the words of respondent 16: "[c]ollaboration reduces risks, shares resources, [and] improves expertise".

Respondent 14's start-up has found that external collaboration enables it to learn new things from its partners, especially in respect of the innovation process. According to respondent 17, external collaborations benefit the start-up "through sharing of different ideas [and] approaches to growth". In the words of respondent 19, the main benefit of collaboration is that "[t]here are partners who come to complement our weakness with their strengths". Respondent 22 spoke of using collaborations with external partners to create new revenue streams and product lines. Respondent 15's start-up collaborates with public relations companies that can boost the start-up's public image and engage in community service work that the start-up would not be able to successfully perform.

For respondent 13's start-up, external partners provide access to additional African markets beyond Kenya:

> The companies we have collaborated with have a wide reach across the African continent. They will play an important role in allowing us to scale faster, a process that would have taken a long while if we were to pursue these avenues ourselves.

At the same time, external collaborations are not without their challenges. While respondent 13's start-up has benefited from external collaborations, the respondent voiced a concern that, because the number of decision-makers increases, collaborations can slow down product development. Respondent 16 expressed the view that some collaborations can serve to limit a start-up's involvement with other potential partners. Respondent 23's start-up has experienced challenges in working with some

non-governmental organisations (NGOs) and with Kenyan County governments, due to collaborations being halted as a result of lack of consistent funding or the termination of funding.

Knowledge governance

It was found that some of the start-ups have experienced what they regard as misappropriation of their ideas—by other start-ups, or individuals with whom they have collaborated. Respondent 20 gave the example of having discussions with potential start-up team members "who were thinking about similar products [and] who then went on to start a company with similar aspects to our work".

Among the 25 start-ups surveyed, only six were found to have used non-disclosure agreements (NDAs) to protect their knowledge, and a majority (13) had not yet engaged in any form of formalised knowledge protection or appropriation, such as via the intellectual property (IP) tools of trademarks, patents, utility models, or claims of copyright. Seven respondents said that their start-ups have copyright registrations (even though registration is not necessary in Kenya in order for copyright to exist in a work), two spoke of pending patents applications, five said that their start-ups have trademarks, and one spoke of the start-up having a trade secret. According to respondent 5, the value of IP to the start-up's business is to protect against copycats (both start-ups and established companies) using their ideas. In the words of respondent 4:

> We put a lot of resources from the business's finances to develop products that are aimed for the mass market, so intellectual property protection provides a way for us to protect our long-term interests and avoid anyone else ripping-off our products for their own benefits. IP adds to the value of the whole company, like having patented solutions could increase the value of the company when it comes to valuation.

However, respondent 7's start-up has found the registration process for trademarks and patents with the Kenya Industrial Property Institute (KIPI) to be slow, and thus a poor use of time and resources. The start-up approached the IP office of a local university to assist with a patent application process, but found the university's process too involved. The general perception among most of the start-ups is that Kenya's patent and trademark registration processes are overly long, complicated, and expensive. Respondents 23 and 25 were of the view that their start-ups' resources are better spent on product development and on scaling the business than on the "secondary" priority of IP protection—although they acknowledged the importance of their start-ups finding ways to protect their IP.

Respondent 8 explained that in the fast-moving world of mobile app development, IP protections will not dissuade competitors from creating similar products and entering the market in which you trade: "So, we haven't really thought of patent-

ing anything because, you know, information technology is based on growth: make something better and sell it." Respondents 3, 7 and 25 stated that for their start-ups, the first-mover advantage is more important for growth than patent protection. As respondent 25 explained: "As far as we know, there's no clear way to protect your knowledge or know-how. So how we [do it] is, we execute faster, before somebody else." Respondent 7 stated that in the world of technology, time is of the essence, so rather than "waste time" with patent protection, the aim of the respondent's start-up was to "develop things and move first/fast into the market". Table 4 provides a picture of what the 25 respondents said were the modes of knowledge appropriation, and efforts at competitive advantage, used by their start-ups.

Table 4: Start-ups' modes of knowledge appropriation/protection and pursuit of competitive advantage

Modes of knowledge appropriation/protection used by start-up	No. of start-ups	% of start-ups
None	13	38%
Copyrights	7	21%
Trademarks	5	15%
Trade secrets	1	3%
Patents (pending applications)	2	6%
Non-disclosure agreements (NDAs)	6	18%
Means used to compete with rival firms		
Superior quality and affordability	8	32%
First-mover advantage	5	20%
Branding and marketing	4	16%
Product innovation	8	32%
Collaborations	0	0%

Scaling[3]

The start-ups were found to be seeking to scale through, among other things, enlarging their product ranges (e.g., by developing and commercialising new products), opening more outlets, entering new markets, and increasing their number of employees. For example, respondent 23's start-up at first offered its services for free, and later began charging a subscription fee. The start-up now launches new products for sale to its subscribers in order to increase the capacity of the company to scale.

3 For an in-depth treatment of approaches to innovation-scaling by start-ups and other knowledge-based enterprises in African settings, see Open AIR (2020), *Scaling Innovation: How Open Collaborative Models Help Scale African Knowledge-Based Enterprises*.

Respondent 22's start-up found collaboration to be of great value in the pursuit of scaling, as it creates new revenue streams and product lines. And, as we saw above in section 6 on "external collaboration", respondent 13's start-up is seeking to scale "across the African continent" through external partnerships.

Respondent 9's start-up has changed its collaboration structure in order to pursue scaling. Initially the team at the start-up worked jointly and collaboratively on a single project. In order to scale, the team split into four teams of two each, to head four different projects simultaneously—including projects outside Nairobi, e.g., in the town of Eldoret, in western Kenya, where the start-up has established a second office.

Some start-ups have changed their business models in order to scale. At respondent 25's start-up, the first business model, based on the start-up's development of a retail discount card platform, consisted of partnering with service providers to increase the service providers' sales. The next business model involved a shift to a mobile point-of-sale solution for the same service providers, which, according to respondent 25, is more amenable to scaling. In the words of respondent 25, "[…] we decided to pivot into a mobile point-of-sale [product], in the form of a mobile app that enables businesses to capture sales and purchases, record their expenses, and manage their stock".

5. Conclusions

The findings and analysis provided above suggest a number of cross-cutting drivers of the start-ups' collaborative innovation practices. Three key drivers are:

- openness;
- networking; and
- informality.

Openness is at the heart of Nairobi's mobile tech ecosystem, as exemplified by the start-ups' organisational set-ups, physical spaces, processes for developing business ideas, and modes of human capital development. Also, many of the approaches to knowledge governance adopted by the start-ups are grounded in an ethos of interaction and open collaboration, both internally and with external partners. We also consider the culture of openness by the start-ups as integral to their approaches to the scaling of their enterprises, as it allows them to optimise their business models while not losing sight of their specific product and service offerings. Further, openness facilitates networking and funding opportunities for the start-ups and enables additional skills development for team members. It is important to state that in respect to knowledge governance, some of the start-ups combine elements of both openness and protection, i.e., they consider certain aspects of their business knowledge to be open to all others, while other aspects are either kept confidential or closely guarded (with, in some cases, IP protections in place or being sought).

The role of *networking* in the practices of start-ups is another prominent feature in the findings. Tech hubs are primary sources of networks for most of the start-ups, with the hubs connecting the start-ups with each other, with investors, and with other strategic partners. Collaborative external partnerships, forged through networking, are key drivers of the start-ups' innovation and enterprise development practices.

In respect of the third cross-cutting factor, *informality*, the mobile technology space in Kenya has, since the advent of M-PESA, witnessed an upsurge in mobile tech innovations driven largely by self-employed or freelance or part-time developers engaged in start-ups located within or around tech hubs. At the same time, it must be noted that some of these developers have engaged in the limited formalisation of certain aspects of their enterprises, e.g., through company registration, full-time employment for team members, written contracts with clients and consultants, NDAs for third parties, and use of the IP system. Thus, there is evidence of the start-ups bridging between, and harnessing, both informal and formal modalities within a general pursuit of open, networked collaboration. This bridging of informal and informal elements is also present in the start-ups' human capital development modalities, with almost all the start-ups in the study emphasising the need to supplement formal education for their team members with practical, and largely informal, on-the-job skills training.

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Appendix: Questionnaire

1. Name of start-up?
2. Name of interviewee? Position at start-up?
3. Date of establishment of the start-up?
4. How long has your start-up been in operation?
5. Location of the start-up and why?
6. Has your start-up had offices in another location/other locations? If so, what were the reasons behind your start-up having offices at these other locations and what was the reason for your re-location to your current offices/office space?
7. How is your office space organised for teams at work?

8. Type of registration of the start-up? (business, company, LLP etc.)
9. Details of founders of the start-up? (e.g., name, designation, level of education, expertise, age, gender)
10. Has the structure of your start-up changed since the company was founded? (e.g., change in management, have some of the founders left the company? etc.)
11. Total number of staff at the start-up?
12. What problem(s) does your "mobile tech" start-up aim to solve and how?
13. What is your start-up's leading product/service?
14. Do you consider yourself to be in the mobile tech space and why?
15. Has your start-up had any interaction/involvement with any tech hub(s), e.g., incubator, accelerator, co-working space? Why?
16. How has any interaction/involvement with any tech hub(s), e.g., incubator, accelerator, co-working space, affected your start-up? Why?
17. Typically, how are business ideas developed and tested at your start-up?
18. Typically, how are intangible business assets (know-how, ideas, and processes) protected at your start-up?
19. Typically, how is business knowledge shared at your start-up among the core staff members and other staff members/consultants that work in conjunction with your start-up?
20. Typically, how is customer business knowledge shared at your start-up?
21. Does your start-up have any contracts in place with its core team and other staff, etc.?
22. Does your start-up have any contracts in place with customers?
23. Does your start-up have any contracts in place with business partners?
24. How do you collaborate with other companies or external individuals in your operations?
25. Does your start-up have competitors? If so, how does it maintain a competitive edge?
26. Does your start-up have copycats? If so, explain with examples of how you deal with copycats.
27. How does your start-up generate revenue?
28. How does your start-up plan to scale up its business?
29. How does your start-up plan to make its business sustainable?
30. What types of funding has your start-up received? If so, what percentage of total expenditure is accounted for by external funding?
31. What means do you use to protect your innovation(s)?
32. Do you employ any intellectual property protection in your start-up? Why? Why not? Which types? How?
33. What is your perception of the value of intellectual property protection to your business?
34. Do you utilise third party software in your operations? If yes, which software and why?
35. What contribution, if any, does mobile tech innovation have to the society in Kenya?
36. What is missing/lacking in the mobile tech space to ensure growth?