



Power Relations, Innovation, Scaling, and Knowledge Governance at Three Egyptian Tech Hubs: An Initial Exploration

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Working Paper 21
Published: 6 January 2020

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Abstract

This Working Paper offers an initial exploration of innovation realities at technology hubs in Cairo. The findings discussed are drawn from interviews with leadership personnel at three tech hubs: the private-sector Flat6Labs, the university-based American University in Cairo (AUC) Venture Lab (AUC V-Lab), and the government-run Technology, Innovation and Entrepreneurship Center (TIEC). The research captured the perceptions of the three interviewees' (one from each hub) in respect of the power dynamics between hub management and startups using the hubs; the nature of the innovation taking place in the hubs; the approaches to scaling present at the hubs; and the knowledge governance mechanisms being employed at the hubs. It was found that power relations between the startups and their hosts were governed in a number of ways, including via contracts and hubs taking equity stakes. It was also found that the startups' innovation practices tended to be open and collaborative, and that scaling, while meaning slightly different things and being approached differently across the three spaces, was a key concern and challenge for all three of the hubs and for the startups they were hosting. In terms of knowledge governance, the interviewees indicated that the startups using their hubs generally did not have a strong interest in pursuit of formalised intellectual property (IP) protection for their innovations.

Acknowledgements

This work was carried out by the Access to Knowledge for Development Center (A2K4D) at the American University in Cairo (AUC), under the auspices of the Open African Innovation Research (Open AIR) network. Open AIR is a partnership among AUC, the University of Cape Town (South Africa), the University of Johannesburg (South Africa), the University of Ottawa (Canada), Strathmore University (Kenya), the Nigerian Institute of Advanced Legal Studies (Nigeria), and researchers in 15 African countries and Canada.

The authors acknowledge the support provided for this research by Open AIR, the Social Sciences and Humanities Research Council (SSHRC) of Canada, and the International Development Research Centre (IDRC). The views expressed in this work are those of the authors and do not necessarily represent those of the research funders.

The authors are grateful for the research assistance provided by the following A2K4D researchers: Farah Ghazal, Sarah El Saeed, Mai El Khamisi, Mohamed Hosny, and Farida Kamel.

Keywords

technology hubs, tech hubs, innovation, scaling, openness, collaboration, knowledge governance, intellectual property (IP), startups, entrepreneurship, Cairo, Egypt

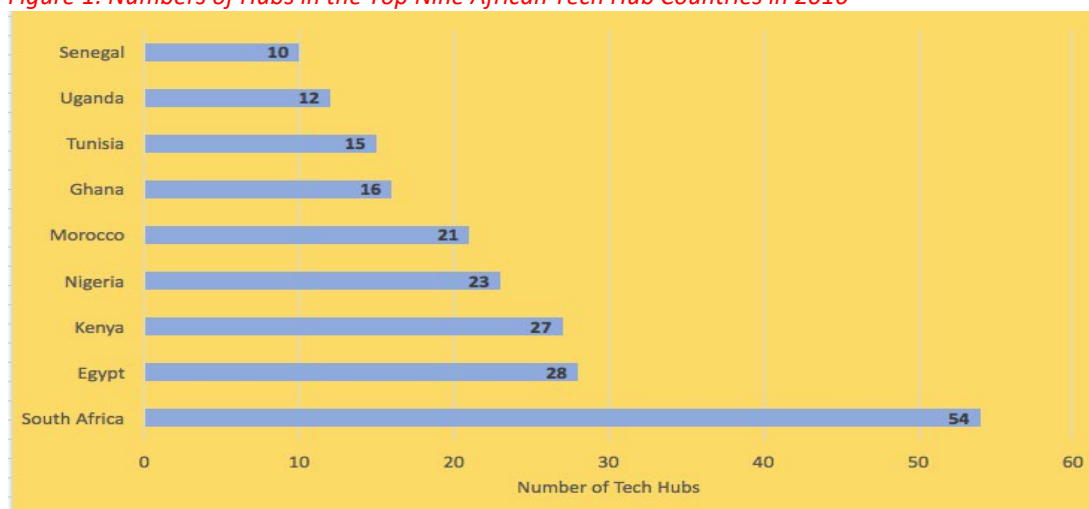
I. Introduction

The entrepreneurial scene in Egypt has flourished at a remarkable pace, with the 2011 Arab Spring uprising acting as a key trigger. This boom in entrepreneurship has manifested itself in, among other things, a thriving innovation ecosystem that includes numerous technology startups and a variety of models of technology hubs, accelerators, and incubators. Linked to these trends has been a growth in Cairo's technology sector. In 2015, Endeavor Insight and Mercy Corps Egypt reported that the compound annual growth rate (CAGR) in the number of tech companies in Cairo had increased by 35% during the period 2010 to 2014, resulting in almost 300 companies (Endeavor Insight & Mercy Corps Egypt, 2015). At the same time, however, tech startups in Egypt face considerable challenges, including weak technology infrastructure; power shortages; limited access to finance and human capital; cumbersome regulations; and poor knowledge of business concepts (Ismail, Tolba & Barakat, 2016). One of the strategies that budding Egyptian startups are employing to address their challenges is to join technology hubs (hereafter "tech hubs").

The Egyptian case is part of a wider trend across Africa, where there is an abundance of tech hubs—with these hubs hailed as progressive forces having positive impacts on African economies. As of September 2015, the World Bank listed 117 tech hubs in Africa (Kelly & Firestone, 2016). A July 2016 GSMA report stated that there were 314 active tech hubs on the continent, compared to 287 in South and Southeast Asia (GSMA, 2016). The GSMA found that the leading African countries with respect to tech hubs were Morocco, Tunisia, and Egypt in North Africa; Nigeria, Ghana, and Senegal in West Africa; Kenya and Uganda in East Africa; and South Africa in Southern Africa (GSMA, 2016). As shown

in Figure 1, in 2016, Dahir ranked Egypt second in terms of the number of tech hubs in Africa, behind only South Africa (Dahir, 2016).

Figure 1: Numbers of Hubs in the Top Nine African Tech Hub Countries in 2016



Source: Based on data from Dahir (2016)

By October 2019, the number of tech hubs identified across Africa was estimated to have increased to 643 (AfriLabs & Bridges, 2019). These included co-working spaces, incubators, accelerators, and hybrid innovation hubs affiliated with government, universities, or corporates (AfriLabs & Bridges, 2019). With the significant increase in the number of tech hubs on the African continent, and as tech hubs gain prominence as homes to startups, the dynamics at play amongst the different stakeholders in these spaces warrant further study.

In this Working Paper, we outline findings from a preliminary study of dynamics at three Cairo tech hubs in respect of power relations; innovation; scaling; and knowledge governance, including intellectual property (IP) elements. The study consisted of desk research, an extensive literature review, and interviews with leaders at three prominent Cairo tech hubs (selected, on a purposive sampling basis, because they had differing ownership and control characteristics):

- Flat6Labs, a private-sector hub
- AUC Venture Lab (AUC V-Lab), based at The American University in Cairo (AUC); and
- Technology, Innovation and Entrepreneurship Center (TIEC), a government-run hub.

The next section of this paper, section II, provides the study context and the findings from the literature review. Section III outlines the research design, section IV provides findings, and section V suggests directions for future research.

II. Context and Literature Review

A. Egypt's Tech Innovation and Entrepreneurship Ecosystem

i. Strengths

Egypt is gaining prominence on the international scene as having a vibrant, emerging startup ecosystem. A number of factors make it attractive for potential investment in startups. According to Flat6Labs, Cairo's "readily available pool of talented developers, techies and entrepreneurs" is among the most positive aspects of doing business in Egypt (Virgin, n.d.). With a population of more than 98 million, of which 50% are below the age of 30, entrepreneurship opportunities are on the rise in Egypt as an alternate means of employment.

ii. Government Support

Since 2000, there have been numerous government-led initiatives to support technological innovation and entrepreneurship in Egypt. These include the 2000 ICT Master Plan, the 2003 Egyptian Information Society Initiative, and Egypt's ICT Strategy 2007–2010, produced by the Ministry of Communications and Information Technology (MCIT) to stimulate an innovative ICT sector. The sector has long been perceived as an important contributor to the country's gross domestic product (GDP) and as a potential source of employment and prosperity. Knowledge and innovation in ICTs and scientific research, feature prominently in Egypt Vision 2030 (GoE, 2014). Since the 2011 uprisings, government rhetoric has stressed, inter alia, the importance of harnessing the socio-economic and developmental potential of ICTs and entrepreneurship in support of youth employment (Helmy, 2013).

In respect of entrepreneurship, the Technology Incubation Program (TIP) was established in 2006 at the government's Information Technology Industry Development Agency (ITIDA) in Cairo. TIP was expanded in 2010, so that there were now incubators in Cairo, Alexandria, and Assiut, and TIP's headquarters were moved from ITIDA to the Technology Innovation and Entrepreneurship Center (TIEC), which was also established in 2010.

The objective of the TIEC incubator, one of the three tech hubs researched by the study, is to engage the ecosystem of stakeholders to "generate, finance, support and deploy ICT related innovation" (MCIT, 2011, p. 4). This mandate involves establishing the necessary infrastructure for entrepreneurship and innovation (for example, policy and capacity-building); empowering business startups and innovation support through public-private funding; supporting technology-specific clusters; attracting multinational corporations (MNCs); and enhancing entrepreneurship and innovation by branding Egypt as an innovation hub. Government has pledged to supporting TIEC with EGP3 billion (approximately USD183 million¹) by 2020 (Helmy, 2013).

Other recent efforts by the government include establishing the Egyptian Entrepreneurship Investment Company (EEIC), also known as Egypt Ventures, created in terms of a March 2017 funding agreement between the Egyptian Ministry of Investment and International Cooperation (MIIC) and the Saudi Development Fund (MIIC, 2017). Within Egypt Ventures, the MIIC launched Fekretak

¹ USD to EGP conversions in this Working Paper are estimated based on the November 2019 average exchange rate of USD1 = EGP16.436.

Sherketak (Arabic for “your idea, your company”), an accelerator programme aimed at stimulating the entrepreneurial environment in Egypt through supporting and empowering Egyptian entrepreneurs to build internationally competitive startups (Fekretak Sherketak, n.d.).

iii. Obstacles and Challenges

Despite Egypt’s attractiveness to entrepreneurs, and despite the numerous government strategies and promises of support, the tech startup ecosystem faces considerable obstacles and challenges. A key obstacle is governmental bureaucracy. An example of this bureaucracy is the high cost (about USD1,500) of registering a company in Cairo (Virgin, n.d.). Another considerable barrier is access to finance during the startups’ seed-funding stage (i.e., during their efforts to generate their first round of funding, in the range of USD100,000 to USD200,000 in investment) and during their venture capital stage (i.e., seeking USD1 million or more) (Virgin, n.d.).

Other challenges faced by Egyptian tech entrepreneurs include weaknesses in building relations with investors; a lack of entrepreneurial education opportunities; and difficulties in attracting qualified employees (Hattab, 2012; Wamda, 2015). Specifically, it has been found that the sector has a lack of the marketing and sales skills necessary to expand into new markets or to launch new products (Wamda, 2015). Research has also found obstacles created by the country’s challenging economic and political environment (Ismail et al., 2016).

The Global Entrepreneurship Monitor (GEM) Egypt National Report 2015–2016 identified the following inhibitors and obstacles to the growth of entrepreneurship in Egypt: the poor quality and levels of education and training; inadequate research and development (R&D); and inadequate technology availability (Ismail et al., 2016). The GEM study reported on the results of a survey of 50 national experts, as well as insights from the Adult Population Survey (a sample of 2,500 individuals) responses in respect of nine factors identified as enablers of the entrepreneurship ecosystem. These nine enabling factors were: “finance, government policy, government programs, education and training, R&D transfer, physical infrastructure, commercial infrastructure, market openness, and social and cultural norms” (Ismail et al., 2016, p. 40).

The GEM Egypt Report 2012 showed that 54% of Egyptian adults between the ages of 18 and 64 foresaw an opportunity for entrepreneurial activity (i.e., an opportunity to start a business) within the next six months (Hattab, 2012). This figure declined to 41.5% in the GEM Egypt National Report 2015–2016 (Ismail et al., 2016), but jumped back up to 53.5% in the GEM Egypt National Report 2016–2017 (Ismail, Tolba & Barakat, 2017).

The GEM Egypt National Report 2016–2017 also stated that total early-stage entrepreneurial activity (TEA) was at 14.3% of the adult population in Egypt (aged 18–64), an increase from the previous year’s TEA of 7.4%. The 2016/2017 GEM report recommended that government agencies and policymakers prioritise entrepreneurship as a pillar of the Egyptian economy. In the GEM Egypt National Report 2017/2018, the TEA of the adult population was found to be slightly decreased at 13.3%, although this was still higher than the global average of 12.3% (Ismail, Tolba & Barakat, 2019).

B. Innovation Hubs and Tech Hubs

Tech hubs fall with the category of “innovation hubs”, a term that is prevalent in the entrepreneurial scene. An innovation hub can mean different things, depending on who is using the term. The term can be understood as referring to, among others, any of the following: incubators; accelerators; co-working spaces; FabLabs; makerspaces; and hackerspaces. Often tech hubs have both incubation and acceleration as the main services offered, as is the case with the hubs selected for this study. In fact, incubators and accelerators, which provide startups with business support resources and services to help them scale, have been found to account for almost 60% of tech hubs in Africa and in South and Southeast Asia (GSMA, 2016).

Although there is no agreed-upon definition in the literature of what exactly innovation hubs are, there is agreement on some of their key elements. A study by the research group Entrepreneurial Spaces and Collectives (ESCies) found that there were four main features of innovation hubs (Toivonen & Friederici, 2015). First, innovation hubs *build collaborative communities with entrepreneurial individuals at their centre*. The hubs are spaces that nurture and thrive on a sense of community, though with due importance placed on individuals’ agency and leadership. Innovation hubs treat community and individuality not as mutually exclusive but, rather, as complementary.

Second, the ESCies study found that innovation hubs *welcome diversity*. They are open to people of a wide variety of class, educational and racial backgrounds, thus seeking to make diversity a resource rather than a potential hindrance. Innovation hubs subscribe to a theory of innovation whereby “creative clashes” are encouraged because they give birth to different forms of innovation (Toivonen & Friederici, 2015).

Third, innovation hubs *facilitate both physical and digital elements of creativity and collaboration*. In physical terms, the hubs are designed to encourage collaboration in shared spaces. The objectives of openness, collaboration, and open innovation are typically integral to the physical architecture of innovation hubs. The hubs provide open working spaces that foster co-working, knowledge exchange, and community-building. They also harness the idea of openness and community-driven approaches through collaborative events, knowledge-sharing, and encouraging development of innovations that address societal needs. The digital realm acts as an extension of the physical space provided for creativity and innovation, whereby the digital presence allows engagement with a wider audience base. Examples of digital presence include websites, blogs, and social media platforms (Toivonen & Friederici, 2015).

Fourth, innovation hubs *localise global entrepreneurial culture*. All around the world, these hubs play host to local manifestations of a global culture of entrepreneurship. Thus, while it is important to acknowledge that innovation hubs are a global phenomenon, it is also pivotal to understand the local context in which a particular hub operates (Toivonen & Friederici, 2015).

There are various ways to categorise tech hubs. Open AIR researchers have developed a framework for assessing tech hubs in Africa. The framework, developed based on data collection in Kenya, posits that there are three main types of hubs: *company hubs*, *cluster hubs* (composed of multiple company hubs), and *country hubs* (referring to national hub ecosystems composed of both company and

cluster hubs) (De Beer et al., 2017). Most relevant to this study is the framework's concept of company hub, which is an independent operating entity that has its own community.

It is important to note that innovation hubs—and, for the purposes of this research, tech hubs—are but one element in an entrepreneurial ecosystem. Such ecosystems include contributions from, among other elements, policymakers, investors, human capital, physical infrastructure, and civil society. For a tech hub to be successful, there needs to be a viable entrepreneurial ecosystem within which the hub can operate. In many developing countries, including our focus country Egypt, the entrepreneurial ecosystem is at an early stage of development, thus providing challenging circumstances for innovation hubs, including tech hubs.

C. Tech Hubs' Innovation and Knowledge Governance Dynamics

Rapid technological advances have facilitated wide dissemination of scientific and technical knowledge, as well as new business models in the digital economy, fueled by growing venture capital funding of innovation (Scarbrough & Amaeshi, 2009). These dynamics of the digital economy can be seen as encouraging open innovation by placing greater emphasis on the acquisition of external knowledge via collaborative approaches to the management of IP (Scarbrough & Amaeshi, 2009).

There is no consensus, in the theoretical literature or in practical application, on the role played by specific knowledge governance mechanisms in different open innovation settings and situations. In some situations, formal knowledge governance mechanisms, including IP protections and clearly defined organisational and legal features such as corporate ownership and legally binding contracts, are emphasised and employed, often in the contexts of joint ventures and strategic alliances. In other situations, more “relational” knowledge governance mechanisms, which rely upon the social ties created by prior experience and trust between partners, are utilised (Scarbrough & Amaeshi, 2009). In this study, we sought to identify the knowledge governance mechanisms present in the three identified hubs, in order to begin to understand which modes of knowledge governance are most conducive for open innovation.

Tech hubs pride themselves on being more than just clearly-defined physical spaces. Their goals include building a large community of stakeholders—including startups, partners, and investors—who can work together in helping each other grow. Hubs seek to build such a community through collaboration on projects, organizing events, and developing partnerships with different kinds of organizations, including investors and advisors (GSMA, 2016). The GSMA (2016) has found that openness and collaboration are cornerstones of most tech hubs, with open innovation at the centre of operations. Tech hubs represent a shift away, metaphorically and physically, from traditional cubical structures that encourage isolation and individual work, towards more open spaces that encourage collective knowledge-sharing and collaborative innovation.

Sharing knowledge and resources is a prominent feature of collaborative innovation (Global Knowledge Initiative (GKI), 2014). The concept of collaborative innovation also involves utilizing community and group capacities to address obstacles and achieve joint objectives (GKI, 2014). In many instances, collaborative innovation occurs informally and “organically between different players” (Ketchen, Ireland & Snow, 2007; Rizk, El Said, Weheba & De Beer, 2018). This is exemplified

in the spillovers that occur when members of an innovation community informally share information and knowledge (Rizk et al., 2018).

Structured collaborations result from formal agreements for sharing and engaging with other stakeholders (Sauniere, Leroyer, Boudin & Jean, 2012, p. 8). As part of their hosting agreement, startups at a tech hub, for instance, may be formally required to collaborate. At the same time, informal exchanges may occur among startups because they share the same physical space, and may, for example, discuss challenges and obstacles over lunch or a coffee break. As such, openness can be a prominent feature along the continuum between largely informal and more formalised collaborative innovation (De Beer et al., 2014). A comparative study of seven innovation hubs across Africa found that innovation that is more open and collaborative is more likely to improve livelihoods (Moraa, 2013). Such open, collaborative innovation is characterized by capitalising on “collaborative events, sharing knowledge and encouraging development of innovations that have a positive impact” (Moraa, 2013). This corresponds with the findings from the research by ESCies, which identified the importance of hubs not only sharing space physically, but also sharing knowledge, creating group spirit, and fostering a sense of closeness and community.

High degrees of openness and collaborative practices are especially important to facilitate innovations in the ICT sector. While much of the ICT industry traditionally relied to a great extent on closed practices, accounting for numerous patent pools, the 2000s have witnessed widespread interest in collaborative arrangements (Lerner & Lin, 2012). Gaining the foundational knowledge to produce cutting-edge technologies can be prohibitively expensive if it is protected by proprietary arrangements. Knowledge-sharing and collaboration allow for low-cost incorporation of the learnings and experiences of others. The infrastructure of research and development is also very costly, and thus splitting the cost amongst partners is more financially viable (Lerner & Lin, 2012).

Previous Open AIR research on innovation in Africa has highlighted the complex nature of the relationship between innovation and IP (see De Beer et al., 2014). There is no blueprint for which knowledge governance systems, of which IP tools are part, facilitate innovation in various African settings. Rather, as shown in the case studies presented in De Beer et al. (2014), a wide range of knowledge appropriation mechanisms can be found in African innovation settings—ranging from IP tools such as copyrights, patents, trademarks, geographical indications, and trade secrets, to approaches grounded in customary practices in respect of traditional knowledge (TK), to informal mechanisms. In African innovation contexts, knowledge-sharing and innovation often occur in informal sectors and spaces outside formal structures. Open AIR’s empirical research in a variety of African countries has shown that there is an abundance of user-driven, informal, organic, accidental, incremental, and indigenous modes of knowledge production occurring outside of the realms covered by formal knowledge governance systems. Instead, the knowledge produced tends to be appropriated via informal or traditional knowledge governance mechanisms (De Beer et al., 2014).

Knowledge goods, including products and services based on ICTs such as software and other technologies, have characteristics that make them differ from private goods, which according to mainstream arguments should benefit from protection as an incentive to compete and innovate. Knowledge goods possess certain public good characteristics, in that their value actually increases with sharing as more people are able to access the goods for use and for further innovation (see

Stiglitz, 1999; Rizk & Shaver, 2010). Knowledge, and knowledge goods, are both inputs and outputs in certain production processes. Thus the mechanisms of knowledge governance that are most suited for innovation in knowledge-intensive industries are those that encourage the flow and sharing of knowledge (Benkler, 2006; Stiglitz, 2006). As such, protectionist knowledge governance mechanisms, including patents, are typically not the best-suited incentive for innovation in knowledge goods, including those based on ICTs. The particular nature of knowledge goods, such as those produced at tech hubs, has implications for the trade-off between access to the goods and incentives to produce them. Communication technologies, increased computing power, and the internet, have meant the cost of replication of knowledge is significantly reduced, with a marginal cost of nearly zero. It is thus more efficient to explore other means to provide incentives to produce knowledge goods, beyond the traditional protection mechanisms that add an artificial barrier to replication. Incentives are still necessary for innovation in knowledge goods, but the incentives need to suit the nature of the goods in question (Rizk & Shaver, 2010).

In exploratory research conducted by iHub Kenya, representatives of 15 Kenyan tech startups were interviewed to try to get a sense of how tech hubs were dealing with potential tensions between openness and protecting IP (Moraa, Murage & Omenya, 2012). In terms of knowledge governance mechanisms adopted, a majority of the companies were registered and had internet domain names for their innovations. A small number did not know what IP protections were and how they could be accessed. And even among those that had awareness of IP protections, none had filed for registration of a patent, and none had copyrighted their work—on the grounds that the process was inconvenient and complicated, and that patenting was not a priority in terms of protection from competition. The results of this study suggested that most of the 15 startups were still evaluating and developing their ideas about which forms of knowledge governance were most relevant and convenient for them (Moraa et al., 2012).

While openness, collaboration and group innovation tend to be encouraged in tech hubs, there is no doubt that complexities will arise as to who owns what, i.e., complexities in respect of how rights to exploitation of the intangible knowledge goods generated at the hubs are to be established and apportioned. Startups, and in some instances the tech hubs themselves, are profit-making entities. As such, it is inevitable that questions will arise as to how to balance hubs' ethos of collaboration with startups' and hubs' knowledge appropriation needs.

III. Research Design

The core research questions that guided the desk research, the literature review, and the interviews with three tech hub leaders, were as follows:

- what kinds of power relations, and ownership elements, are present at the hubs?
- to what extent are open, collaborative innovation dynamics present at the hubs?
- what are the attitudes and approaches towards scaling at the hubs?
- what are the approaches to knowledge governance, including IP protection, at the hubs?

The desk research, which informed the context and literature review section of this paper, was divided into three parts. First, we undertook a review of literature on the Egyptian innovation and

entrepreneurial ecosystem. Due to the limited nature of timely academic scholarship on the topic, this review relied mainly on practice- and policy-oriented literature, including reports, articles, and official announcements. Second, we examined academic, and practice- and policy-oriented literature, exploring the characteristics of innovation and tech hubs. This allowed for a better understanding of the wide array of characteristics that tech hubs have. Third, we examined literature on the dynamics of innovation and knowledge governance at Egyptian tech hubs.

We then mapped the different types of tech hubs in Egypt, and identified three categories: private-sector-run, university-based, and government-run. We selected the hubs that we found to be among the most prominent in each category. As mentioned above, the three hubs selected for interviews (all in Cairo) were:

- a private-sector hub, Flat6Labs;
- a university-based hub, the AUC Venture Lab (AUC V-Lab); and
- a government-run hub, the Technology, Innovation and Entrepreneurship Center (TIEC).

We interviewed a leader from each of these three hubs, as follows:

- the Managing Director of Flat6Labs;
- the Director of AUC V-Lab; and
- the Manager of the Incubation Department at TIEC.

In conducting the semi-structured interviews with the three hub leaders, we followed the Interview Protocol provided in the Appendix to this Working Paper.

IV. Findings

A. The Three Hubs' General Characteristics

i. Private-sector Tech Hub: Flat6Labs

Flat6Labs, based in Cairo, is a “regional startup accelerator programme” (Flat6Labs, n.d.) that launched in 2011. Flat6Labs provides startups with seed funding, strategic management, workspaces, training, and other forms of direct support (Flat6Labs, n.d.). To identify startups to support, Flat6Labs uses an online application system, followed by interviews, short-listing of candidates, a five-day “boot camp” on business concepts, and startup pitches to the Flat6Labs selection committee. Selected startups are provided with seed funding of up to EGP250,000 (USD15,210), with some receiving follow-up funding of up to EGP1 million (USD60,842) (El Amin, personal interview, 2017). The in-kind support provided to each startup is estimated to be worth between EGP150,000 and EGP200,000 (USD9,126 to USD12,168) (El Amin, personal interview, 2017). In exchange for support from the hub, each startup hosted by Flat6Labs grants the hub 10-15% equity in its enterprise (El Amin, personal interview, 2017).

Flat6Labs is a for-profit entity operating as a fund, backed by private-sector investors (El Amin, personal interview, 2017). Its startups are expected to make a profit, with a profit percentage going to investors, depending on the agreement reached. At the time of our interview with the Flat6Labs Managing Director (El Amin, personal interview, 2017), the hub had a fund of EGP100 million (USD6.1

million) to invest in startups. Flat6Labs provides seed funding to 10 startups every 6 months (Flat6Labs, n.d.).

Flat6Labs works with the startups to define their products, to develop their value propositions, and to write business plans. After the startup's selection, each startup support programme lasts 16 weeks, with key milestones and deliverables throughout (El Amin, personal interview, 2017). Flat6Labs also offers legal support and a range of both virtual and offline services. After each cycle, Flat6Labs holds a Demo Day event, where startups present their business propositions to potential investors and the media. At the time of our interview with the Flat6Labs Managing Director, the hub had gone through 19 cycles of startup support and had graduated over 100 companies.

The startups hosted at Flat6Labs have included entities focused on hardware, renewable energy, and software (El Amin, personal interview, 2017). Although we regard Flat6Labs as having the characteristics of a tech hub, its Managing Director, when asked whether he considers Flat6Labs a tech hub, answered in the negative. He said he considered Flat6Labs an “accelerator”, with a narrower focus than a tech hub. An accelerator, he said, has the specific purpose of scaling businesses to reach commercial viability in a short timeframe (El Amin, personal interview, 2017). (Nevertheless, as mentioned earlier, acceleration is often a core service of entities that regard themselves as tech hubs.)

ii. University-based Tech Hub: AUC V-Lab

At the time of our interview with its Director (Ismail, personal interview, 2017), the AUC V-Lab was the first university-based incubator in Egypt. It was launched in 2013 with a mission to help Egyptian startups commercialise their technologies and business models into ventures that will contribute to the country's economic growth, competitiveness, and job creation. The V-Lab also aims to provide a learning and research platform to the AUC community.

Supported by its corporate co-founders and by corporate sponsors, the V-Lab runs two incubation cycles per year (in line with the university's academic semesters), with each cycle working with 10 startups. Among the services provided by the V-Lab are a co-working space at AUC, business training, mentoring, networking events, EGP20,000 (USD1,217) seed investments, and access to AUC facilities, students, faculty, and alumni (who serve as, inter alia, mentors and investors). Between the V-Lab's inception in 2013 and our interview in April 2017, eight acceleration cycles had been completed, 93 startups had been accelerated, EGP43 million (USD2.6 million) had been generated in revenues by the startups, EGP26 million (USD1.6 million) had been raised in funding, and 432 jobs had been created (AUC V-Lab, 2017; Ismail, personal interview, 2017).

The V-Lab has an outreach process for advertising each cycle, with outreach activities including media campaigns and advertising through its partners. It has several corporate partners, including the Arab African International Bank (AAIB), which is a corporate leadership co-founder, in addition to SODIC (a real estate developer), Shell, and General Electric (Salih, 2019).

The V-Lab has a selection process that consists of multiple rounds. The first round of applications is done through F6S, a global online platform used by incubators and accelerators. Incomplete applications, or applications by startups in sectors that the V-Lab does not support (such as cafés and

restaurants), are eliminated (Ismail, personal interview, 2017). Following that, a first round of interviews is conducted, in conjunction with a three-day “boot camp” that allows the V-Lab to observe people working and interacting and to spot anomalies that might have been missed in the interviews. After this, there is a final selection panel, which includes members of the V-Lab team and occasionally external panelists. The end of each acceleration cycle is followed by a Demo Day, where investors are invited to learn about the startups. In its first cycle of applications in 2013, the V-Lab received roughly 80 applicants; in cycle eight in 2017, there were almost 400 applicants (Ismail, personal interview, 2017).

It was found that more than 90% of the startups hosted at the V-Lab were tech-enabled or tech-related. The Director explained that the V-Lab tries to focus on being an innovation hub and not specifically a tech hub (Ismail, personal interview, 2017). The reason for this is that the V-Lab tries to place emphasis on innovative business models, whether technology-based or not. The majority of business models incubated at the V-Lab have a technology aspect, but not necessarily advanced technology.

iii. Government-run Tech Hub: TIEC

TIEC was launched in 2010 in Cairo’s Smart Village, a high-technology business district, by the Ministry of Communications and Information Technology (MCIT). Its mission is to stimulate an innovation-based economy through strategising for, facilitating, and promoting innovation in ICTs and their application (TIEC, n.d.). Its objectives include acting as a catalyst among government agencies, the private sector, and academia; mobilising the different components in the ICT ecosystem; and generating revenue from commercialisation of innovation (TIEC, n.d.). It also aims to provide IP licensing tools, and to promote the national economy through creating jobs and supporting startups to export IT services to foreign countries (Al Rashidy, personal interview, 2017).

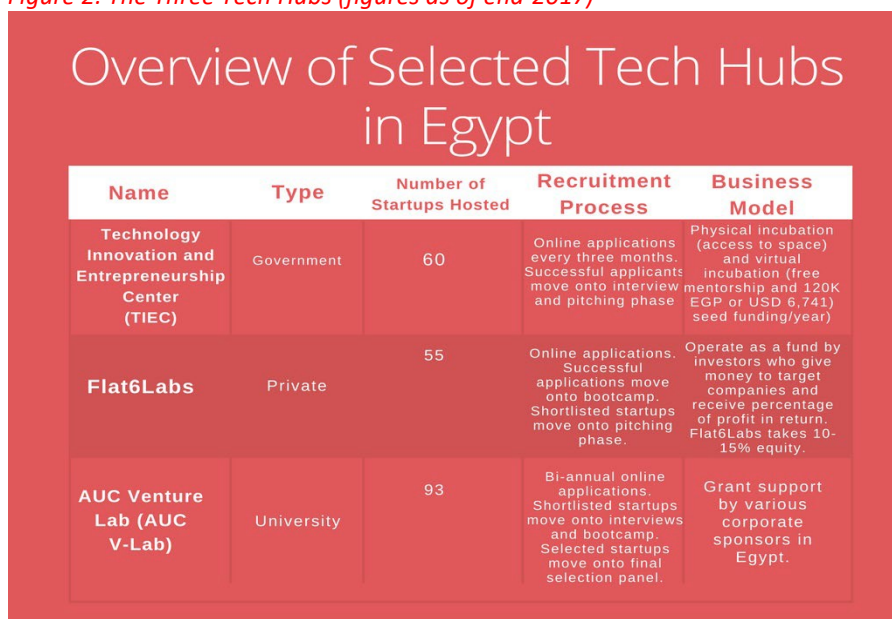
TIEC runs several programmes, but for the purposes of our interview (with TIEC’s Incubation Department Manager) our focus was on its incubation work. TIEC’s Incubation Department runs several initiatives, including business plan competitions, a virtual incubation programme, and the START IT programme focused on the internet of things (IOT) and big data. Startups can apply at any time, and applications are evaluated once every three months, with invitations for pitching sent to accepted applicants. The successful teams spend a year at TIEC’s incubation centres, either in Cairo, Alexandria or Assiut. The services TIEC offers to the incubating startups include up to EGP120,000 (USD7,301) worth of in-kind services, such as co-working spaces, hardware and software tools, consultancy support, marketing, mentorship, and access to technical and business workshops (TIEC, 2016). In-kind services are tailored to the business plans of each startup and its needs. As a government-run hub, TIEC provides all of its services free-of-charge, including use of co-working space.

Virtual incubation is provided to those startups that cannot be physically present. They receive free virtual mentorship on a weekly basis, and seed funding of up to EGP120,000 (USD7,301) for one year. TIEC requires the startups it supports to have a minimum of two co-founders, since the support TIEC provides is for companies and not individual entrepreneurs (Al Rashidy, personal interview, 2017). All the startups hosted at TIEC are tech-related. Between the launch of TIEC in 2010 and our interview in 2017, TIEC had hosted around 60 startups.

The TIEC interviewee said that TIEC considers itself a tech hub, and that it seeks to be more than just an incubator (Al Rashidy, personal interview, 2017). In addition to its Incubation Department, it has departments focused on Innovation Support; Entrepreneurship and Business Support; and Technology Management (TIEC, n.d.)

Figure 2 below summarises the recruitment processes and business models followed by the three tech hubs featured in this study. As seen in the figure, the V-Lab had the largest number (93) of startups hosted (as of end of 2017), with TIEC and Flat6Labs having hosted 60 and 55 startups respectively.

Figure 2: The Three Tech Hubs (figures as of end-2017)



Name	Type	Number of Startups Hosted	Recruitment Process	Business Model
Technology Innovation and Entrepreneurship Center (TIEC)	Government	60	Online applications every three months. Successful applicants move onto interview and pitching phase.	Physical incubation (access to space) and virtual incubation (free mentorship and 120K EGP or USD 6,741 seed funding/year)
Flat6Labs	Private	55	Online applications. Successful applications move onto bootcamp. Shortlisted startups move onto pitching phase.	Operate as a fund by investors who give money to target companies and receive percentage of profit in return. Flat6Labs takes 10-15% equity.
AUC Venture Lab (AUC V-Lab)	University	93	Bi-annual online applications. Shortlisted startups move onto interviews and bootcamp. Selected startups move onto final selection panel.	Grant support by various corporate sponsors in Egypt.

B. Power Relations

i. Hubs' Company Registration Requirements for Startups

Company registration is a requirement for startups hosted by Flat6Labs and TIEC. Flat6Labs facilitates the registration process for startups. TIEC has a condition that startups need to be registered within three months of incubation, and directs them to the General Authority for Investment (GAFI) for registration (Al Rashidy, personal interview, 2017). For the V-Lab, company registration is not a requirement, although most of the startups hosted are registered prior to approaching the hub (Ismail, personal interview, 2017). Registration is important for enterprise-scaling since it allows startups to enter into legal agreements with investors and other entities.

ii. Contracts between Hubs and Startups

At TIEC, startups are asked to sign a contract with the hub that affirms their commitment to the milestones and business plan they have proposed. Through AUC, the V-Lab signs formal legal contracts with the startups it hosts. In exchange for the services provided by the V-Lab, startups agree to, inter alia, act in a manner befitting their presence on a university campus, attend V-Lab events, attend the Demo Day event, and provide the required information on their startup. At Flat6Labs, a

legal agreement is signed between the hub and each startup, which sets out the terms of Flat6Labs hosting the startup.

iii. Hub Ownership Stakes in Startups

Of the three hubs, only Flat6Labs takes a shareholding in the startups it hosts. It sets up a joint stock company for each startup and owns 10-15% of that company, with the other 85-90% owned by the startup's founders (El Amin, personal interview, 2017). Neither V-Lab nor TIEC takes an ownership stake, i.e., equity or shares, in the startups hosted. According to the TIEC interviewee, the entrepreneurs at TIEC felt a strong sense of ownership in their work to the extent that it sometimes created a problem for startup founders when a potential investor asked for equity (Al Rashidy, personal interview, 2017).

iv. Other Power Dynamics

According to the Flat6Labs interviewee, trust is a predominant factor in the success or failure of relationships between the hub and startups. Flat6Labs does not interfere in the day-to-day operations of startups, but it tries to steer companies in a direction that maximises their growth (El Amin, personal interview, 2017).

According to the V-Lab interviewee, the hub has leverage over startups because they want to remain at the university (AUC), which gives the startups credibility and creates value for them (Ismail, personal interview, 2017). The V-Lab also provides a network of connections for startups, including mentors, investors, and customers. If a startup is not complying with the standards of V-Lab or is not sufficiently focused, it can be ejected, but this has happened very rarely (Ismail, personal interview, 2017).

According to the TIEC interviewee, the relationship between the hub and a startup is a partnership (El Rashidy, personal interview, 2017). TIEC does not interfere in the way founders manage their own startups. However, TIEC has set key performance indicators and milestones. As long as these milestones are being followed and achieved, startups continue being incubated and receiving support. If there is a disagreement, the incubation is simply terminated.

C. Innovation

All three interviewees stated that they had witnessed elements of open, collaborative innovation by the startups hosted at their hubs, mainly as evidenced by the sharing of knowledge and resources.

The TIEC interviewee stated that the hub's startups are often initially wary of sharing information (Al Rashidy, personal interview, 2017). The interviewee cited the absence of a culture of collaboration in Egypt as one of the reasons behind this. TIEC tries to explain the value of collaboration to all of its startups, yet collaboration still tends to only occur between startups that do not regard each other as competitors and that face obstacles of a similar nature. Startups evaluate the value of collaboration based on perceived value versus perceived threat. The value of cost reduction, or of discovering new solutions to common challenges, are important motivations for collaboration at TIEC. But if there is a perceived threat of competition, startups are less inclined to collaborate (Al Rashidy, personal interview, 2017). Al-Rashidy (personal interview, 2017) added her personal view that, ideally, even startups producing similar (and thus potentially competing) products or services

should collaborate, since building on each other's knowledge "can have great benefits". She continued by saying that when the market is so large, there are enough different "pieces of the pie" for entrepreneurs to not have to compete for the same piece. To encourage open, collaborative innovation, TIEC has created the Egypt Innovate Platform, an online platform for stakeholders to share resources (Al Rashidy, personal interview, 2017).

At Flat6Labs, according to the interviewee, open collaboration is in clear evidence among the hub's startups, and it manifested itself through knowledge-sharing, which was facilitated by the hub's shared co-working space (El Amin, personal interview, 2017). The interviewee provided an example of such collaboration, wherein two startups decided to merge their services: One startup that was renting vacation homes partnered with another startup that was offering home cleaning services, thereby creating a model where both services complemented each other with mutual benefits. However, the interviewee also pointed to some limited instances where collaboration between two startups was deterred by a sense of competition. At Flat6Labs, startups collaborate when there is a clear business development function for both, and when there are business needs being served. And open collaboration is more common between startups around the same level of maturity (El Amin, personal interview, 2017). In the few instances where Flat6Labs has hosted competing startups, the relationship between these startups has been competitive, not collaborative, because investors will likely only select one of the competitors.

At the V-Lab, according to the interviewee, a lot of the collaboration occurs organically in a non-structured manner, with non-competitor startups engaging in informal collaboration as a result of working in the same physical space (Ismail, personal interview, 2017). The V-Lab does not actively push collaboration, meaning that it largely occurs as a natural by-product of interactions at the hub—when it adds value to the startups and results in a win-win situation. The collaborations include hub participants mentoring one another, and sharing resources, personal experiences and knowledge about specific areas of expertise (Ismail, personal interview, 2017).

All three interviewees said that, in an effort to ensure a collaborative environment, their hubs seek to avoid hosting potentially-competing startups. However, at TIEC and Flat6Labs, as seen in the statements above, hosting of competitor startups has in some instances occurred.

D. Scaling

We found that each of the three hubs defined scaling in a slightly different manner. Flat6Labs' El Amin (personal interview, 2017) defined scaling as growth in the key metrics that define the profitability and success in your business (e.g., revenue, or traffic on a website). The V-Lab's Ismail (personal interview, 2017) differentiated between growth and scaling. Growth, in Ismail's analysis, is increasing revenue, while scaling is growth that is exponential in nature. Ismail explained his view by saying that when you talk about scaling, you need to look for business models that are rapidly scalable, i.e., models that allow the startup to very quickly ramp up the delivery of the service if more people want it. Often, according to Ismail, the businesses that are highly scalable are digital in nature, because with digital products scaling can be performed nearly instantaneously. Products with physical constraints, such as manufacturing elements, are usually less scalable, or much slower to scale.

TIEC's Al Rashidy (personal interview, 2017) distinguished between different dimensions of scaling. A startup can scale in terms of the market served, or by targeting different areas within Egypt, or within the service/product itself by adding more features or extra services.

The three interviewees stated that all startups desire scalability. For startups hosted at Flat6Labs and the V-Lab, scaling outside Egypt is a medium-term goal, after the startups become well-established in the Egyptian market. TIEC, on the other hand, pushes startups to scale outside Egypt in the short-term, as this is part of the TIEC mandate. TIEC's Al Rashidy (personal interview, 2017) explained that scaling outside Egypt can, among other things, allow a startup to benefit from more favourable pricing.

All three interviewees were of the view that startups could form partnerships to facilitate the scaling process. And, according to El Amin (personal interview, 2017), they could create a sort of "consortium" in order to enter a new market.

When asked how the hub supports scaling by its startups, Flat6Labs' El Amin (personal interview, 2017) explained that scaling is essentially the core of Flat6Labs' 16-week accelerator programme. The V-Lab interviewee said the hub assists startups in optimising their business models in order to figure out how fast they can scale and how much it will cost. TIEC's Al Rashidy (personal interview, 2017) said that the hub offers in-kind services to support startups in scaling. Al Rashidy pointed to the complexities that arise in managing a startup when it is time to scale. During scaling, problems typically emerge in the operational aspects of running the business. There is usually a new investment that startups have received that has enabled them to scale in the first place. Many of the challenges arise regarding managing a bigger budget, handling a bigger customer base, and managing more employees who are needed to scale the business. It is important, Al Rashidy pointed out, for the startup to have an investor that not only puts money in, but also has experience and can provide guidance on how to manage a bigger business (Al Rashidy, personal interview, 2017).

E. Knowledge Governance

It was found that formalised IP protections are not of primary concern to either the hubs or to the startups at the hubs. Formal IP appears to be, at best, of secondary concern. The interviewees did not see acquiring formalised IP rights as necessary to startups' pursuing scalability, and they expressed the view that startup entrepreneurs tended to not be greatly concerned with IP.

Additionally, all three interviewees stated that their hubs did not own any of the IP of their startups. According to the TIEC interviewee Al Rashidy, the Center had previously provided IP consultancy services to its startups, but this had been cancelled due to lack of demand (Al Rashidy, personal interview, 2017). Al Rashidy offered the view that getting a product or service to the market quickly was often the best way for a startup to appropriate and exploit the knowledge and innovations it had created (Al Rashidy, personal interview, 2017).

The Flat6Labs interviewee El Amin said that the hub held IP sessions for the small number of entrepreneurs interested in the topic, but that IP was not a core component of the Flat6Labs incubation programme for several reasons (El Amin, personal interview, 2017). Firstly, as El Amin pointed out, most startups at Flat6Labs are software-based, and it is difficult so secure formalised IP

protection (patents or copyrights) for software. Even more significantly, according to El Amin, because the startups at Flat6Labs get limited initial funding, it is not advisable for them to use this funding for the costly pursuit of IP protection. Instead, Flat6Labs advises startups to only seek funding for IP during a follow-on stage of development of their enterprises, and to rather use the initial funding they receive to grow successful, functioning businesses. El Amin explained that if startups have initial funding of EGP100,000 (USD6,084), they do not want to spend EGP30,000–40,000 (USD1,826–2,434) of that making sure their idea is protected before knowing for sure they will be able to take it to market (El Amin, personal interview, 2017).

The V-Lab interviewee Ismail said that the V-Lab turns to the university's (AUC's) Technology Transfer Office for provision of IP sessions for startups. Ismail further pointed out that software startups do not tend to seek IP protection because most of their innovations are not easily eligible for patents or copyrights (Ismail, personal interview, 2017)—an input that echoed the statement cited above from Flat6Labs interviewee, El Amin.

Flat6Labs' El Amin (personal interview, 2017) also pointed to the challenge of determining which type of IP is relevant to a particular business. Determining the type of IP protection needed requires getting expert advice, which is expensive. If founders of a startup do not understand the types of IP protection, and do not have resources to pursue advice, then matters of IP will be disregarded.

V-Lab's Ismail and TIEC's Al Rashidy both listed high costs as the main limitation faced by startups in seeking IP rights (Ismail, personal interview, 2017; Al Rashidy, personal interview, 2017). Al Rashidy pointed out that patenting abroad requires IP lawyers with international experience. There are very few such lawyers in Egypt, and those who are present are based in Egypt's international law firms and are thus very expensive. (According to Al Rashidy (personal interview, 2017), this barrier is potentially somewhat mitigated in the case of TIEC, which, through being part of ITIDA, has links to an ITIDA programme called Information Technology Academia Collaboration (ITAC), which sponsors (partially or fully) costs for patenting for startups wishing to patent abroad.)

V. Future Research

This preliminary study has generated findings based on an extensive literature review and interviews with leaders of three prominent Cairo tech hubs, with the hubs purposively selected as leading examples of three kinds of hubs: private-sector-led, university-led, and government-led. Future research could expand the number of hubs studied, again using purposive sampling so to include hubs exhibiting varying dynamics. A future study could also expand geographically beyond Cairo, to other governorates in Egypt. Also, in order to offer a more complete picture, the perspectives of the startups making use of the hubs could also be canvassed, via interviews. Interviews with startup founders would provide bottom-up accounts of the power relations, innovation dynamics, scaling approaches, and knowledge governance mechanisms present in the hubs.

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Appendix

Interview Protocol

1. About the technology hub

- a. How many startups have been hosted at your technology hub since its inception in Egypt? How many are specifically tech-related?
- b. Do you consider yourself a technology hub? Why or why not?
- c. Tell me about the recruitment process.
- d. What are the terms of host agreements with startups? What is the funding (if any) conditional on?
- e. Tell us a little bit about your business model.

Types of technology hubs and knowledge governance frameworks

- f. Is there an overarching knowledge governance policy (IP policy) that governs relations between technology hubs and the startups or entrepreneurs they host?
- g. For example, does the tech hub get a stake in the startup(s) it hosts? Or does each startup set its own policy?

2. Intellectual property and business models

Company Registration

- a. Do startups register their companies?
 - i. What is the rationale of registering (or not)?
 - ii. Is it required by your technology hub?
 - iii. What is the legal process?
 - iv. Does your technology hub support intellectual property acquisitions?
- b. Do you get support from the government (for registration), and in what form?
- c. Do startups register their companies in Egypt or abroad? Why?
- d. Do startups register a domain name? Why or why not?

Knowledge governance/ IP

- e. Do you talk to startups about IP? (how relevant is it in the training and mentoring you offer?)
- f. What types of IP do startups register? Why?
- g. Do they register IP in Egypt or abroad? Why?
- h. Do you (host technology hub) assist the startups in securing their IP rights? If yes, how?
- i. What limitations do startups face in securing the intellectual property rights of their products?
- j. Is acquiring intellectual property rights in IT something founders of a startup discuss?
 - i. What is the legal process?
 - ii. How do they decide on different regimes of IP (proprietary, creative commons, open source)?
 - iii. Do they understand the legal structures of IP laws in Egypt?
- k. Do you know the difference between copyright and patents?
Understanding the differences between protecting innovations that are hardware and that are software, understanding intellectual property rights in IT, understanding what is patentable and what is copyrighted, etc.

Ownership

- l. How do entrepreneurs define their work in terms of ownership?
 - m. Do you feel like they own the idea? What about the product/service they make/produce?
 - n. Does your host tech hub share this ownership? And do you feel like they should? And why?
 - o. What is the process of creating ownership agreements between startups and their host technology hub?
 - p. What examples of mergers, acquisitions, or other instances of valuation of tech initiatives have occurred in the identified technology hubs?
 - i. How has IP factored into such actions?
 - q. What factors determine the power relations between the startup and the host tech hub? Rank them.
 - r. Are there other mechanisms in place that govern the relationship between the startups and the tech hubs?
 - i. How relevant is IP?
 - ii. If not relevant- then why? And what else is relevant?
 - s. Other than IP, how do startups protect their product?
3. Collaborative interactions at high technology hubs
- a. How many competitor startups are hosted at the same tech hub?
 - b. Does this factor into the decision of accepting startups?
 - c. Do startups collaborate with other startups producing a similar product/service in the same tech hub?
 - i. If yes, specify how they collaborate.
 - ii. If no, explain why they do not collaborate.
 - d. If they do not collaborate with their competitors, what is the nature of their relationship?
 - e. What should the relationship be between startups producing the same product/service in the same tech hub?
 - f. What should the relationship be between startups producing other/different products/services hosted in the same tech hub?
 - g. What should the relationship be between startups producing the same product/service hosted at different tech hubs?
 - h. What do high tech spaces offer in terms of collaborative opportunities for open innovation and scaling up? (Do you encourage collaboration opportunities for open innovation and scaling up?)
 - i. Do entrepreneurs and their hosts have discussions balancing IP “rights” and collaboration? If yes, what types of discussions?
 - j. What factors into the decision of a startup of whether or not to collaborate? Is this collaboration formalised, if yes then how?
 - i. For example, have you ever helped a startup register for a patent pool? What is the legality behind doing collective work in a corporate framework?
 - k. Do you ask/require startups to share with their employees the “secret of the trade”?
 - l. Do startups collaborate with their customers?
 - i. If yes, what are the models of knowledge exchange?
 - ii. And how do you facilitate/ support such collaboration?
 - m. Do startups collaborate with their suppliers?
 - i. If yes, what are the models of knowledge exchange?
 - n. What are the drawbacks of collaboration?

4. Scaling up

- a. How do you define scaling up?
- b. Do startups want to scale up their product/service?
- c. Do startups want to scale outside of Egypt?
 - i. In how many years?
 - ii. Why?
- d. Would startups team up with a different company to scale up?
 - i. What would the model of IP/knowledge governance be in that case?
 - ii. What would the role of your host tech hub be in this case?
- e. What steps would you take to scale up?
 - i. And how would you deal with IP at the different steps?
 - ii. Does this include being hosted at another tech hub?



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Open AIR is carried out with financial support from the International Development Research Centre, Canada, the Social Sciences and Humanities Research Council of Canada, and Queen Elizabeth Scholars Program. More information about Open AIR's current and previous supporters can be found at <https://openair.africa/supporters>. The views expressed herein do not necessarily represent those of Open AIR's funders.

