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Digital Entrepreneurship in Africa

How a Continent Is Escaping Silicon Valley's Long Shadow

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OA Funding Provided By:

- Arcadia Fund
- Knowledge Unlatched

The open access edition of this book was made possible by generous funding from Arcadia—a charitable fund of Lisbet Rausing and Peter Baldwin.

The title-level DOI for this work is:

[doi:10.7551/mitpress/12453.001.0001](https://doi.org/10.7551/mitpress/12453.001.0001)

5 Uneven Ecosystems

In their fittingly titled TechCrunch blog post “The Rise of Silicon Savannah and Africa’s Tech Movement,” US journalists Jake Bright and Aubrey Hruby (2015b) capture a period of hope and ambition for African digital entrepreneurship:

Across [Africa,] new Silicon Savannahs are in the making and the components of a budding . . . tech culture and ecosystem emerge. . . . iHub-like innovation centers are becoming a mainstay of the continent’s progressing ICT infrastructure. . . . These IT spaces are becoming central connect points for ideas, entrepreneurs, investment, and innovation across the continent.

As is evident in this quote, the setup of Nairobi-based iHub in 2010 and the moniker “Silicon Savannah” to refer to Kenya’s technology landscape had turned into symbols for the continent as a whole (we will return to this in chapter 7). Innovation hubs and, with them, the ideas and excitement around digital entrepreneurship had diffused across Africa in a relatively short period of time (Friederici 2019). In the mid-2010s, policymakers and media conveyed that vibrant digital entrepreneurship ecosystems existed everywhere in Africa, with impressive maps visualizing hundreds of innovation hubs (Bayen and Giuliani 2018; Boucher 2016; Firestone and Kelly 2016). Bright and Hruby (2015a) went so far as to proclaim that “the Next Africa” had become “a global [economic] powerhouse.”

Chapter 2 already called parts of this narrative into question, highlighting vast differences in digital entrepreneurship activity between African cities. In this chapter, we analyze how and why the observed differences have arisen. In the following section, we first briefly introduce entrepreneurship ecosystem theory. The next section further details unevenness among African digital entrepreneurship ecosystems. The final five sections review the most pressing bottlenecks in African ecosystems.

This chapter shows that ecosystems of digital entrepreneurship have indeed emerged across the eleven analyzed cities. However, the degree to which ecosystems support digital enterprises effectively is drastically different. We discern three tiers of African ecosystems: learning, incipient, and maturing. Worryingly, vicious cycles resulting from bottlenecks in ecosystem evolution can lead to lower-tier systems being stuck at relatively nascent levels.

Our theoretical contribution is to highlight that different types of entrepreneurial resources play different roles as ecosystems evolve (see Mack and Mayer 2016; Motoyama and Knowlton 2017). We also show that enterprises are embedded in ecosystems, but ecosystems are themselves embedded in wider structures. Entrepreneurial resources (e.g., market knowledge, investment capital) must be converted from nonentrepreneurial resources (e.g., markets, traditional capital). We show some of the mechanisms of interactive resource conversion (see Motoyama and Knowlton 2016; Spigel and Harrison 2018) and thus highlight how ecosystems are tied to the economic destinies of their nonentrepreneurial urban and national surroundings.

Entrepreneurial Ecosystems: Concepts and Theory

Practitioners and policymakers find the “entrepreneurial ecosystem” to be an extremely appealing concept (Malecki 2018; Spigel 2017; Stam and Spigel 2018). At the same time, it has caused a lot of confusion and critique (Alvedalen and Boschma 2017; Stam 2015). Therefore, we start this chapter with a short conceptual excursion, outlining what we mean when we talk about entrepreneurial ecosystems.

In Silicon Valley and most large cities in high-income countries, digital enterprises can access an array of support resources in their vicinity. It is easy for founders to talk face to face with experienced entrepreneurs who attempted similar business models. Coworking spaces and incubators are abundant, offering work space and access to partners and peers with related interests. Associations and informal groups of professionals organize regular networking events and share information. Universities provide technology transfer services and coordinate extensive alumni networks that reach into the technology industry. City and national governments give out startup grants with no or few strings attached. Venture capital and angel investors provide venture-suitable funding and organize pitching events and demo

days. All these location-based “interdependent actors and factors, coordinated in such a way that they enable productive entrepreneurship within a particular territory” (Stam and Spiegel 2018), are summarized in the entrepreneurial ecosystem concept.

The makeup of an entrepreneurial ecosystem has direct consequences for entrepreneurship. Ecosystems differ in *quality*, which is defined as the chance of success for the same growth-oriented enterprise in one ecosystem compared to another. Notably, Silicon Valley’s technology industry has been able to simultaneously diversify and specialize (Saxenian 2006), as qualified and experienced entrepreneurs and professionals constantly network and develop new ideas, moving flexibly between positions or starting new ventures (Barley and Kunda 2004; Benner 2008). Ecosystems evolve over years and decades (Saxenian 1994; Storper et al. 2015), harboring complex but potentially generative interdependencies (Ferrary and Granovetter 2009; Spiegel and Harrison 2018).

The current dominant understanding of ecosystems sees them as relational (ecosystem elements interdepend to determine ecosystem quality) and processual (ecosystem elements variously affect each other over time to determine the system’s evolution in quality; Mack and Mayer 2016; Spiegel 2017; Spiegel and Harrison 2018). This theory was developed in response to a number of criticisms with regard to policy-driven component-based conceptions of ecosystems (like Babson’s model or Startup Genome’s ranking)—for instance, that they are static, tautological, and conceptually ambiguous (Alvedalen and Boschma 2017; Stam 2015).

A key concept that relational processual ecosystem theory uses is the notion of *entrepreneurial resources*, defined as “resources specific to the entrepreneurship process . . . rather than other types of industrial benefits found in clusters that accrue to firms of all sizes and ages” (Spiegel 2017, 52). Entrepreneurial resources can be cultural (e.g., individuals’ willingness to leave stable employment), social (e.g., risk capital from angel investors, talented startup employees, or mentorship), or material (e.g., incubators, physical infrastructure, and policy affecting the startup process) (Spiegel 2017).

This entrepreneurship-specific notion of resources has implications for the kind of knowledge that matters for entrepreneurial ecosystem quality and evolution. Spiegel and Harrison (2018, 156) note that market and technical knowledge are important, but that *entrepreneurial knowledge* (i.e., knowledge about the entrepreneurial process itself) is just as relevant.

Entrepreneurial knowledge includes “skills such as opportunity identification, business planning, and pitching for investment [as well as] cultural norms regarding how an entrepreneur should act and present themselves to others.” Based on this understanding of resources, the theorists posit that entrepreneurial ecosystems are “ongoing processes of the development and flow of entrepreneurial resources. . . . The presence and circulation of these resources helps explain how ecosystems evolve and transform over time and allows us to distinguish between strong, well-functioning ecosystems and weaker, poorly-functioning ones” (Spigel and Harrison 2018, 152).

The key argument is that entrepreneurial ecosystems depend on resource endowments, but also on the system-internal configuration of those resources, which affects whether early-stage, growth-oriented entrepreneurs rather than incumbents, rent seekers, or non-growth-oriented businesses have access to them. Spigel and Harrison (2018, 164) note that it is difficult, if not impossible, to create entrepreneurial ecosystems from scratch. Instead, resources in an ecosystem are enriched over time through mutually beneficial exchanges (mentorship, investments, deals, etc.). Exchanges are based on interpersonal and interorganizational ties, which themselves are based on trust, norms, and contracts.

Ecosystem quality and development thus depend on a system’s endowment of entrepreneurial resources, as well as on the interplay of resources. Well-functioning ecosystems are defined as those “with dense networks between entrepreneurs, investors, advisors, and other key actors . . . [which] support the flow of resources within the ecosystem, making it easier for entrepreneurs to access them” (Spigel and Harrison 2018, 161). The higher the quality of an ecosystem, the easier it is for enterprises and their supporters to effectively exchange and augment resources in an ongoing, location-specific process (Mack and Mayer 2016; Spigel and Harrison 2018). At the same time, because different resources depend on each other, the absence of a given resource can become a bottleneck for ecosystem advancement.

Unevenness of African Ecosystems: Discerning Three Tiers

In chapter 2, we introduced the extremely skewed distribution of digital entrepreneurship activity across Africa, with only four countries (South Africa, Nigeria, Egypt, and Kenya) making up 60 percent of Africa’s total

activity, the next eight covering 25 percent, and the last forty-two countries accounting for the remaining 15 percent. As mentioned, the six metrics used for these calculations have severe limitations and can only be seen as indicative. However, to understand the variation of ecosystem challenges across Africa in more depth, these indicators can usefully be divided into three categories: startups, angel investors, and hubs. When examining the distributions of these categories of digital entrepreneurship organizations separately (see figure 5.1), it becomes apparent that they differ in the degree of skewedness. Namely, the distribution of angel investors across Africa is skewed much more extremely than the distribution of hubs. For instance, in the Angel.co database, 35 percent of all angel investors in Africa are in South Africa, while none at all (0 percent) are located in the bottom thirty-six African countries. For hubs, the skewedness of the distribution is still drastic but less so than for angel investors: South Africa has 18 percent of all African hubs, exactly like the bottom thirty-five African countries combined. Even if we assume that the Angel.co database vastly underrepresents the actual number of angel investors in incipient ecosystems (e.g., because angel investors there do not register on an international database), these stark differences suggest that the degree of skewedness increases from the number of support organizations (like hubs), through the number of startups, to the number of angel investors in African countries.

This is also in line with our own and others' qualitative analysis (see Bramann 2017; Drouillard et al. 2014). We know from interviews that in cities like Kampala, Abidjan, and Kigali, a significant number of digital enterprises have emerged and two or three hubs have been established; yet venture financing like angel and venture capital investments is rare or completely missing. In comparison, digital enterprise numbers are much more limited in cities such as Maputo and Addis Ababa, even if they also boast two or three hubs. In other words, the distribution of digital enterprise activity seems to be more skewed than hub counts appear to suggest. We therefore question estimates of startup activity that extrapolate from the number of hubs, like Bright and Hruby (2015a) are attempting.

These observations lead us to discern *three tiers of African digital entrepreneurship ecosystems* (see table 5.1). These tiers should not be understood as precise or static delineations. For instance, Kigali's ecosystem unites the bottlenecks of tier 2 and 3, while Accra has elements common in tier 1.

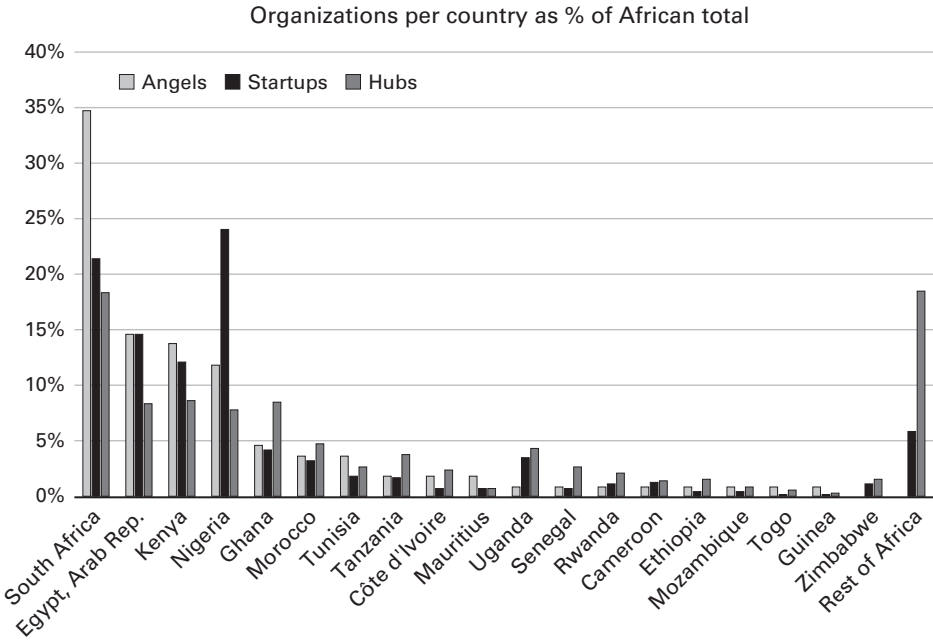


Figure 5.1

Distribution of three types of digital entrepreneurship organizations across Africa. *Note:* Data for fifty-four African countries was analyzed. The bars are percentage values indicating a country’s value as a share of the continent-wide total in three categories: angel investors, startups, and hubs. Countries are in the order of highest to lowest value for the “Angels” value. Values for startups are averages of two indicators: F6S.com and Crunchbase.com. Values for angels are based on Angel.co. Values for hubs are averages of three indicators: BongoHive (2017), Firestone and Kelly (2016), and Boucher (2016). “Rest of Africa” includes, in the order of average values from highest to lowest: Zambia, Benin, Mali, Burkina Faso, Seychelles, Botswana, Malawi, Namibia, Angola, Democratic Republic of Congo, Liberia, Algeria, The Gambia, Madagascar, Sierra Leone, Rep. of Congo, Sudan, Burundi, Somalia, Niger, Mauritania, Gabon, Lesotho, Libya, Central African Republic, Swaziland, Djibouti, Sao Tome and Principe, South Sudan, Guinea-Bissau, Comoros, Chad, Cabo Verde, Equatorial Guinea, and Eritrea.

Table 5.1
Three tiers of African digital entrepreneurship ecosystems

Ecosystem tier (cities analyzed in this book)	Number of active innovation hubs ^a	Examples of leading digital enterprises ^b (estimated number of employees)	Ecosystem bottlenecks			Hubs and support organizations	Funding
			Markets and infrastructures	Entrepreneurial knowledge and mentorship	Venture labor and talent		
1—maturing (Lagos, Nairobi, Johannesburg/Pretoria)	Three to eight, including at least one with Pan-African recognition	Africa's Talking, Andela, Cellulant, Craft Silicon, IROKOtv, Interswitch, Paga (100–500)	Leading enterprises address Pan-African or cross-national B2C and B2B ^b , make tens of millions of US dollars in annual revenues	Range of experienced entrepreneurs across diverse business models; mentorship exists, but fragmented and not specialized	Specialized and internationally competitive software engineers (algorithms, IoT, financial technology, etc.)	Disconnect between major enterprise success cases and hub scenes; scaling and coordination of US\$2–20 million	Internationally competitive venture funding needed for scaling, ticket sizes of US\$2–20 million
2—incipient (Accra, Kampala, Dakar, Abidjan, Yaoundé)	Two to four	Hubtel, Rancard, Wari, Taxijet (50–200)	Leading enterprises address national B2C and B2B, or B2B in proximate countries; make millions of US dollars in annual revenues	Several entrepreneurs have achieved product-market fit, including in B2C business models; few of them are mentoring	Engineers with product development and craft skills; “missing middle” affordable high-skilled	“Jack of all trades” syndrome; guiding small ventures to investability	Venture-suitable risk investments (esp. angels) of US\$50 thousand to 2 million
3—learning (Kigali, Addis Ababa, Maputo)	One to three	Rwanda Online, Pivot Access, C-Net, Apposit, Emprego (20–150)	Leading enterprises target national B2B, make hundreds of thousands of US dollars in annual revenues	Most entrepreneurs with short experience; have not yet achieved product-market fit; almost no active mentors	Any full-stack software developers	Mobilizing active entrepreneurial community (beyond freelancers and graduates)	Funding of any kind; ticket/grant sizes of US\$20 thousand to 1 million

^aWe use “active hubs” as a category here that is qualitatively assessed based on interviews and our own impressions when visiting hubs. We also exclude incubators and support programs that are not specifically targeted at digital entrepreneurship. This number is therefore significantly lower than numbers quoted in hub mappings (see Boucher 2016; Firestone and Kelly 2016).

^bExcludes mobile operators, subsidiary offices of foreign technology companies, and digital enterprises with top management and software engineering teams mainly located outside of Africa (e.g., Jumia).

Instead of being firm demarcations, the three tiers serve to focus attention on *differences in ecosystem bottlenecks*. We conceive of bottlenecks as those factors that hamper an ecosystem to advance further. To some extent, these factors are idiosyncratic to any given ecosystem, but there may also be systematic patterns of certain bottlenecks prevalent at distinct stages of ecosystem evolution (see Mack and Mayer 2016).

In the remainder of this chapter, we discuss the most pressing bottlenecks for African digital entrepreneurship ecosystems in five areas, roughly in line with Isenberg's popular component model of ecosystems (Isenberg 2014): (1) markets and infrastructures, (2) entrepreneurial knowledge and mentorship, (3) venture labor and talent, (4) hubs and support organizations, and (5) access to funding. We use this categorization of entrepreneurial resources due to its popularity among policymakers and practitioners, but we do not assume that the categories are exhaustive, independent, or static (see Iacob, Friederici, and Lachenmayer 2019). We omit the oft-used "entrepreneurial culture" dimension because this ecosystem component is difficult to imagine and assess as a resource that reaches from poor to rich (see Spigel and Harrison 2018), making it impossible to meaningfully compare African cities (see appendix B for observations on each ecosystem).

Bottleneck #1: Markets and Infrastructures

Our analysis suggests that *access to sizeable markets* is the most important bottleneck for digital enterprise ecosystems across Africa. The previous chapters extensively discussed market and growth barriers from an enterprise perspective. They highlighted that the markets enterprises were able to access had a lot to do with where ventures were located. Only well-resourced enterprises were able to address urban and rural areas at the same time or cater to customers abroad at scale. Chapter 2 also documented that addressable local market sizes are determined by physical local infrastructures (both digital and analog infrastructures, like roads and power networks). In sum, these chapters demonstrated that the vast majority of African digital enterprises are confined to fragmented small local markets.

What remains in this chapter is to discuss the (eco)systemic nature of these market and infrastructure barriers and to analyze differences across Africa. Market and infrastructure challenges for enterprises become systemic bottlenecks by how they unfold their effects together in a similar fashion

for all enterprises in a city. This system-level aggregation of addressable demand allows us to conceive of market access as a place-based resource for enterprises in a given location (Spigel and Harrison 2018).

When examining market access at the system level, it is striking how closely the ecosystem tiers outlined in the previous section correspond to proxy values for local digital market sizes (see table 5.2). When comparing tables 5.1 and 5.2, it is apparent that tier 1 ecosystems (Nairobi, Lagos, and Johannesburg) are all (a) large cities (b) that represent major economic and trade hubs (c) in populous African countries (d) with relatively high mobile and internet penetrations and (e) a GDP per capita that is around or above the African average. Tier 2 ecosystems (Accra through Kampala) lack some of these features, while tier 3 ecosystems (Kigali, Addis Ababa, and Maputo) lack most or all of them.

Our interview data substantiates that the diverse demand challenges mentioned in chapters 2, 3, and 4 apply across all African ecosystems, and that they exacerbate each other in bottom-tier ecosystems. Digital enterprises located in small poor countries with small capital cities in which consumers and small businesses have low disposable incomes do not have access to the kinds of digital mass markets that are needed to make products like e-commerce platforms or payment services viable. Because large businesses (banks, insurances, hospitals, etc.) are typically the only actors with high enough willingness to pay for digital products, they represent the customers that digital enterprises in those ecosystems focus on. Meanwhile, megacities like Lagos or Nairobi represent bigger and more homogenous digital markets than small African countries like Rwanda or Mozambique.

Ultimately, the overall analog economic legacy of a given location thus unfolds an important role for digital entrepreneurship, as it strongly determines the size of addressable digital product markets. Problematically for low-tier ecosystems, they are relatively *less able* to escape the confines of local markets than top-tier ones because only enterprises in leading ecosystems typically are able to generate enough revenue in domestic markets to fund costly international expansions (see chapter 3). Accordingly, African ecosystems in general and the most nascent ones in particular face a stubborn bottleneck in the form of limited market access. Access to affordable broadband internet is a necessary condition for digital enterprises to operate, whereas local infrastructures, willingness to pay, and capacity issues in local markets constitute early thresholds for enterprise growth.

Table 5.2
Broad indicators of domestic digital market ceilings

Country (case study)	Mobile subscriptions per 100 inhabitants	Number of internet users per 100 inhabitants	Population in largest city (millions)	Urban population (millions)	GDP per capita (current US\$)	Income per capita per day (2011 purchasing power parity US\$)
South Africa (Johannesburg)	164.5	51.9	9.40	35.65	5,718	–
Nigeria (Lagos)	82.2	47.4	13.12	87.05	2,672	–
Kenya (Nairobi)	80.7	45.6	3.91	11.80	1,377	–
Ghana (Accra)	129.7	23.5	2.60	14.81	1,370	6.6
Senegal (Dakar)	99.9	21.7	3.52	6.61	900	–
Côte d'Ivoire (Abidjan)	119.3	21.0	4.86	12.30	1,399	–
Cameroon (Yaoundé, Buea)	71.8	20.7	3.07	12.69	1,217	–
Uganda (Kampala)	50.4	19.2	1.94	6.28	705	3.2
Rwanda (Kigali)	70.5	18.0	1.26	3.34	697	2.6
Ethiopia (Addis Ababa)	42.8	11.6	3.24	19.35	619	3.6
Mozambique (Maputo)	74.2	9.0	1.19	9.01	529	2.7

Note: – indicates missing data. Income per capita includes mean consumption data based on 2014–2016 World Bank data. All other data is 2015 World Bank data. Cities are arranged in descending order for internet subscription figures. The largest city was also the case study examined, except for Cameroon.

Bottleneck #2: Entrepreneurial Knowledge, Mentorship, and Experience

A second key bottleneck across Africa is the *low local stock of entrepreneurial knowledge*. It is particularly pressing in tier 3 ecosystems, while it is narrower and more specific in tier 2 and tier 1 ecosystems.

Although academic and policy literatures often emphasize a “lack of skills” as a key constraint for African innovation and development (Blimpo et al. 2017; Carmody 2013; Venables 2009), they have rarely recognized entrepreneurial knowledge as a particular type of expertise that is essential for ecosystem evolution. *Entrepreneurial knowledge* is an understanding of how to operate and grow a venture and how to do so in a given local context (Spigel 2017). Such knowledge is largely tacit and contextual. It can thus barely be acquired from codified and standardized information (books, media, online courses, etc.). This is what makes entrepreneurial knowledge location-specific and space-bound: due to its tacit and situational nature, it cannot easily be transferred across distances. Instead, it builds mostly from entrepreneurs’ direct experience with setting up a digital enterprise and from their face-to-face interactions with others who have this knowledge: experienced entrepreneurs who act as mentors or angel investors. This *recycling* of existing experiential and situational entrepreneurial knowledge by mentors interacting with newcomers has been identified as a key process in ecosystem evolution (Mack and Mayer 2016; Spigel and Harrison 2018).

Given how new digital entrepreneurship is to most African cities, almost all locally relevant entrepreneurial knowledge has only recently started to be built, mostly through painstaking acts of learning by doing. As chapter 3 highlighted, templates of how to run a digital enterprise from elsewhere can be used as a starting point, but they typically require major context-specific adaptations that are hard to predict upfront (see Rodrigues et al. 2018):

These [learnings] are things that don’t come just falling from the clouds. It’s very much been an evolutionary process of understanding the market. . . . This is actually what I think it means to have a local awareness. (Entrepreneur in Kigali)

Experienced entrepreneurs in Lagos and Nairobi told us that although digital entrepreneurship may recently have entered a period of maturity in those cities, this has been the result of a lengthy and sometimes wasteful process of learning from past mistakes:

What [investors] were doing then [in the early 2010s] was really badly structured and shooting in the dark. It gave a lot of people opportunities to test out. . . . They were dishing money out left, right, and center. Somebody was like Oprah with the free cars: “You get 25K! You get a deal! You get a deal!” You could have ripped them off, and there were some people who took money and never showed up again—get 25K and then you change your number and you’re done: you’ve got 2.5 million shillings. (Experienced entrepreneur in Nairobi)

The market corrected itself at some point. . . . A lot of people started setting up very, very funny businesses. Some people wanted to compete with Facebook; some people wanted to compete with Twitter. . . . They were burning a lot of cash. They were paying to acquire fake users and whatnot. It sounded like a good business model, but at some point, foreign capital met with local capital—remember the guys behind the local capital are traditional guys. . . . As a result, all the companies that were not focused on revenue started dying. So that corrected itself. Now, from day one, you have to show the revenue potential. (Experienced Nigerian entrepreneur)

Even where a number of experienced entrepreneurs exist, given the challenges of scaling within African markets (see chapter 3), they may be preoccupied with guiding their business to sustainability for long periods of time. Moreover, being a mentor and role model is not for everyone:

A lot of times, I’ll walk into a place and people are like, “Oh my God, this is [*interviewee’s name*],” and I keep thinking, “Okay, it’s kind of awkward, I’m just a regular guy. I’m just somebody who is trying to figure out how to get this thing to work half the time.” People are seeing what you’ve done, [while] you’re seeing what’s *not* yet done. You’re always feeling inadequate, you’re always feeling I could do better, we could go faster. (Experienced Kenyan entrepreneur)

This implies that several generations and a critical mass of entrepreneurs must have been active in a particular ecosystem for locally relevant entrepreneurial knowledge to develop into a collective resource that is shared and circulated (see Spigel and Harrison 2018). If there are only a handful of entrepreneurs with relevant experiential knowledge and if these entrepreneurs are not inclined to share their insights as mentors, a novice entrepreneur is forced to start her learning process from scratch, making all costly mistakes again:

There’s nobody’s footsteps we’re following in. . . . You look at M-Pesa: it’s an Israeli product bought by Vodafone and shoved into Safaricom. You look at Hellofood, and this is Rocket Internet. Who’s done it yet? Rather than this being a pessimism thing, it’s an optimism thing. I like the idea that we’re the pioneers and that, if we’re successful, we’ll be the ones who are the case studies that lead the way for

other people. It's also inherently frustrating because it means that every single lesson learned is really a tough lesson to learn. . . . The fact that nobody's done the first steps is a terrific opportunity, because it means you don't always have to have a crisis of realizing everything you dream about has been done a hundred times. That's also a real challenge because it's like building a house and realizing that you just want to go move in and put the furniture in, but you've got to start by clearing the trees from the lot. (Entrepreneur in Kigali)

In tier 1 ecosystems, entrepreneurs have accumulated knowledge on how to execute standard digital business models, but they have yet to acquire specialized and niche knowledge. Examples of specializations in entrepreneurial knowledge include, for instance, leading a digital enterprise to profitability within particular sectors (ERP systems for hospitals vs. insurance companies), monetizing different types of digital technologies (e.g., payment platforms as smartphone apps vs. blockchain-based), or applying strategies that deviate from Silicon Valley role models (see chapter 4):

The entrepreneurs at that time were guys that were just fresh out of school; [they] had very little knowledge about business. Even if you look at IROKOTv, Jason [Njoku] was just, I don't know, maybe just new in town—there were no mentors. . . . At that time, there was no advice. You do it well or you flop, right? So you had to do all the learning yourself, you had to grow fast . . . and we're not making money and a lot of people did not understand your model because the traditional businesses could not fathom why you do a business without making money and posting losses on a monthly basis. (Founder of a local information platform in Nigeria)

A very consistent finding was that formal work experience served as a significant compensator for the scarcity of entrepreneurial knowledge and mentorship opportunities. We found work experience to have a fourfold virtuous effect (see Sørensen and Fassiotto 2011) in that formal employment

- was a source of startup capital;
- provided a professional alternative and backup for individuals needing to (temporarily) quit entrepreneurship;
- was an environment in which to learn skills and cultural knowledge; and
- allowed entrepreneurs to develop fruitful connections that could be turned into customers and business partners.

Unsurprisingly, employment at digital corporations came with particular opportunities. For instance, we interviewed four individuals in three cities

who had formerly worked at national telecom operators and were able to leverage that experience to create new ventures. Some of them counted their former employers and their former employers' customers among their clients:

I left the company that I was working for, which is SATCOM, and then I opened my own company. . . . One of our customers is an ISP [internet service provider] that we helped develop. So we designed the whole technical network and we still give them support. Because of my experience with SATCOM, we're involved other aspects in the roles of telecommunications. We work with a lot of banks . . . and we work with companies that want to implement internet solutions or want to implement telecommunications in general. (Entrepreneur in Maputo)

Many other (mostly younger) entrepreneurs we encountered had never been formally employed, and this affected their social capital and their business knowledge. One common and unsurprising reason were local constraints on employment opportunities. Another more unexpected pattern was found with techie entrepreneurs who developed coding skills at a young age and who wanted to remain independent, choosing to stay self-employed and work as freelancers. We also found evidence that the startup imaginary has gained ever-greater cultural influence, thus permeating livelihood and lifestyle decisions. The implication for these entrepreneurs' social networks was a negative side effect: they did not experience the benefits of formal employment (Sørensen and Fassiotta 2011).

Some participants had entered employment after trying their hands at entrepreneurship. They confirmed that employment had provided them with knowledge that would have been vital to their entrepreneurial endeavors:

I think if I was to develop a solution right now, I would do a much better job. And actually, the whole team, I think it would be much better and would be much prepared to do it. But still I—what I noticed from trying to create all these products, because there was a time that I was crazy about creating products, but then trying them into the market, it was like, it was bad. I understood that it is better to improve myself. The strategy that I chose was to improve myself, to gain the skills that I needed to about product management, about knowing the market, about marketing, about financial management, about human resources management. All of those things, those are skills that I'm learning. I've been learning a lot actually that would help me to develop my own company. Actually, when I started working at [a big four consulting company], one of the things that I told my boss is that I'm here because I want to be able to create my own company in the future. (Former serial entrepreneur in Maputo)

Similarly, an entrepreneur in Johannesburg, who had gone into business after being employed in a big consulting company, pointed to a variety of entrepreneurial skills that she gained during her employment. These include dealing with administrative and operational tasks, as well as the ability to speak convincingly about business matters to potential supporters:

Do not rush to become an entrepreneur. Every phase that you're in will prepare you for where you need to be. I went in and I knew nothing about business and I had worked in different departments in different industries. Different types of projects from your revenue projections to cost recovery, projects, operational improvement, people optimization, to culture. I think work experience is probably one of the biggest things you can have before you leave. It's knowing when you can leave. Because you're always taking a risk . . . but I think you're taking a bigger risk if you go naïve.

Last but not least, employment also benefits entrepreneurs by providing them with a financial base for their enterprise. An American entrepreneur in Nairobi spoke of using the entirety of their savings and credit lines, which left them in a position of great financial uncertainty:

It's been the biggest struggle of my life for sure. I've put all the money I had saved from seven years of working, and I put \$40,000 on credit cards that I came into this, never having a credit card balance in my life, and four years later I have like 99 percent of my credit space utilized. And whatever, I have like \$107 of credit card space left.

Of course, for many African entrepreneurs, credit card debt is not an option in the first place because they simply do not have access to credit cards. Both the mentioned entrepreneurs' former employment and salary and their origin are thus important factors in determining a high level of credit. More broadly, any source of funding beyond personal and familial sources may depend on financiers' judgment of a person's credit, which is itself influenced by their assessment of how affluent the debtor is.

Bottleneck #3: Digital Venture Labor and Talent

Digital enterprises depend on highly skilled, creative knowledge workers, including software engineers, designers, product developers, project managers, data scientists, social media managers, and so on. African digital enterprises struggle to effectively attract and retain highly skilled and reliable labor. We identified a mismatch between local demand and supply for

venture labor as a barrier across all African ecosystems, making it the third important ecosystem bottleneck. Similar to entrepreneurial knowledge, this bottleneck becomes more specific and narrower from tier 3 to tier 1 ecosystems. In turn, the mismatch seemed to be the most pronounced in tier 2 ecosystems, in which a number of enterprises had identified product-market fit and were eager to hire but were unable to find employees able to take on involved technical and managerial roles.

Africa's Technologist Workforce: A Wide Spectrum of Talent and Principals

The professional group we found to exist across all ecosystems was made of *technologists*: software developers and engineers, working either as freelancers for local and distant clients or as employees of local digital enterprises. Across Africa, interviewees in this group reported to us that they were motivated by “creating something,” making “easy money,” and by independence.

Initial coding skills were typically obtained from local universities and online courses. In all eleven cities, participants reported that most local universities and educational institutions did not prepare young people for the job market. Typical complaints were that these institutions only taught the theory but not the practice of computer science, that teachers' programming knowledge was outdated, and that learning methods did not encourage critical and creative thinking. Accordingly, a lot of learning happened by doing. Many coders started by developing simple websites (often with WordPress templates) for friends or family.

Especially talented technologists then came to realize that what is easy for them could generate significant income, leading them to complete further online courses. Many technologists alternate between part-time and short-term employment and freelance work, depending on the options they can find locally and online at any given point time. Those who stay freelancers and consultants enjoy being their own bosses. The technologists we interviewed were keenly aware of the concrete financial value of their skill. Often, freelancers established a local base of loyal customers and iteratively increased their portfolios through online freelancing. In a clear pattern, talented developers often get paid among the highest monthly incomes available to young urban professionals (e.g., about \$500 in Addis Ababa or \$2,000 in Accra).

Many freelancers preferred to work with clients from high-income countries, not only because of higher rates, but also because they claimed that such gigs pushed them to achieve higher quality standards and work toward deadlines in a disciplined fashion. A further advantage of online freelancing is that income opportunities are less affected by local economic issues, like currency fluctuations or economic downturns. Technologists we interviewed were skeptical of general digital labor platforms, such as Upwork, citing the risk that clients would not pay, the piecemeal nature of the work, and low hourly wages. Instead, they obtained international contracts either through personal contacts or specialized software developer platforms, such as Toptal or LinkedIn and Slack groups. For the most talented and experienced software developers, online freelancing provided much better job opportunities compared to regular employment at local corporations or startups. For instance, one Nigerian software developer reported that the rates he obtains through Toptal are ten times those he would attain locally.

A New Breed of Entrepreneurial Workers

We found more variation across ecosystems for the second professional group: *entrepreneurial workers*. Digital enterprises often have malleable organizational structures and engage in constant knowledge exchange, requiring workers to be flexible and engage in professional communities beyond the enterprise (Auschra et al. 2017; Benner 2008; Ibert 2004). Accordingly, managerial and soft skills are often valued just as highly as technical skills in digital entrepreneurship ecosystems. Ultimately, even employees who are not executives may be required to adopt an entrepreneurial approach, as they design products, share risks, get rewarded through company shares rather than salaries, and partake in strategic decisions (Neff 2012). In such a context, some workers can attain high incomes, but career paths are more uncertain and workloads can be overwhelming (Barley and Kunda 2004; Neff 2012).

We found a critical mass of such workers to exist in tier 1 ecosystems (Lagos, Nairobi, and Johannesburg) and to a lesser extent in tier 2 ecosystems (Accra and Abidjan). Kigali was an exceptional tier 3 ecosystem in which we found some entrepreneurial workers, potentially due to Rwanda's concerted push to institute entrepreneurial ideas across society (Root 2016).

Like entrepreneurs (see previous section), entrepreneurial workers acquired important skillsets over time and social networks played an

important role for learning and identifying opportunities. In tier 3 and some tier 2 ecosystems, founders seeking to hire entrepreneurial workers reported that recent university graduates often were not independent and reliable enough, making workers who had been exposed to professional corporate environments the preferred candidates. They bemoaned the narrow range of options for graduates to learn about how to comport themselves:

People who will work [are those] who are competent or they can train easily to get in the flow of your business. So, work ethic is different in Cameroon and maybe in Kenya, or in [the] US or Europe, because first of all, [here] there no student jobs. So, people don't get into professional work and learning work ethic until usually they finish university and they get into a new job. You have to train people [in] work ethic, getting to work on time, respecting deadlines, being conscious of their lines. Having the results-focused culture, not dropping the form, not building excuses that you don't care about. Wearing the professional face when they come to work. Don't pull your personal drama to work! I mean, all these things that will seem like common sense usually aren't very common. (Hub manager in Yaoundé)

Our findings confirm that this new professional class of confident, young, well-educated, and skilled workers is exploring career options rather freely and deliberately (see Avle 2014; Avle and Lindtner 2016). They usually seek to balance salaries with skill development and job quality, while placing lower emphasis on employment security. These professionals feel part of a wave of positive and long-overdue transformation in their home countries or in Africa as a whole:

[It] is really important to drive products coming from Africa that are very tailored to this context in the coming future. . . . It's nice that [Google is] making products but you also want to produce an Uber, an Airbnb. There's a lot of digitizing. These [new] digital cultures are producing their own digital products. . . . Perhaps global cultural homogeneity is not the best thing. I think I feel very strongly about that. That's what informs this 'African solutions to African problems' type of thing. (Startup employee in Nairobi)

For entrepreneurial workers, digital enterprises are an environment in which they can hone and deepen managerial skills and build careers with a more long-term orientation. In particular, they feel that working for a digital enterprise lets them actively partake in building useful products and gain entrepreneurial experience without being entrepreneurs. Workers benefit in particular from being closely involved with business processes, reasoning that they learn essential skills for their own companies, which they are envisioning to start at a later point. They tend to like the flatter

hierarchies and friendlier organizational cultures that many startups have compared to traditional and larger local corporations. Money definitely matters for entrepreneurial workers, but it is not everything, and they are often content so long as salaries cover their living standard. They often forego higher salaries attainable at corporations, at development organizations, or in the government:

I didn't think too much about money. I just wanted to be in an IT company where I can practice what I did in school. . . . I wanted to be focused on one thing, because the IT, it's expanding. I wanted to find my place. . . . I have inside of me that entrepreneurship thing. I want to create something. Even if I'm not the CEO, to me, that's not the problem. I just want to know we achieved what we wanted together. (Startup employee in Kigali)

Competing for the Best, with Limited Resources

Although the number of software developers has mushroomed across Africa, digital enterprises especially in tier 2 ecosystems have suffered from a *missing middle of skill and talent* (cf. Grugulis and Stoyanova 2011). A central issue was that ventures often require not just software developers but software engineers, who are able to build compelling digital products, shape a venture's strategy, and lead teams of junior developers. Self-taught developers with basic skills existed in relatively large numbers in most cities we visited, but they did not show the application and comprehensive skillset required for product development:

We were with a Kenyan self-taught developer for two-and-a-half years, who is great for where he learned his skills, but now we've got this French guy who is just a super star! (Entrepreneur in Nairobi)

In turn, the few highly skilled and experienced engineers that exist command high prices for their labor, excluding most digital enterprises from accessing such outstanding workers. Participants noted that usually only software engineers from high-income countries or foreign-educated Africans were able to meet all the requirements of working independently in a fledgling enterprise:

A lot of the people that we took here studied or worked abroad. I mean two of the people working on [our startup] worked in Ghana. Joel, that you can see over there worked in India. You have Janet who studied in Canada, we have Paula who studied in Morocco. You have me, who studied in England, Joseph who studied a little in the US as well. So yeah, we're really trying to take the best. . . . We can

find talent in Ivory Coast, but a lot of times, it's talent that we have to reshape. For instance, [an employee] has a lot of potential because he has energy, he has an extremely classic mind to begin with. But he was taught in the ways that will make him a good web designer. . . . He may even know how to do CSS and JavaScript, which are mainly used for websites. But here we're building strong software so you need "deeper," if you will. Languages such as Python or C++ and [talent that know] those languages are extremely hard to find in Ivory Coast. (Entrepreneur in Abidjan)

In addition, multinationals are often able to attract the best local talent:

A lot of people are just thinking: How can I get paid as much as possible, how can I work for blue chip companies and that's why startups have such a problem attracting talent sometimes because you're competing with Safaricom, which has name recognition and this is someone who is fresh out of school. In a few years, I'll be able to take a huge pay cut to join a startup or to build my own company because you've already got something set aside, but a lot of people who are young and just coming out of school don't have that luxury, you don't have the luxury of working at a small company when you could have started your career at a bigger company and moved a lot more. (Entrepreneur in Nairobi)

Ultimately, the required talent was often unaffordable or wholly unavailable for African digital enterprises:

When I began, the idea was like, "let's just have ten software devs and crack this code." Now, it's realizing that we're really looking at [our CTO as the only software engineer]. I think he's the best software developer in East Africa. Having spent so much time at MIT and CMU [Carnegie Mellon University], I think he knocks it out of the water in terms of how his brain thinks of these things. You can't get someone else like that . . . Our dear competitors, they've been trying to hire a CTO, and they've been having that post advertised for 5 percent equity of the company, for 75,000 dollars a year—they still haven't been able to fill it. You know, that's more than half our yearly budget! (Entrepreneur in Kigali)

In tier 1 ecosystems, skill gaps were more specific. Here, entrepreneurs bemoaned that local coders missed specialized technical skills beyond basic web and app development (server administration, niche programming languages, algorithmic computing), craft software engineering skills (writing clean, elegant, and efficient code; understanding the product development context of software development), and secondary skills (documenting code, collaborating with other software developers, time management and realistic scheduling, maintaining focus on a single project):

Things like web development, mobile, that's fairly low hanging fruit. But now when you want to start doing things like banking systems, serious integrations,

robotics, AI—if you don't have a proper theoretical foundation, you're probably just going to be using Google libraries, and [we] will never get to the point where we're able to write those libraries ourselves (Startup employee in Nairobi)

However, enterprises in tier 1 ecosystems also had more means to compensate for shortages. Especially in Nairobi, immigrant venture laborers from the US and Europe were often willing to accept pay cuts:

So I spent quite a bit of time in Berlin. There's a good tech scene there . . . Cheap developers because all of Ukrainians and Eastern Europeans want to come to Berlin. Through our local networks, we stumbled upon [our lead developer]. He was bored to death in [his job there] and, when we asked him if he minded moving to Nairobi, he [agreed and came] here because it's the Wild West and it's exciting, right? (Foreign-born entrepreneur in Nairobi)

As a result, a number of digital enterprises across Africa outsource software development, mostly to India and sometimes to Europe. Entrepreneurs noted that despite coordination and communication issues, the quality-price ratio was better in particular for projects of medium complexity and size, for which teams of software developers need to be assembled for a few months:

Well, we tried to do it internally. We realized, it was so much—it was quite an issue trying to scale that. The market was not really willing to pay premium, and the talent was pretty much expensive to get the right sort of people. (Entrepreneur in Lagos)

Bottleneck #4: Innovation Hubs and Other Support Organizations

The fourth bottleneck concerns innovation hubs and other digital entrepreneurship support organizations. This challenge is most pressing in tier 2 ecosystems, in which significant numbers of enterprises exist that demand support, while organizations tend to struggle to streamline and scale their offerings in a way that effectively responds to demand. In tier 3 ecosystems, informal community-driven support organizations usually exist, while the narrow set of entrepreneurial experiences, small market access, and shortages of venture labor supply represent the most pressing bottlenecks. In tier 1 ecosystems, again, the bottleneck becomes more specific: several hubs and other organizations usually exist in those cities, while they suffer from coordination challenges and sometimes struggle with legitimacy among experienced entrepreneurs.

Innovation Hubs: What Does Their Ascendance Really Tell Us?

As alluded to earlier, the fast increase in the numbers of innovation hubs across Africa was aided by the symbolic role of iHub and an ideological match between current paradigms in development (e.g., participatory and community-driven development), digital technology (e.g., openness), and hub principles (e.g., grassroots entrepreneurship). In media reports and popular books, the sheer growth in numbers of hubs is often taken as evidence of a rise in digital entrepreneurship as a whole (Bayen and Giuliani 2018; Bright and Hruby 2015a; McGee 2017).

A growing body of empirical evidence (Friederici 2017a; Jiménez and Zheng 2018; Littlewood and Kiyumbu 2018; Marchant 2018; Rodrigues et al. 2018) suggests that such an understanding is problematic. The social realities of hubs are immensely complex, and hub managers and funders struggle to fully understand the strengths and weaknesses of the strategic options at their disposal. Ultimately, many hubs had to scale back their ambitions or move away from iHub's archetypical "hub" approach, in the sense of an open community-driven space with limited intervention by managers (Moraa 2012; Toivonen and Friederici 2015).

In the end, hubs' quick rise is merely evidence of their popularity among their funders (mostly development organizations, foundations, tech corporations, and local governments), not of their effectiveness (Friederici 2019, 2018). We will discuss their underlying ideology in more depth in chapter 7.

Lofty Goals and Mundane Purposes

Many hubs start out with high aspirations, often including some notion of "building ecosystems." Indeed, assembling entrepreneurial communities, which give members a sense of collective identity and meaning, has been found to be the most transformative outcome of hubs (Friederici 2017a; Marchant 2018). Hubs have also become the first points of contact for foreigners entering a given entrepreneurial ecosystem and they thus serve an important orientation function (Littlewood and Kiyumbu 2018). They can also be boundary organizations in which indigenous creative traditions are blended with foreign ideas and technologies (Eglash and Foster 2017).

Yet the social dynamics of community formation can be fickle (Bøllingtoft 2012; Garrett, Spreitzer, and Bacevice 2017), and African hubs often have struggled to strike the right balances of inclusion and exclusion

(Friederici 2018; Jiménez and Zheng 2018). Hubs (like coworking spaces and incubators) have a basic function that resonates with African environs: they alleviate the overhead costs of running a small business and create opportunities for horizontal scaling, in which small firms rely on each other to provide competencies that are not available in-house, like market research and professional development (Hersman 2013). It is thus easy for hubs to be workspaces for students, consultants, software developers, freelancers, and so on—but establishing communities (as purposeful social collectives) has proven to be more elusive. Accordingly, hubs have sometimes struggled to be “more than just a space” and to avoid being considered glorified internet cafes:

But just sitting next to each other without a structure . . . I don't really [believe that works]. It depends on your company [but] we have very strong methodologies from the beginning. We started very strong in business [advice]. (Entrepreneur in Kampala)

Moreover, active entrepreneurial communities can be very valuable in many ways, but they are not in and of themselves a generator of growth-oriented or sustainable ventures. An expectation that hubs can “create startups” may therefore be misguided, even where hubs are extremely successful, because immediate startup creation is simply not an outcome that the organizational actions of hubs could ever achieve (Friederici 2017a). Especially in tier 3 ecosystems, hub managers may justifiably be inclined to neglect venture development for the sake of softer goals:

Building something, a little bit, the ecosystem. We found a very lean way to build it . . . in the beginning [in 2012], just to say, “Hey, awareness creation.” Because there was no other hub, nobody was talking about startups or entrepreneurship. . . . I think that was really how we also defined our mission, saying “Okay, let's find some cool people who got an idea, let's try to bring them to the next level, having a prototype, a business plan.” But that was in a very unstructured way. . . . I think the main task was really making events, bringing entrepreneurs to the university to give speeches, having round tables, providing space for interest groups . . . just building a community and I think that's what we basically did for the first couple of years. . . . I think [it was about] creating the demand. (Hub managers in Addis Ababa)

Beyond the difficulties of community facilitation, hubs have struggled at the organizational level from lacking clarity concerning goals, best practices, target groups, and impact. Like incubators, accelerators, and

technology transfer offices, innovation hubs are boundary organizations that mediate interests of funders (principals) and beneficiaries (agents) (Guston 2001; Hackett and Dilts 2004). These interests may be conflicting (e.g., governments wanting to create employment vs. startups wanting to employ few productive staff), and there may be substantial cognitive distance between the two groups (e.g., a foundation in Europe may fund hubs without its staff having set foot in an African hub or talked to local entrepreneurs). Compared to incubators, both funders and beneficiaries of hubs are typically more openly defined and rather unorganized groups of actors, which makes hubs' intermediary role even more complicated and their success more ambiguous (Friederici 2017a; Littlewood and Kiyumbu 2018). Especially in tier 2 and 3 ecosystems, hub managers often do not have an entrepreneurial background, inviting criticism:

I think from the hub side, [the key to success] is picking the right idea, having a more stringent process for reeling it through your door, [and] mentors and the people leading the programs being entrepreneurs themselves and not teaching from a book. It's also very valuable because if you've never had your own business, or anything, how are you going to teach me how to get through these really tough times? (Entrepreneur in Johannesburg)

Similarly, in tier 2 and 3 ecosystems, hubs' struggle for effectiveness has been exacerbated by the number and magnitude of challenges for entrepreneurs, leading hubs to try to take on more problems than they can realistically handle given their usually modest budgets, short histories of operation, and limited organizational capabilities. Hub managers have been found to be "winging it" and suffer from "feature creep" (Rodrigues et al. 2018). As some hubs have attempted to satisfy too many principals and too many different kinds of entrepreneurial needs, they have become jacks of all trades, masters of none.

The Mutual Dependence of Support Organizations and Ecosystems

Finally, and maybe most importantly, African hubs had to relearn two old lessons from business incubation (Bøllingtoft and Ulhøi 2005; Hansen et al. 2000; Rice 2002): they depend on active contributions by entrepreneurs and on the already available resources in the local ecosystem. In African cities, both these contextual dependencies become pitfalls for hubs because their own effectiveness can be hampered by the very problems they are trying to address, especially the absence of entrepreneurial knowledge and of

mentors. In tier 2 and 3 ecosystems, experienced digital entrepreneurs and mentors that can contribute to hub activities may simply not be available. In tier 1 and some tier 2 systems, we regularly found divergence both of mindsets and of networks between established digital entrepreneurs and the more grassroots novices frequenting hubs and networking events:

[My co-founders and I] hardly go for events. . . . We believe that it's relevant for the ecosystem but we also feel that those hubs and those engagements don't give out the right message. We still pass the message that as long as you have an idea, that's great: you'll get investors. . . . But having been in the online business for a while . . . you can have the idea and you can grow at rocket speed. You'll probably do that for a year. Afterwards you have to understand that a sustainable business has to be sound from day one. That is not readily preached. . . . By the time you get to CcHub [Nigeria's best-known innovation hub], you need to ask yourself, How many businesses have actually been incubated and how many have been successful? . . . I think I've done about three or four speaking engagements . . . talking to startups, talking to internet companies. . . . But for example, if you ask me if I'm going for the Social Media Week next week, no. . . . I'll only go when my time [is] really requested . . . , or when I see that there is a lot of value to attract from it. . . . So we talk to a lot of people. There are different channels. We're in WhatsApp groups. . . . There is quite a lot of stuff to do. . . . We also invest in them. So we know what is happening, but we don't—permit me to use the word *jump around*—and [we don't] go for all the events because we believe that there is so much to do. (Experienced entrepreneur in Lagos)

But in tier 3 ecosystems, community- and event-oriented interventions often are more widely appreciated given the overall dearth of activity. An example of a particularly extensive and locally popular program is the Science, Technology and Innovation between Finland and Mozambique (STIFIMO) project. Aside from providing mechanisms for assisting Mozambique with its national science, technology, and innovation strategy, STIFIMO also provided funds for networking opportunities among digital entrepreneurs and funded entrepreneurs' trips to Slush, a major pitching competition and conference in Finland:

So at my third year at my university, I attempted my first hackathon organized by Sciences and Technology minister with partnership with Finland. It was a project called—let me remember. It was a STIFIMO. So that was the first hackathon that I participated and unfortunately, I didn't win the first prize but we learnt a lot about how we can use hackathons to just expose ourselves and connect with good organizations that are willing to build solutions or tech solutions for local or global problems. (Founding member, developer community in Maputo)

Still, it is questionable whether such support initiatives are well-positioned to advance tier 3 ecosystems to compensate for other bottlenecks. For instance, it is hard for hub managers to teach entrepreneurial knowledge that would usually be established through direct entrepreneurial experience:

So we've been evolving a little bit that way. We're dealing with like true seeds of ideas. Young guys who are like "I know code; I'm thinking about building these couple of projects as a product"—they have no business sense whatsoever. They're just thinking it's a good idea. So we don't discourage them but we say, "Take it too its logical conclusion. Work your idea through all of these steps: Viability? What kind of team do you need?" And not only that, but we try to train and focus people, right. Many think that they can have a great idea and tomorrow it becomes Facebook, but we have to sensitize them to the market realities. It's that your startup may continue to be a startup until it's the teenager, again, because the market is moving a lot slow. You can't expect to hit massive penetration when you only have 30 percent internet penetration and your country is 50 percent under fifteen. (Hub manager in Kampala)

This quote illustrates that market and entrepreneurial knowledge bottlenecks can make efforts like hubs futile, leaving exiting entrepreneurship as a more appealing option. We found a similar dynamic in many tier 2 and 3 ecosystems, including in Maputo (see box 5.1), where STIFIMO had provided valued support options. In such settings, a critical mass of sufficiently experienced grassroots entrepreneurs cannot be convened, thwarting peer-mentoring and other self-sustaining community dynamics that hubs have been praised for.

Accordingly, most of the more recent boom in funding for digital entrepreneurship support organizations has focused not on innovation hubs but on modern versions of incubators, such as structured mentorship programs and accelerators (see Pauwels et al. 2016 for a definition and review). Notables include Google's Lagos-based accelerator, giving \$3 million in investments and in-kind support (Jackson 2018a); the World Bank's XL Africa program that connected twenty enterprises from all over the continent with investors at events in South Africa (Kapil, Andjelkovic, and Lu 2018); the GSMA Innovation Fund, giving mentorship and amounts of \$1–\$2.3 million per enterprise, also sourced from the entire continent (Mulligan 2017); and the Make IT program by GIZ, which set up a large-scale and complex initiative to support several dozen startups, offering (among other services) access to hubs in Nairobi and Lagos.

Box 5.1**The Maputo Living Lab: Tilting at the Windmills of Structural Inequality**

The Maputo Living Lab (MLL) was a program that was established to provide youth trained in computing with the skills to develop enterprises. The alumni we interviewed felt that their time in the incubation program equipped them with codified knowledge about professionalism that was expected to enable them to succeed as digital entrepreneurs. Yet they also reported that despite the intensive MLL program, they still did not have a good sense of what the market needed, and they did not obtain the skills to run a company.

After the MLL program's demise, the alumni faced difficulties as entrepreneurs. The program had attempted to be inclusive: all candidates had been selected from a local public university rather than from the private schools where local elites send their children. Alas, none of the alumni now had the financial wherewithal that might have enabled them to learn by doing, fail up, or otherwise wait for startup success.

Many of the alumni were, however, able to find high-level corporate jobs. Their academic performance and experience with the program seemed to have made them ideal recruits for global companies. Many of them reported that they had a whole new outlook on the business world through work. Those who have plans to eventually leave employment to try entrepreneurship once more feel that they will be much better equipped.

Such organizations and initiatives have a much higher ratio of resources per supported venture compared to hubs. Yet they are typically only available to already relatively successful startups that have proven some product-market fit. Concerning their impact, similar questions present themselves as for incubators because “ideally, only those firms that are ‘weak-but-promising’ (weak due to a lack of resources, but promising in the sense that they have built a compelling business case) should be considered . . . candidates” (Hackett and Dilts 2004, 62). In reality, such a determination may be anywhere from difficult to impossible to make, especially for Pan-African programs. Implementers also have a strong incentive to pick ventures that are successful either way because rigorous impact evaluations that attribute a program's contribution to a venture in precise terms are almost never done (see McKenzie 2015 for the only exception we are aware of).

Here too, the prescriptions of frameworks for digital entrepreneurship do not completely apply in Africa. The expectation by donors and other

organizational funders is that, over time, firms should cease relying heavily on support organizations. Ideally, incubators and accelerators should jet-tison firms that do not achieve their milestones at the target rate. Yet across Africa, there were numerous instances in which organizations did not actually follow this model. Detractors of entrepreneurship support organizations often framed this negatively as propping up failures, but we found it also to be true that if one eliminated all digital ventures in tier 2 and 3 ecosystems subsidized in some way, there would be very few firms left in those ecosystems:

A lot of the incubators are terrible. All of them must have actually forgotten what it is that they're supposed to be doing. They did a blanket approach to enabling entrepreneur. Whether you're mid-stage, late-stage, early-stage, they teach you the same thing which is usually not that useful. Maybe incubators need to start talking amongst themselves and say, "Okay, so who are you incubating with? What are they giving you?" It's open and fair in a way to the other startups as well. (Entrepreneur in Johannesburg)

An interesting market access-oriented intervention is Alibaba founder Jack Ma's Electronic World Trade Platform (eWTP), the goal of which is to allow African traders to sell their goods in the Chinese market (Moloi 2018). Ma's goal of facilitating digital entrepreneurship in Africa is philanthropic, but also has the added benefit of connecting African and Chinese markets through platforms that Ma has developed. eWTP is complemented by an UNCTAD partnership. The program provides fellowships for training at Alibaba's business school in China. Rwanda has also been the first country to sign up.

In tier 1 and 2 ecosystems with high numbers of support organizations, an additional challenge becomes effective coordination across an ecosystem: connections with universities and established businesses in particular may be explored weakly, while links to tech corporations and mobile operators may come with long-term risks and conflicts of interest (Rodrigues et al. 2018). Accordingly, even when there is a great number of accelerators and innovation hubs, tight entrepreneurial communities may not always follow. In Johannesburg, despite the large number of organizations, entrepreneurs frequently lamented the lack of pulling together and community in the ecosystem:

One thing we don't really do well is we don't really support each other, and so we need to that whole supporting structure. I mean if I have an opportunity, I should

be able to pull you in and say “Okay, here’s an opportunity,” but at the same time I should pull you in because of merit. Because yes, I know you’re really good at this. . . . We should be able to pull in the right people. Those that are not skilled, and we pull them in to upscale them. I think once we get that right, we’ll probably be in a better position. (Founder of a technology production and consulting startup in Johannesburg)

Bottleneck #5: Inadequate and Exclusive Funding

The fifth bottleneck concerns missing funding, especially when it comes to investments that are appropriate for digital ventures to achieve both growth and sustainability. The overall amount of investments matters for an ecosystem’s evolution, but which firms have access to funds and which ones do not is just as important. Most resource exchanges in ecosystems are by nature exclusive to some entrepreneurs and not open to all. From an entrepreneur’s perspective, his or her networks are important for acquiring financing, contracts, and advice, leading to an improvement in the performance of firms (Khayesi, George, and Antonakis 2014).

It is unsurprising, then, that entrepreneurs in our sample who were independently wealthy or who had relationships able to support their entrepreneurial efforts had better chances. The distribution of resources in any ecosystem is necessarily uneven. However, what determines an ecosystem’s conduciveness to productive entrepreneurship is the degree to which those exchanges are enabled that benefit viable new enterprises rather than incumbents and rent seekers (Spigel and Harrison 2018; Stam and Spigel 2018). In this section, we thus also will examine in what ways social networks in African ecosystems are able to channel resources to entrepreneurs with high-potential digital products, irrespective of their preexisting status and socioeconomic position.

As with the previous four, the funding bottleneck also materializes in different ways across ecosystem tiers: in tier 3, fledgling startups tend to struggle to attain financing of any sort, especially enterprises helmed by underprivileged entrepreneurs; in tier 2, small pots of money are available from entrepreneurs’ savings, innovation competitions, and kinship networks; and in tier 1, small VC funds, angel investor networks, and an abundance of innovation competitions are available, even if ticket sizes available to most ventures are still too small to take on foreign competition.

Traditional Channels, Traditional Challenges

A complaint across all ecosystems was that traditional channels of finance, such as bank loans and government grants, are unavailable or wholly inadequate to be accessed by digital enterprises. The vast majority of entrepreneurs' whose firms had reached financial sustainability had achieved this by reinvesting revenue (see chapters 2 and 4) while relying on no or very small amounts of external funds.

Traditional small and medium enterprise support programs set up by government agencies often require physical assets as collateral and for candidate firms to be at least three to five years old, excluding a large share of digital enterprises from eligibility. Many respondents (e.g., in Kampala, Maputo, Yaoundé, and Abidjan) perceived their governments as paying lip service to supporting them. These entrepreneurs pointed to evidence such as a lack of business grants or government procurement practices that privilege global corporations:

Starting and running a business is a real uphill task for young entrepreneurs . . . with all the licenses, taxes, and lack of access to capital. (CEO of e-commerce site, Maputo)

The refrain among participants was that not enough accommodations are made for bootstrapping startups, wrongly treating startups like other businesses, despite their low revenues and young age. In some locales, these costs were heightened by the burden of expediting stalled bureaucratic processes:

[It] is not easy to work with this government and the taxes are excruciatingly high. Yeah, and just the roadblock in administrative red tape [makes it] really hard to get things [done] quickly. Things are intentionally done so that they will be slow, so that you need to pay [an] "expedited fee" for it to go first. When you're not really comfortable with paying "expedited fees" that are unofficial, it puts you in a very embarrassing situation. (Hub manager in Yaoundé)

However, the strength of government support varied strongly across Africa. Enterprises in countries like South Africa and the Ivory Coast, where better-resourced governments gesture toward commitment to the digital economy, benefit from initiatives like targeted funding, favorable taxation regimes, and ease of registration and licensing.

Clearly, the "friends, family, and fools" category of financiers also tends to be more limited for African enterprises than for their high-income-country counterparts. The distress of entrepreneurs was palpable as some founders spoke of the need to sometimes "delude" themselves and to focus

attention on small gains, while fielding the reality of imminent failure and the social scrutiny that seemed to come with engaging in mass-market digital entrepreneurship:

The challenges are many, but people ask me, why do I stick in when the business is not making money. [The business] is not making money, but we've been able to meet our costs. We are at the initial break-even point. (Founder of an e-commerce site in Kampala)

Innovation Competitions: Problematic Incentives, but Often without Alternatives

In the absence of traditional financing, entering innovation competitions is the only widely available funding channel for most fledgling digital enterprises in tier 2 and 3 ecosystems. We define *innovation competitions* broadly and include any initiative where in-kind support or prize money is delivered to ventures or teams as part of a competitive and relatively short-lived process (one night to a few months), such as in business plan competitions, pitching and demo nights, hackathons, bootcamps, and the like.

While local governments sometimes back such competitions, development organizations of all stripes, as well as corporations, are their dominant funders. Many corporation-funded competitions are done as corporate social responsibility campaigns, thus following similar logics and aims as those of development organizations. Hubs are often the executing entities of innovation competitions because commissions and consulting fees represent an important revenue stream for them. Yet as a result, hubs are also under pressure to reproduce donor ideals when implementing competitions (Rodrigues et al. 2018).

Novice entrepreneurs often seek access to investors through such events, but soon realize that this is not the actual outcome. An interview respondent in Johannesburg, who was very successful in the competition circuit, expressed her disappointment at the fact that no investments had flowed from the spotlight. She had, however, managed to convert visibility and name recognition into a revenue stream by generating speakers' fees. She spoke of the challenge of maintaining a successful façade as she experienced the stressors of keeping the business going.

Many entrepreneurs also reported that they would prefer support from profit-oriented or risk investors (such as angel investors) but that

development funders are much more easily accessible or sometimes the only funders, especially for business models with unclear market opportunities:

In Cameroon, we don't have local [foundations]. . . . Most of them are international but with an office here. Just one internal office here in Cameroon, then others are religious [from] Europe, and don't have an office here. . . . [There are no local angel investors], just [an] incubation hub. (Entrepreneur in Yaoundé)

Yet the reward structures of prizes have also led to the emergence of competition entrepreneurs, or *compreneurs*. Participants in Kenya used this term to refer to mostly young and inexperienced entrepreneurs with a technological background who participate in innovation competitions to win prize money and recognition, but without showing any commitment to developing a digital venture:

People actually plan and say, "Okay, when the year starts, I'll be entering A, B, C, D competition, because I know there is money." So they enter with one idea in different competitions. The idea is that the whole point is not to showcase the idea, but it's to say . . . "I want to take the money." That's how I think the entrepreneurs have started hacking the system. . . . People are [even] hopping into incubators. You find one startup is incubated by three, four, five different incubators . . . They go grab your money and then they get something else from someone . . . Now, the problem with that is, from what I'm thinking, is you're recycling the same people. (Entrepreneur in Johannesburg)

It's the same with the competitions . . . where people run after money here and there, 10 thousand and maybe 20 thousand. It's a lot of money if you think about the short term . . . but what it does [is] it changes your priorities for your business. (Entrepreneur in Kampala)

Many performative practices are thus dedicated to the attraction of resources and status (we will discuss this in more detail in chapter 7). More often than not, a good idea and confident presenter trumps working prototypes with traction. Especially in more nascent ecosystems, only few engineering-focused competitions require the presentation of a material artifact rather than a five-minute slide presentation. Winning these higher profile events typically led to media coverage and celebrity within the community.

Angel Investors and Venture Capital: Chicken and Egg

It is undeniable that risk financing in digital enterprises is growing immensely across Africa. Year-on-year growth rates are in double- or triple-digit percentage points in most reports tracking such investments

(Collon 2017, 2018; Disrupt Africa 2016, 2017b, 2018; VC4Africa 2014, 2016, 2017, 2018; WeeTracker 2019).

Still, relative to startup cities in high-income countries, the reported amounts are rather small. For instance, in its most recent report, WeeTracker (2019) finds US\$725.6 million to have been invested in 2018 across all of Africa (a continent with about 1.3 billion people and a GDP of roughly US\$2.2 trillion). For comparison, startup investments in Berlin (a city of about three million people and US\$0.18 billion GDP) alone were EUR 2.6 billion in that year—about four times more (Voss 2019). It seems that even in the oldest and resource-richest African ecosystems like Lagos and Nairobi, only the cream of the crop of ventures are attractive to risk investors. Hundreds and maybe thousands of ventures are operating in those cities, but only a few dozen or so attain significant risk investments each year (WeeTracker 2019).

It is challenging to understand whether risk investments in African cities rarely happen because startups are not investable or because there is simply not enough money to go around (Drouillard et al. 2014). On the one hand, both investors and entrepreneurs are inspired by the ostensibly vast market opportunities for fast-scaling consumer-oriented digital products (see chapters 1 and 3). On the other hand, enterprises struggle to attain hockey stick growth, and early financiers pursuing prerevenue investments to scale user bases quickly have been burnt.

It seems that those ventures are able to attract significant amounts of risk financing that fulfills either or both of two features. The first is proven product-market fit in a scalable market. Many participants told us that significant traction and substantial revenue are preconditions for risk investors to consider a startup investable:

I talk to PE [private equity] guys a lot. I talk to VC guys a lot. It's extremely difficult finding very good businesses to put money in. They are out there but the businesses don't get the revenue fundamentals. (Experienced entrepreneur in Lagos)

Yet even proven revenue itself is not necessarily enough. Instead, revenue needs to be combined with (perceived) scalability, which is a challenging proposition in African markets (see chapter 3):

I wouldn't say we don't like tech companies but it has to be a company that is solving a massive need, that is potentially using tech to solve that need. They're not there to say: "I've developed some fantastic software or an app and that's it,

my job is done.” It’s a different set of entrepreneurs I think, that are looking to address very large needs and then figuring out what [is] the best way to do it, and tech might be one of the ways to do it. I think it’s a different mindset perhaps. (Investor in Nairobi)

From the entrepreneur’s perspective, engagement with risk investors represented yet another experiential learning process, in which a specific and localized kind of entrepreneurial knowledge was formed. For instance, especially in tier 3 ecosystems, entrepreneurs mistook investors for their customers, and investments for personal income:

The average entrepreneur would want to see a traction in revenue before he decides to take in money, and even when he takes in money, he wants to retain control. In the earlier days, control was not really so much of a problem, right? “Hey, I’m a loss-making business. You’re telling me just to acquire all the guys on the streets? Oh, that’s easy. Oh, okay.” “So, we’re going to give you a million. When you need money again, let me know. We’ll send you another million.” So, I come in, I get nice cars, I just get people on my platform and I get millions in dollars. (Entrepreneur in Lagos, Nigeria)

Somewhat paradoxically, the emphasis on early-stage financing rather than a single-minded focus on revenue was particularly conspicuous among novice entrepreneurs in nascent ecosystems—the group that is least likely to access such financing. Astute entrepreneurs came to understand the concept of market traction in digital entrepreneurship (Nicoll 2000), in which even unprofitable and nonpaying users may have value. A Maputo-based entrepreneur who had expanded into a neighboring country explained why it did not matter if they were financially successful in the new market:

The realization that this market was not big enough for us to become a big company was sort of quick, and we understood that for us to be able to get to the level that we wanted, especially attract investors and whatnot, you would need to have presence in multiple countries. . . . We were just feeding the platform to increase our traction but that’s it. I can’t even say that we have business in Angola because we are not making money in Angola yet. . . . A lot of startups is all about raising the interest of the next investor. So we start up with a strong concept, a strong pitch—you know, you’ve got a two-paged business plan. And you get someone to put 200 to 300 thousand in your products that you’ve just launched, and you’ve got little traction and it’s actually just a prototype. . . . So if you do that long enough to show some sort of stability, you might raise real funds and then you might be playing with a million or two. So where I’m trying to get here is: Angola gave us profile even if it wasn’t generating money. If let’s say that we are in five countries and we’ve got two countries that are making a lot of money. I come to

an investor and I say “Guys, our presence is in five markets and we’re making this much money,” all right, he’s not going to care which market is doing what and I don’t care about the other three.

Other entrepreneurs realized that coming up with good technology was not enough to attract funding where they were and that seeking funding may not be the right path for them:

I just look at myself. I think if I was in the Silicon Valley environment, I would also be one of the geeks who are raising money here and there. I also have like friends who would really do a better job than people in the Silicon Valley to raise money. . . . So for me it’s always a learning process. If someone says “no” for some reason, then we go back, we realize what happened—I also check if they really have the money [*laughter*]. . . . The same energy I use to deliver this app is equivalent to the same energy that we used to run after this investor, getting rejected, and another investor. I feel like . . . we’re [now] channeling this through a different model to something that maybe can work for us and for Rwanda. (Experienced Rwandan entrepreneur)

Detachment from Established Local Business

In the end, the financial resources to support digital ventures have to come from somewhere. Digital entrepreneurship ecosystems’ newness and cultural distance from traditional business seemed often to prevent actors from gaining information, learning, and resources. Local investors prefer low-risk investments such as real estate (Hersman 2012). What we found in most cities was that digital entrepreneurs felt that they were too detached from well-established local business arenas:

I think also we don’t have like mature companies here to work with big companies. Most of the clients are big companies. You must have like a big startup to work with them, and also you must just prove that you are worth it. (Former entrepreneur in Maputo)

Advantages thus accrued to entrepreneurs able to act as brokers between otherwise distant professional realms (Sapsed, Grantham, and DeFillippi 2007). For instance, a Kenyan participant left stable employment for entrepreneurship after realizing the value of her relationships:

I asked myself, why does the government want me, why does IBM want me, why does Google want me, why do all these people want me for consultations? Because, one, I have a good connection with the government because I’ve worked there for a while. Then two, they think I’m smart, and then three, I have good knowledge: I’m a software engineer and I work with data and data is becoming

a thing right now. [A mentor told me], “You are possibly the most connected young person I know, whether you’re connected to people who can give you money, or you’re connected to people who can give you work, but you are that person—and your network is your net worth.” I’m like, “Okay, I guess, if you say so!” (Entrepreneur in Nairobi)

Summary: Bottlenecks and Vicious Cycles Thwart Ecosystem Evolution

This chapter has shown differences across digital entrepreneurship ecosystems in Africa. Ecosystems are locally bounded social contexts and assemblages of resources that affect the success of digital enterprises from a given location. Digital enterprises all over Africa have gained improved access to basic resources like support organizations (hubs, innovation prizes, angel investor networks, tech parks, etc.), professional talent, mentors, and startup funding. Yet any ecosystem in Africa—whether it is Cape Town, Cairo, Nairobi, or Lagos—offers more limited access to entrepreneurial resources (knowledge, investments, etc.) than ecosystems like Silicon Valley, London, or Tokyo (see Rodrigues et al. 2018). Market-related bottlenecks were particularly concerning for Africa’s ecosystem when compared to Silicon Valley: international mass scaling, beyond the threshold imposed by the size of the local economy, was a rare exception. Our interview data suggests that markets are the more important bottleneck for entrepreneurial ecosystems in Africa compared to various supply-side dimensions (such as social networks, organizational capacity, and institutional factors), which have been identified as success factors for the world’s leading ecosystems (Spigel 2017; Storper et al. 2015).

Within Africa, tier 1 ecosystems have very different bottlenecks compared to tier 3 ones. This finding will be rather unsurprising for anyone studying evolutionary processes in ecosystems, or related concepts like regional innovation systems or business clusters (Audretsch, Kuratko, and Link 2016; Colombo and Delmastro 2001; Mack and Mayer 2016; Stam 2015): due to the complex interdependence of locational factors (tacit knowledge, infrastructure, etc.), positive (and negative) feedback loops and path dependencies reinforce initial (dis)advantages over time (Bathelt and Cohendet 2014; Spigel and Harrison 2018). But this chapter filled this broad theory with empirical detail about what distinguishes different African ecosystems—and what holds them back.

We discerned three tiers: learning, incipient, and maturing. Distinguishing tiers and the bottlenecks that are most likely to apply to a given tier can be a helpful framework for policymakers, investors, and other supporters of digital entrepreneurship when seeking to identify the most relevant interventions for a given context. Typical bottlenecks were found to differ drastically between ecosystems with rich versus narrow sets of resources. Broadly speaking, basic supply-side interventions like hubs and innovation prizes exist in all ecosystems, but they do not seem to be able to compensate for bottlenecks like market access or the incipient nature of entrepreneurial knowledge. As ecosystems advance, the most pressing bottlenecks shift. For instance, in higher-level ecosystems, venture labor is usually available, just not at critical mass (incipient ecosystems) or with the required technical specializations (maturing ecosystems). As a result, software development projects of medium complexity and size often have to be outsourced to India or to Europe.

It is likely that every African nation will develop a sustainable but small domestic digital enterprise sector, serving local niche markets. However, concerningly for nascent ecosystems, negative feedback loops may hamper any evolution beyond this state, making it hard to supersede ingrained economic legacies. Ecosystems evolve through the interplay and enrichment of entrepreneurial resources (Spigel and Harrison 2018). Especially where entrepreneurial knowledge and market access are lagging, support organizations and other resource infusions are likely to be insufficient to advance the ecosystem because these organizations themselves depend on minimum local capacity (Friederici 2017a). African ecosystems thus can be stuck with a slow pace of evolution.

We ultimately find that African digital entrepreneurship is anything but location independent. Instead, local economic histories and social contexts differ across cities, and they affect what is possible or not for the average enterprise in a given city.

