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Scaling Africa's Digital Economy

ACCELERATED MARKET INNOVATION
VIA AN ENABLING STARTUP ECOSYSTEM

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Executive Summary

This regional policy brief assesses the enablers of the emerging startup ecosystem in Africa, the challenges to their scaling, and the contextual influencing factors for the key startup hubs within the continent.

With the rise of the global digital economy, the growing significance of innovative startup ecosystems that have the potential to catalyze long-term socio-economic growth has become imperative. This regional policy brief assesses the enablers of the emerging startup ecosystem in Africa, the challenges to their scaling, and the contextual influencing factors for the key startup hubs within the continent – Cape Town (South Africa), Nairobi (Kenya), Lagos (Nigeria), and Cairo (Egypt). The paper's primary objectives were to benchmark Africa's key startup hubs with leading global tech ecosystems with respect to their potential to catalyze the startup ecosystem for market innovation, in order to recommend specifically-targeted policies for scaling the fledgling startup ecosystem in Africa.

Drawing data from secondary academic literature and policy reports, relevant standardized databases and rankings, as well as semi-structured interviews with startup investors, entrepreneurs, industry trade groups, innovation policy experts, and public leadership within Africa's digital ecosystem, the paper highlighted Cape Town's relatively robust logistics infrastructure, the poor logistics infrastructure and weak technology transfer system of the Lagos ecosystem, Nairobi's optimal ICT regulatory environment, and Cairo's high number of relevant educational institutions as critical levers to engage in scaling the fledgling digital ecosystem across the continent.

Introduction

With the rise of the global digital economy, the growing significance of innovative startup ecosystems that have the potential to catalyze long-term socio-economic growth has become imperative (Johansson, 2020). Nevertheless, in developing regional contexts, these emerging startup innovation hubs face unique constraints that make commercial scaling difficult relative to more mature innovation ecosystems.

This paper seeks to assess the enablers of the emerging startup ecosystem in Africa, the challenges to their scaling, and the contextual influencing factors. Within the region, the report focuses on the key startup hubs (Digital Africa, 2022) within the continent – Cape Town (South Africa), Nairobi (Kenya), Lagos (Nigeria), and Cairo (Egypt). A strength-weakness assessment will enable the recommendation of specifically-targeted policies for scaling the startup ecosystem in Africa.



The Importance of a Thriving Startup Ecosystem

High-growth startups are critical for market innovation, job creation, and economic growth at both national and regional levels, making it imperative to create an enabling ecosystem that can help them thrive (Tripathi et al., 2019; Komoriya, 2022; Otieno & Muathe, 2022). According to the Center for Economic Studies (CES) at the U.S Census Bureau, "High growth output firms are disproportionately young and make outsized contributions to output and productivity growth."

A critical enabling factor that has drawn significant global attention recently is the potential for venture capital investments to catalyze innovation and create jobs within the digital economy (Leamon, Garcia-Robles & Lerner, 2013). However, the impact of policy intervention in evolving a virile venture capital ecosystem is often overlooked.

A critical factor that underscores a country's success in catalyzing innovation in any market sector is the ability to enact policies that incentivize private sector investment and inflows of foreign direct investment (FDI) into the sector (Dahlman, Mealy & Wermelinger, 2016). Within the global digital economy, differences in the relative size of venture capital investments suggest differences in extent of development in the venture capital industry.

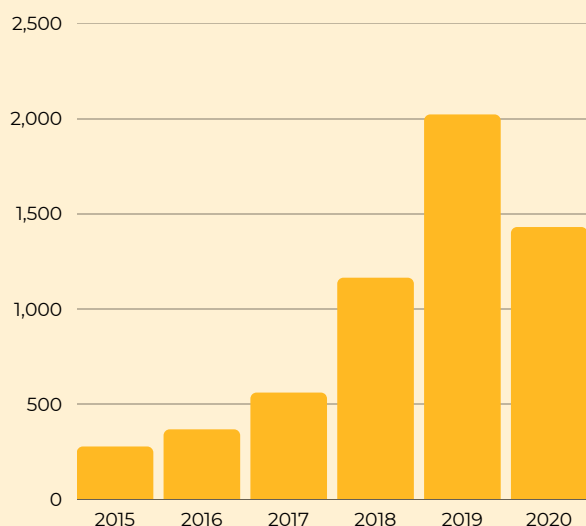
This difference is primarily concerning a supporting ecosystem for venture capitalists. In this regard, leading global tech ecosystems like the United States, Singapore, China, Sweden, and Israel have combined critical government investment initiatives and startup legislation encouraging private venture capital investments (Wolken, 2020).

For African countries, a thriving startup ecosystem is a critical lever for catalyzing its fledgling digital economy, which is projected to contribute an estimated \$300 billion to the continent's GDP by 2025 (Bayuo et al., 2022). This positive impact will have significant complementarities for tech jobs on the pathway to regional digital sovereignty in the fourth industrial revolution. Nevertheless, within an emerging market, venture capitalism is still in its nascent stages across Africa, with V.C. flows representing just around 3-4 percent of total global V.C. funding (AfDB, 2021). Nevertheless, venture funding has grown steadily since 2015, with an initial dipping in total equity funding in 2020, mainly due to the global economic disruption due to the COVID-19 pandemic (Figure 1).

Despite being a relatively nascent digital ecosystem, the progressive growth of venture funding across Africa was fundamentally underpinned by a relatively strong macroeconomic

Africa Tech VC - Total equity funding: 2015 to 2020 (in US\$ M)

Partech Analysis



Africa Tech VC - Total number of equity rounds: 2015 to 2020

Partech Analysis

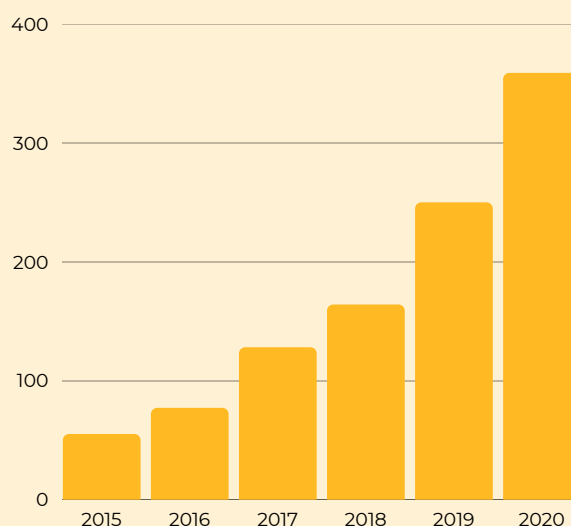


Figure 1

outlook, with GDP growth averaging 4.6 percent between 2000 and 2016 (ODI, 2018), coupled with an expanding middle-class consumer base, a thriving entrepreneurial culture and an emerging policy and regulatory landscape for technology startups (AVCA, 2020). Notwithstanding this progressive V.C. outlook within the African digital ecosystem, critical funding gaps exist, especially concerning early-stage technology ventures (Carraro, 2020; World Bank, 2020).

With similar economic characteristics as SMEs, early-stage startups (especially those with high-growth potential) represent significant contributors to the

socio-economic growth of developing countries – catalyzing market innovation, economic diversification, and job creation (World Bank, 2020). Within the confines of this paper, early-stage startups are defined as those that have a tested market prototype, a defined business model (that are typically not fully validated nor have optimized product-market fit), and are still within the pre or early revenue stage of their business maturation, at which they may yet not have been profitable (see Figure 2).

Based on the venture characteristics, in Figure 2, early-stage venture capitalists take on higher investment risk to



Figure 2: Venture maturation growth path. Source: World Bank (2020)

incubate early-stage startups before their scale phase if successful in the long term. While this category of venture funders has existed in developed markets since the late 1990s (Falat-Kilijanska, 2018), they are still relatively nascent in emerging markets and developing countries, with institutional voids and, in some cases, restrictive regulations that further negates investor risk appetites within these high-risk market segments (OECD, 2015; World Bank, 2020). This market constraint impedes the evolution of startups into commercially viable enterprises.

In response to the above challenge, Startup Acts are becoming Africa's next frontier for instrumental digital policy innovation (Wolken, 2020; ICReport, 2021). Startup Acts are comprehensive legislation specifically targeted at catalyzing high-growth digital entrepreneurship, and encompass regulatory frameworks and fiscal incentives for accelerated development. Tunisia and Senegal passed their Startup Acts in 2018 and 2019,

respectively, with sixteen several more African countries in the process of enacting their own (including Nigeria, Rwanda, Ghana, Kenya, Ethiopia, Mali, Benin, DR Congo, Togo, and Uganda).

Another area of digital policy innovation in the last few years is the deployment of Sovereign Wealth Funds (SWFs) as critical co-investment vehicles with other SWFs and Multilateral development agencies for domestic investing in technology startups alongside traditionally foreign V.C. funds within the digital economies of developing countries (Adonu, 2020). In Africa, for example, Wessal Capital was set up as a co-investment platform by the Ithmar Capital Government Fund of Morocco to raise U.S.\$2.5 billion from other SWFs, including Mubadala Investment Company of UAE and Saudi PIF, for digital ecosystem investments. Other SWF policy initiatives emerging across the continent include the Mezzanine Investment Fund by Angola's Funso Soberano de Angola (FSDA) and Gabon's Okoume Capital,

which are committed to digital economy investments. These alternative forms of venture capital usually have higher liquidity premiums and risk-adjusted returns with longer investment horizons than traditional V.C. investments (Adonu, 2020). From a demand-side perspective, a significant constraint to developing a V.C. market

is the lack of investor-ready startups (OECD, 2015). An innovation policy focus should therefore be on deepening access to knowledge networks and linkages at both the local and the global levels for critical entrepreneurial knowledge, skills, and V.C. investment matches via incubators and accelerators.

Within the above context, the key objectives of this paper are to:

- 1. Benchmark Africa's key startup hubs against leading global tech ecosystems with respect to their potential to catalyze the startup ecosystem for market innovation.**
- 2. Leverage the strength-weakness assessment to enable the recommendation of specifically-targeted policies for scaling the key and emerging startup ecosystem in Africa.**

Based on the paper's key objectives, the central research question is:

How can an enabling startup ecosystem catalyze market innovation within Africa's digital economy?

This broad question was interrogated within the confines of the sub-objectives below:

- Examine the structural characteristics that limit startup market innovation within Africa's digital ecosystem.
- Assess the role of innovation policy in enhancing the capacity of the startup ecosystem within Africa's digital ecosystem.

Snapshot: Africa's Startup Ecosystem



According to Endeavor Nigeria, the African tech ecosystem is projected to grow exponentially from a current market size value of about \$115 billion to \$712 billion by 2050. This projection is buoyed by strong regional market fundamentals – a young demographic with increasing internet access(1) and tech talent(2) , increasing levels of consumer spending(3) , and a relatively fast urbanization rate.

This positive outlook drives inward investment into the continent's fledgling startup ecosystem. According to the Endeavor report, "Between January 2020 and December 2021, funding for African digital startups grew two times faster than global rates", reaching over \$4.3 billion in 2021. However, this growth is skewed towards the leading startup hubs on the continent – South Africa (Cape Town), Nigeria (Lagos), Kenya (Nairobi), and Egypt (Cairo) (Otieno & Muathe, 2022). These startup ecosystems accounted for over 85 percent of the continent's tech startup funding between 2010 to 2020 (Bayuo et al., 2022), with over 70 percent of the funds coming from international venture capital. Overall, in broader global terms, the African startup ecosystem is still relatively nascent and still lags far behind the rest of the world (Bayuo et al., 2022; Otieno & Muathe, 2022), comprising just about 0.2 percent of the \$3.8 trillion global startup venture funding.

(1) Africa currently has 522 million internet users, and is expected to expand by 11% over the next decade to comprise 16% of the global total. Sources: www.accenture.com/us-en/insights/software-platforms/africa-digital-transformation; www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.BDT_AFR-2019-PDF-E.pdf#zoom=50

(2) Across Africa, the number of software developers increased by 4% between April 2020 and October 2021. That compares with a ~1% increase in the US over a similar period. Sources: www.accenture.com/us-en/insights/software-platforms/africa-digital-transformation; Daxx.com (Evans Data Corporation)

(3) Consumer spending is expected to grow by two-thirds between 2015 and 2030 – especially for Africa's fast-growing urban population which spends 80% more on goods and services than the continent average. Sources: www.accenture.com/us-en/insights/software-platforms/africa-digital-transformation

Analytical Framework

The innovation ecosystem theory underpins the analytical framework for this study. The theory is apt for interrogating how ecosystem stakeholders collectively work to enable technological development and generate innovation. At the national level, it assesses the integrations between economic actors, technologies, institutions, cultural and sociological elements, and external partners in driving ecosystem innovations.

Concerning startup ecosystem benchmarking, innovation ecosystem theory defines a systemic framework that helps reveal cluster strengths and weaknesses, as well as potential benefits and threats in developing a cluster's

comparative advantage in relation to their technological and industrial competencies (Carayannis, Meissner & Edelkina, 2017). Within this purview, we leverage and integratively adapt the MIT approach (Murray & Budden, 2017) and the Cukier and Kon (2018) Framework for assessing innovation ecosystems. Four key parameters are adduced as important in evaluating a cluster (Figure 3).

Factors I and II cumulatively lead to III and IV, specialized around areas of expertise for a cluster. The application of specific innovation policy catalyzes the resulting impact. It can then be used to optimally evaluate the performance of the innovation policy in the long run concerning their economic contributions, job creation, and valuation levels (Sheriff & Muffatto, 2015).



I SUPPORTING INSTITUTIONS

- Rules, practices, and norms that ensure investments in innovative capacities are protected and optimally leveraged to drive the innovation economy.
 - a. ICT regulatory environment
 - b. Exit strategies
- Financial institutions that support innovative capacities
- Ease of doing business
- Technology transfer processes

II INNOVATION AND ENTREPRENEURSHIP CAPACITIES

- Human capital
 - Human capital quality with relevant education, training, and experience for either innovation, entrepreneurship, or both.
 - Relevant educational institutions
- Funding
 - The total amount of investment in startups in USD
 - A variety of types of capital (from the public and private sectors) that support innovation and entrepreneurship both at their origins but also throughout the journey from idea to impact or startup to scale-up.
 - a. Angel equity funding
 - b. Venture capital (VC)
 - c. Debt finance
 - d. Other credit arrangements
- Infrastructure
 - Necessary to support innovation and entrepreneurship at their different stages – including space as well as equipment required for discovery, production and supply chains, etc.
 - Information access support – availability of good telephony and Internet connections etc.
 - Logistics
 - Ecosystem data
- Demand
 - Domestic market size
 - High-tech company presence
- Culture and incentives
 - Culture values for entrepreneurship
 - The nature of role models and individuals who are celebrated, the social norms ('culture') that shape acceptable career choices, and the incentives that shape individual and team behaviors (entrepreneurial culture)

III COMPARATIVE ADVANTAGE

IV IMPACT

- Startups and innovation-driven enterprises (IDEs)

Figure 3: Framework for assessing innovation ecosystems

Research Design



The research design for this study draws data from secondary academic literature and policy reports, relevant standardized databases and rankings, as well as semi-structured interviews with startup investors, entrepreneurs, industry trade groups, innovation policy experts, and public leadership within Africa's digital ecosystem. This approach provided a more textured understanding of how the startup ecosystem in Africa operates,

how they connect with investors and their limitations in funding a wide range of socially valuable innovations within the continent's digital economy. This understanding can help inform policy reforms to improve the ability of the startup ecosystem to finance innovation and supplement those markets in areas where they cannot and in alignment with the comparative advantages of the startup hubs.

Interviewee identification relied on a variety of sampling techniques: convenience (based on professional contacts with proposed interviewee categories); purposive sampling (to reach interviewee categories in which there are limited pre-existing connections); random (to identify startup investors and entrepreneurs); and snowballing (to augment sample scope of respondents). The implementation of the interview was virtual, depending on the availability and convenience of the interviewees. The interview data were thematically coded, analyzed, and integrated into the startup hub assessment. Further details of the interviewees engaged in the study are indicated in the methodological appendix.

Startup Ecosystem Selection

The benchmark startup ecosystems were selected based on a regionally diversified ranking performance score on the [2022 Startup Genome report](#). The ecosystems of interest identified within this ranking and used for the benchmarking assessment in this report is as detailed in Table 1.

Country/Region	Ecosystem	Ranking
USA	Silicon Valley	1
China	Beijing	5
India	Delhi	26
Brazil	São Paulo	28
Europe	Geneva	Top 100 emerging: 21-30

Table 1: Selected benchmark ecosystems and their rankings



Ecosystem Benchmark Summary Tables

Table 2: Relevant educational institutions benchmark

Ecosystem	Country	Region	Number of relevant educational institutions
Cape Town	South Africa	Africa	1 (UCT)
Nairobi	Kenya	Africa	1 (University of Nairobi)
Lagos	Nigeria	Africa	1 (University of Lagos)
Cairo	Egypt	Africa	5 (AUC, Cairo University, Ain Shams University, University of Canada in Egypt, Al-Azhar University)
Silicon Valley	USA	Americas	3 (UC Berkeley, Stanford, UC San Francisco)
Beijing	China	Asia	1 (Peking University)
Delhi	India	Asia	3 (Delhi Tech University, Netaji Subhash UT, Indraprastha IIT)
Sao Paulo	Brazil	Americas	1 (University of Sao Paulo)
Geneva	Switzerland	Europe	1 (EU Business School)

Legend:

AVERAGE

STRONG

WEAK

Table 3: Benchmark summary for investment, information support, and logistics

Ecosystem	Total investment in startups (USD)/2021	Information access support (NRI 2022)	Logistics (LPI Index 2018)
Cape Town	838 million	61	33
Nairobi	375 million	69	68
Lagos	1.37 billion	85	110
Cairo	588 million	46	67
Silicon Valley	120.1 billion	4	14
Beijing	100.5 billion	1	26
Delhi	42 billion	59	44
Sao Paulo	9.43 billion	27	56
Geneva	3.1 billion	16	13

Table 4: Benchmark summary for ecosystem data, market size, and high-tech company presence

Ecosystem	Ecosystem data (number of data centers)	Domestic market size (USD) (Statista 2022)	High tech companies presence (Glassdoor)
Cape Town	5	636.2 million	400
Nairobi	7	101.2 million	300
Lagos	9	1.07 billion	450
Cairo	11	1.11 billion	N/A
Silicon Valley	29	109.9 billion	20,000
Beijing	12	69 billion	450
Delhi	17	710.5 million	7,000
Sao Paulo	28	3.43 billion	3,000
Geneva	6	2 billion	200

Table 5: Benchmark summary for the cultural environment, ICT regulatory environment, and market exit strategies

Ecosystem	Culture values	ICT regulatory environment (NRI 2022)	Exit strategies
Cape Town	High	73	Strategic Acquisition (97%), IPO (3%)
Nairobi	Moderate	33	Strategic Acquisition (100%)
Lagos	Moderate	57	Strategic Acquisition (100%)
Cairo	High	39	Strategic Acquisition (100%)
Silicon Valley	Moderate	33	Strategic Acquisition (40%), IPO+M&A (60%)
Beijing	Low	124	Strategic Acquisition (70%), IPO+M&A (30%)
Delhi	Low	64	Strategic Acquisition (90%), IPO+M&A (10%)
Sao Paulo	Low	28	Strategic Acquisition (80%), IPO+M&A (20%)
Geneva	Very Low	20	Strategic Acquisition (60%), IPO+M&A (40%)

Table 6: Benchmark summary for financial institutions and government effectiveness

Ecosystem	Financial institutions that support innovation	Bureaucracy (National Govt. Effectiveness Index; Global Economy Ranking 2021)
Cape Town	3 (Nedbank, Barclays, StandardBank)	90
Nairobi	4 (Citi, Chase, GroFin, IFC)	115
Lagos	2 (BoI, UnionBank)	165
Cairo	4 (Mastercard, IFC, CBE, Temenos)	121
Silicon Valley	>10	25
Beijing	2 (IFC, CITIC Group)	44
Delhi	1 (YesBank)	67
Sao Paulo	2 (BNDES, FINEP)	122
Geneva	1 (Temenos)	2

Table 7: Benchmark summary for technology transfer processes and impact

Ecosystem	Technology transfer processes	Impact (number of startups/IDEs)
Cape Town	University TTOs	450+
Nairobi	Proximity between startups and large companies	90+
Lagos	Nil	500+
Cairo	University TTOs	400+
Silicon Valley	University TTOs	40,000+
Beijing	Foreign investment in more developed markets; TT organizations	5,000+
Delhi	Innovation Technology Transfer Office (i-TTO)	7,000+
Sao Paulo	University TTOs	4,000+
Geneva	University TTOs	500+

Regional Comparative Advantage Assessment

Cape Town: Strong Logistics Infrastructure

Cape Town's relatively robust logistics infrastructure is critical for intensifying ecosystem interaction between players in its digital ecosystem and for the internationalization of its local digital market. With a relatively high ranking of 33 on the Logistics Performance Index (LPI), a key focus for this startup ecosystem should be the development of digital logistics platforms that facilitate trade for both local and international operations. This comparative advantage will enable ecosystem competitiveness for transport cost reduction and increasing speed-to-market of digital products and services, leveraging its robust warehousing and efficient multi-modal transportation infrastructure. The trade logistics platforms could leverage disruptive technologies like blockchain to guarantee quality and provenance as well as combat fraud in a post-COVID environment (see Koh, Orzes & Jia, 2019; Remko, 2020; Scholten, Stevenson & van Donk, 2020; Subramanian, Chaudhuri & Kayıkcı, 2020; Barykin et al., 2021). Their development impact will increase the stability and reliability of regional supply chains within the trade and economic relations, especially between African countries.

This possibility is important for scaling regional economic growth and pan-African international cooperation, particularly in e-commerce (see Hruby & Rugoon, 2020). A practical case would be solving the perennial logistics inefficiencies of Nigeria's high-potential but unprofitable e-commerce market - which ranks 110 out of 160 countries on the LPI. According to the World Bank, it takes as much as three times longer to import products via Nigeria when compared to South Africa. Regionally, the logistics startup ecosystem can position itself as a critical player in the now active African Continental Free Trade Area (AfCFTA) - the largest free-trade area in the world by the number of participating countries, which launched on January 1, 2022 - in bridging the currently low level of intra-African trade (see Mureithi, 2021).

Nairobi: Optimal ICT Regulatory Environment

Since the former President of Kenya, Uhuru Kenyatta, declared the country a "startup nation" in 2015, Nairobi's world-class mobile money market has demonstrated the critical importance of enabling regulation as an important

source of protection for a digital business ecosystem. The Nairobi startup ecosystem thrives on an aggressive ICT regulatory environment in solid partnership with the private sector to develop ubiquitous broadband infrastructure that supports critical innovations such as mobile money (Ndemo & Weiss, 2017). The Nairobi ecosystem was one of Africa's earliest adopters of undersea cable technology. This enabling infrastructural environment lowered internet connectivity costs, which has since catalyzed the emergence of the world-famous mobile money platform – M-Pesa, contributing significantly to financial innovation and inclusion across the East African corridor. Nairobi ranks 3rd and 4th on the Affordability of mobile subscriptions and Regulatory Quality, respectively, on the Regional Startup Friendliness Index (SFI), relative to other cities in the Middle East and Africa (Van der Biest & Wyss, 2019).

Concerning digital policy innovation, the Kenyan government has actively promoted digital entrepreneurship within the Nairobi ecosystem through its National Innovation Agency via entrepreneurship training and startup business acceleration. The Kenyan government also launched the Open Data Initiative in 2011 to make business data readily available to digital startups. More so, In 2013, the government launched the National ICT Master Plan to fast-track the country

into becoming a knowledge economy and the ICT hub for Africa. This startup ecosystem can therefore maximize its excellent ICT regulatory and policy framework to drive the influx of digital startups as a regional entrepreneurship hub by leveraging its relatively lower costs of doing business, favorable tax regime, liberal policies on forming legal entities, wider spread access to finance, and lower barriers to market entry (see Hospers, Desrochers & Sautet, 2009; Isenberg, 2011; Mason & Brown, 2014; Kelly & Firestone, 2016; UNCTAD, 2019).

Lagos: Poor Logistics Infrastructure and technology transfer system

Although the largest digital ecosystem in Africa with a thriving entrepreneurial spirit, Lagos still does not have the complementary level of logistics infrastructure support (see Oyedemi, 2019). While its population of above 20 million (similar to the Sao Paulo ecosystem) offers an attractive market for digital startup entrepreneurship, the logistics challenge has remained the most critical cost constraint for venture investors and digital startups operating in the ecosystem (OC&C, 2018; Banya, Cieslik & David-West, 2022; Disrupt Africa, 2022). The focus for this ecosystem should be a disruption of this infrastructural constraint to enhance the seamless warehousing and delivery of products

and services within the ecosystem via targeted market interventions that leverage effective innovation policies. A critical pathway in this respect is addressing the logistics constraint within the framework of Lagos State's domestication of the Nigerian Startup Act 2022 in the buildout of the Lagos startup ecosystem.

More so, unlike its leading tech hub counterparts, Cape Town (South Africa) has a robust technology transfer system, leveraging its 2008 Technology Innovation Agency Act for the creation of its Technology Innovation Agency (TIA) to become Africa's most technology-driven nation; Nairobi (Kenya) leverages proximity between startups and large technology companies operating across the East African region as guided by its Science and Technology Act of 1977 Cap. 250 to facilitate technology transfer within its digital ecosystem (see Fadeyi et al., 2019); Cairo (Egypt) has The Academy of Scientific Research and Technology (ASRT) that serves as the ecosystem's technology transfer management agency responsible for developing its country-wide "Technology Innovation and Commercialization Offices" (TICO) , the Lagos startup ecosystem does not have any innovative technology transfer process, as the principal institutional technology transfer agent – The National Office for Technology Acquisition and Promotion (NOTAP) , established since 1979, has been largely ineffective.

This factor should also be a primary focus for the Lagos startup ecosystem, in particular, with respect to engaging the relevant educational institutions in the setting up of ecosystem-active Technology Transfer Offices. This consideration is essential for the Lagos ecosystem to minimize its risks of foreign technology reliance in the development of more locally-contextualized innovation products and services, as well as enhance the competitiveness of local startups for longer-term commercial sustainability (see Fadeyi et al., 2019; Shmeleva et al., 2021).

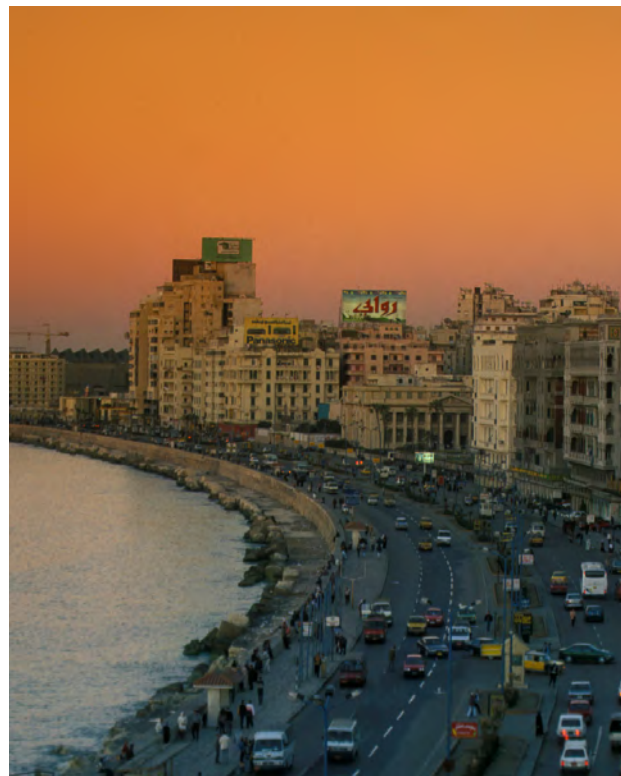
Cairo: High number of relevant educational institutions

Cairo is positioning itself as the regional hub for academic institution-led digital startups in Africa (see Disrupt Africa, 2021; El-Galil, 2022). Within its ecosystem, the positive interactions between tech startups and academic institutions are imperative for long-term ecosystem sustainability with respect to growing market-driven tech innovation (see Kelly & Firestone, 2016). Cairo, as a digital startup hub, has institutionalized university-led startup innovation activities, comprising incubation, technology transfer, and university tech spin-offs on campuses – including Bosta, CreditFins, ElGameya, Swvl, and Rology (see Kamel, 2018; Disrupt Africa, 2021).

A key player within this domain is the American University in Cairo which spawned the AUC Venture Lab in 2013 (see Ismail et al., 2017; Disrupt Africa, 2021). The AUC lab has graduated more than 300 tech startups, gaining more than 3 billion Egyptian pounds (\$162 million) in investments and creating 10,000 jobs (see El-Galil, 2022). Other key academic institutions driving the Cairo startup ecosystem include the Cairo University, which has set up the FEPS Business Incubator "with an array of programmes and services designed to boost early-stage founders with training based on its scientific methodology." (Disrupt Africa, 2021: 54). There is also the Nile University, which launched its NilePreneurs Initiative in 2019, supporting hundreds of startups via programmes that include advisory support services, mentorship, and incubation. The University of Canada in Egypt (UofCanada) has also launched an incubator programme in partnership with Ryerson University's DMZ, which supports scalable Cairo-based startups (see Disrupt Africa, 2021).

Egypt is also setting up a 300-acre Knowledge City, located 45 kilometers east of Cairo, to provide an environment of learning and scientific and applied research emphasizing innovation and entrepreneurship (see Kamel, 2021).

According to Kamel (2021: 21): "The Knowledge City is planned to host a consortium of international and local universities, with a focus on scientific, technology, and engineering fields. In addition, it will include research and innovation centers specialized in advanced technologies such as A.I., the Internet of Things (IoT), integrated systems, and technology and business accelerators to promote entrepreneurship. This development includes a technology park that will house local and international I.T. enterprises to promote collaboration and build bridges between universities, research institutes, and industries to transfer technology, knowledge, and skills in various fields, including smart applications and digital systems."



The focus of this ecosystem should therefore be the scaling up of these initiatives across the region, with the proliferation of academic institutions that promote, support, mentor, finance, and engage with entrepreneurs and startups across Africa to bridge the overwhelming bottleneck of a slow pace of entrepreneurial learning within the region's digital ecosystem (see Kamel, 2018). This proposition is critical, as the African the above proposition digital ecosystem depends on entrepreneurial knowledge for its long-term evolution and capacity to generate more veritable market outcomes (Friederici, Wahome & Graham, 2020).

Within this purview, one critical pathway for the Cairo ecosystem, according to stakeholders, is aggregating ecosystem learnings and experiences in developing curated programs to help other universities within the region in developing their local digital entrepreneurial ecosystems, following the AUC model. Low-hanging innovation points for a pan-African entrepreneurial learning diffusion are the AUC's Entrepreneurship and Innovation Program, hosted within its Center for Entrepreneurship and Innovation, and the AUC Business Forum, which it has hosted as an annual event since 2020.



Conclusion

In summary, this paper has elucidated valuable empirical evidence to clarify the innovation deficiencies of the key technology startup ecosystems in Africa - as a result of benchmarking with select global ecosystems, which, if addressed, can be leveraged to scale the fledgling digital ecosystem across the continent. A paucity of exit strategies is one of the primary differentiators between the ecosystems assessed and the mature ecosystems. While mature startup ecosystems present all three approaches – strategic acquisitions, IPOs (initial public offers), and M&A (mergers and acquisitions), there is a lack of exit options in the African ecosystems, limited to primarily strategic acquisitions. Overall, though the African startup ecosystem is considered relatively nascent, the benchmarking assessments indicate an evolving ecosystem with a few regionally successful companies and a modest regional impact with respect to investing deals - reaching more than 4 billion USD in 2021 (Digital Africa, 2022), and catalyzing the emergence of seven unicorns – Fawry (Egypt), Opay (Nigeria), Wave (Senegal), Flutterwave (Nigeria), Interswitch (Nigeria), Jumia (Nigeria), and Andela (Nigeria) (See Startup Genome, 2021; Otieno & Muathe, 2022).

However, to become self-sustainable and scale across the continent, the African startup ecosystem will require at least a second generation of entrepreneur mentors, especially angel investors - derivable from more plausible exit options, high-quality tech entrepreneurial talent – derivable from a proliferation of high-quality tech-entrepreneurship universities across the region, and leverage more its high cultural values for an inclusive entrepreneurial environment (see Cukier & Kon, 2018).



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Methodological Appendix

Both primary data and secondary data were collected. Quantitative and qualitative secondary data was obtained through industry statistics and reports, organizational websites as well as publicly available information. The primary data was collected online through semi-structured interviews to understand deeper individual entrepreneurial perspectives. The interviewee sample is as listed in Table 8.

Table 8: Interviewee Sample Listing

Name	Designation	Organization (Country)
Oluwaseun David	Head of Research	CcHub (Kenya)
Akinwande Akinsulire	Head, Startup Support (Africa)	CcHub (Nigeria)
Olanrewaju Odunowo	Lead Analyst	TechCabal (Nigeria)
Nkemdilim Uwaje	MD/CEO	Future Software Resources (Nigeria)
Tracy Okoro	States Adoption Lead	Startup Bill Project (Nigeria)
Akintunde Oyebo	Former Special Adviser, Investment, Trade and Innovation	Ekiti State (Nigeria)
Bimbo Adekanmbi	MD/CEO	iNCUBHub (Nigeria)
Oluseun Onigbinde	Co-Founder/CEO	BudgIT (Nigeria)
Prof. Ayman Ismail	Abdul Latif Jameel Endowed Chair of Entrepreneurship & Founding Director	AUC Venture Lab (Egypt)
Prof. Sherif Kamel	Dean	AUC School of Business (Egypt)

Acronyms

SME- Small and Medium Enterprises

GDP- Gross Domestic Product

SEC- Securities & Exchange Commission

SWFs- Sovereign Wealth Funds

UAE- United Arab Emirates

Saudi PIF- Saudi Public Investment Fund

SWFs including Mubadala Investment Company of UAE like Saudi PIF



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