



(REVIEW ARTICLE)



## Conceptualizing ICT entrepreneurship ecosystems: African and U.S. tech hubs

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World Journal of Advanced Research and Reviews, 2024, 21(03), 387–393

Publication history: Received on 22 January 2024; revised on 29 February 2024; accepted on 02 March 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.21.3.0720>

### Abstract

This review paper offers a comparative analysis of ICT entrepreneurship ecosystems in African and U.S. tech hubs, highlighting their structures, challenges, and impacts on local and global markets. It examines the roles of government policies, access to capital, talent pools, and the catalytic effect of tech hubs in fostering innovation and economic growth. The analysis reveals differences in maturity and operational dynamics between the ecosystems, with U.S. tech hubs benefiting from a mature environment of abundant resources, while African hubs display innovation driven by necessity and emerging global interest. The paper contributes theoretical and practical insights for stakeholders and suggests future research directions, including longitudinal studies and the exploration of the role of digital transformation in emerging markets.

**Keywords:** ICT entrepreneurship ecosystems; Tech hubs; Innovation; Global markets

### 1. Introduction

The advent of Information and Communication Technology (ICT) has revolutionized how we live and communicate and played a pivotal role in shaping the global economic landscape (Beniger, 2009; Castells, Fernandez-Ardevol, Qiu, & Sey, 2009; Unwin, 2009). ICT entrepreneurship ecosystems, which serve as engines of innovation, economic growth, and digital transformation, are at the heart of this transformation (Hanna, 2018; Isenberg & Onyemah, 2016; Sussan & Acs, 2017). These ecosystems, comprising a network of tech entrepreneurs, startups, investors, educational institutions, and supportive policies, are crucial in nurturing innovative solutions that address both local and global challenges.

This review focuses on the ICT entrepreneurship ecosystems within African and U.S. tech hubs to uncover the dynamics that drive their success and the challenges they face. The rationale behind selecting these regions lies in their contrasting yet complementary natures. While the U.S. is home to some of the world's most established and globally recognized tech ecosystems, such as Silicon Valley, African tech hubs are emerging as vibrant innovation centres, offering unique solutions tailored to their socio-economic contexts. By examining these ecosystems, the review aims to provide insights into how different environments shape the development of tech hubs and their impact on the broader ICT sector.

The scope of this review is twofold. Firstly, it covers the types of ICT entrepreneurship ecosystems, focusing on tech hubs as central nodes of innovation and entrepreneurship. Tech hubs are defined as physical or virtual spaces that foster collaboration and innovation among tech entrepreneurs, offering access to resources such as mentorship, capital, and networking opportunities. Geographically, the review concentrates on tech hubs located in Africa and the U.S., aiming to capture a broad spectrum of ecosystems from emerging to well-established ones. This includes an analysis of various

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aspects, such as the structure of these ecosystems, the role of government policies, access to financial resources, the availability of human capital, and the influence of cultural factors on entrepreneurship.

Understanding ICT entrepreneurship ecosystems is paramount for a wide range of stakeholders. For policymakers, insights into the functioning and needs of these ecosystems can guide the development of supportive legal and economic frameworks that foster innovation and growth. Entrepreneurs stand to benefit from understanding the dynamics of different ecosystems, which can inform their strategies for navigating challenges and leveraging opportunities within these environments. On the other hand, investors can gain valuable information on emerging trends, investment opportunities, and risk factors associated with different tech hubs. Lastly, researchers can build upon this analysis to explore further the factors contributing to the success and sustainability of ICT entrepreneurship ecosystems.

By providing a comparative analysis of African and U.S. tech hubs, this review aims to contribute to a deeper understanding of how diverse ICT entrepreneurship ecosystems evolve and how they can be nurtured to drive further innovation and economic development in the digital age.

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## 2. Theoretical Frameworks and Definitions

### 2.1. ICT Entrepreneurship Ecosystems

ICT entrepreneurship ecosystems are complex networks that encompass various actors and factors working synergistically to foster innovation and growth within the information and communication technology sector (Minà & Dagnino, 2015). These ecosystems are characterized by their ability to nurture startups and tech enterprises through various stages of growth, from ideation to scaling. A widely accepted framework for understanding these ecosystems is the "triple helix model," which emphasizes the interaction between academia, industry, and government as key to innovation and economic development (Cai & Amaral, 2021; Etzkowitz & Zhou, 2017). The "entrepreneurial ecosystem" framework also highlights the importance of systemic conditions, including culture, policies, capital markets, and open markets, in supporting entrepreneurship.

The vitality of ICT entrepreneurship ecosystems is dependent on several core components:

- **Government Policies:** The regulatory environment and government initiatives that support or hinder the growth of tech startups. This includes policies on taxation, business registration, intellectual property rights, and specific support for the tech sector such as grants and subsidies.
- **Financial Capital:** Access to funding is critical for startups. This encompasses venture capital, angel investors, crowdfunding, and other financing mechanisms providing the necessary growth and expansion resources.
- **Human Capital:** The availability of skilled labor, including entrepreneurs, engineers, and scientists, as well as mentors and advisors, is fundamental to the success of ICT startups. Education and training programs are also crucial in developing this capital.
- **Market Access:** The ability of startups to access local and global markets, which is influenced by the demand for ICT solutions, trade regulations, and the presence of supportive infrastructure such as internet access and logistics.
- **Support Services:** Incubators, accelerators, and tech hubs that offer mentorship, workspace, networking opportunities, and access to resources and services that help startups navigate the early stages of their development.

### 2.2. Differences and Similarities

The U.S. boasts a mature ICT entrepreneurship ecosystem with a well-established venture capital landscape, robust legal frameworks, and a culture of innovation. In contrast, African ecosystems are often in earlier stages of development, with varying levels of infrastructure and access to capital. However, both regions benefit from a strong entrepreneurial spirit and a growing emphasis on digital transformation. Cultural attitudes towards entrepreneurship and failure can significantly impact ecosystem dynamics. The U.S. culture traditionally celebrates entrepreneurial risk-taking and resilience. While there is a growing acceptance of entrepreneurship as a career path in Africa, cultural norms around failure and risk can vary significantly between countries, affecting startup culture (Hayton & Cacciotti, 2013). Economic conditions, such as market size and consumer purchasing power, play a crucial role in shaping ICT entrepreneurship ecosystems. The U.S. market offers vast opportunities for scale. In contrast, African tech hubs often innovate out of necessity, focusing on solutions tailored to local challenges such as financial inclusion, agriculture, and health (Kandachar & Halme, 2017; Kim, Shah, Gaskell, & Prasann, 2020).

### 2.3. Tech Hubs as Ecosystem Catalysts

Tech hubs act as focal points within ICT entrepreneurship ecosystems, providing a physical or virtual space where entrepreneurs, investors, and mentors can converge (Thomas, Sharapov, & Autio, 2018). They catalyze the development of startups by offering resources such as seed funding, training, and networking opportunities. Tech hubs also foster community and collaboration, which is vital for sharing knowledge and experiences. Tech hubs enhance innovation by cross-pollinating ideas and best practices by facilitating interactions between various ecosystem players (March & Failler, 2022). They provide a platform for startups to connect with potential investors, partners, and customers, increasing their visibility and chances of success. Tech hubs often partner with academic institutions, government agencies, and private sector entities to provide startups access to advanced technologies, research facilities, and market insights. This support is crucial for startups developing cutting-edge solutions and competing in global markets (Atiase, Kolade, & Liedong, 2020).

In summary, ICT entrepreneurship ecosystems are multifaceted networks that require the interplay of various components to thrive. The differences and similarities between ecosystems in African countries and the U.S. highlight the diverse paths to fostering innovation and growth in the tech sector. Tech hubs play a pivotal role in these ecosystems, acting as catalysts for development by supporting startups through their growth journey.

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## 3. Comparative Analysis of African and U.S. Tech Hubs

### 3.1. Overview of Tech Hubs

Africa's tech ecosystem has grown rapidly, with tech hubs sprouting across the continent, from Nairobi's iHub to Lagos' Co-Creation Hub (CcHub) and Cape Town's Silicon Cape. These hubs serve as epicenters for innovation, providing entrepreneurs with access to mentorship, funding, and networks. They focus on solving local problems, such as financial inclusion through mobile money technology, enhancing agricultural productivity, and improving healthcare delivery. Many African tech hubs are supported by a mix of international donors, local governments, and private sector partners, reflecting a collaborative approach to fostering innovation (Commission, 2021; Junaid, 2019; Madichie & Hinson, 2022).

In the U.S., tech hubs like Silicon Valley, New York City's Silicon Alley, and Boston's Route 128 Corridor are globally recognized for their innovation and economic impact. These hubs have mature ecosystems supported by a dense concentration of venture capital, world-class universities, and a culture of entrepreneurship. They have been instrumental in the rise of tech giants and many startups that lead in software, biotechnology, and clean energy. The objectives of these hubs are to foster innovation, attract top talent, and maintain their status as global leaders in technology (Zukin, 2020, 2021).

### 3.2. Factors Influencing Success and Challenges

In both regions, supportive government policies play a crucial role. In Africa, initiatives such as Kenya's Vision 2030 and Rwanda's focus on becoming an ICT hub have bolstered the tech ecosystem (Dinika, 2022; Mureithi & Nyaguthii, 2021). In the U.S., policies around intellectual property, entrepreneurship, and innovation have laid the groundwork for tech hub success. The U.S. leads in venture capital availability, with a mature market for startup funding. African tech hubs, while growing, still face challenges in funding, though there's increasing interest from international investors (Carbone, 2018; Ntakirutimana, Aguirre-Bastos, & Mugabo).

The availability of skilled professionals is vital. U.S. tech hubs benefit from a strong educational system and immigration policies that attract global talent. African hubs increasingly leverage local talent and returnees who bring skills and experience from abroad. The U.S. market's size and purchasing power are significant advantages. On the other hand, African tech hubs innovate out of necessity, creating solutions for local challenges, which often have the potential for scalability across similar markets in the Global South. While U.S. tech hubs enjoy advanced infrastructure, African hubs often contend with unreliable internet and power supply challenges. Startups in Africa sometimes face bureaucratic hurdles and changing regulatory environments, whereas, in the U.S., a more stable regulatory framework exists, although it can be complex. Despite growing investor interest, African startups often struggle with access to capital compared to their U.S. counterparts, where there is a more established ecosystem for seed, venture, and growth funding (Aka, 2019; Bonini & Capizzi, 2019; Pantin & Lynnise, 2017).

### 3.3. Impact on Local and Global Markets

Tech hubs in both regions have a profound impact on local economies. In Africa, tech hubs have spurred job creation, fostered new industries, and contributed to GDP growth. For instance, Nigeria's tech sector, buoyed by Lagos' tech hub, has become a significant part of the national economy (Olajide & Lawanson, 2022). In the U.S., tech hubs have been engines of economic growth, driving job creation and fostering innovation across sectors. U.S. tech hubs contribute a significant portion of the global technology products and innovations, from internet infrastructure to consumer electronics and software. African tech hubs, while smaller in scale, are making notable contributions to the global ICT ecosystem, particularly in mobile technology and solutions tailored to emerging markets challenges. Innovations such as mobile money and off-grid solar solutions have garnered international attention and adoption (Bright & Hruby, 2015; Wernick, 2016).

In conclusion, the comparative analysis of African and U.S. tech hubs reveals both shared and unique factors influencing their development and impact. While the U.S. enjoys the advantages of a mature ecosystem with abundant resources, African tech hubs are rapidly emerging as centers of innovation, leveraging local talent and creativity to address pressing challenges. Both regions' tech hubs play crucial roles in their local economies and the broader global ICT ecosystem, demonstrating the universal importance of fostering environments that support technological innovation and entrepreneurship.

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### 4. Implications for Stakeholders

The comparative analysis underscores the necessity of fostering supportive regulatory environments for ICT entrepreneurship ecosystems. Policymakers must prioritize policies simplifying business registration, protecting intellectual property, and offering tax incentives for startups and investors. Moreover, there's a critical need for infrastructure development, particularly in African regions, encompassing reliable internet access and power supply to bolster tech hubs' growth. In the U.S., ongoing investment in cutting-edge infrastructure is imperative to maintain global competitiveness. Policies supporting STEM education and entrepreneurship training are also vital, including partnerships with universities to foster innovation and equip individuals with the necessary skills to thrive in the tech sector. Policies encouraging venture capital investment, such as government-funded venture programs, can bridge the funding gap, particularly in African ecosystems, while in the U.S., supporting diverse funding sources can enhance ecosystem inclusivity (Kelly & Firestone, 2016; Shkabatur, Bar-El, & Schwartz, 2022).

Implementing regulatory reforms to reduce barriers to startup formation and growth is crucial, alongside investing in physical and digital infrastructure supporting tech innovation. Fostering education and training programs to build local talent and attract international expertise is essential, as well as encouraging public-private partnerships to stimulate investment in the tech sector.

Entrepreneurs in African and U.S. tech hubs can leverage local resources by utilizing support services like incubators and accelerators, offering access to mentorship, funding, and networks. Active participation in the local tech community and leveraging online platforms can enhance networking and community engagement, opening doors to partnerships and investment opportunities. Scaling strategies vary; African entrepreneurs may adapt solutions to diverse markets across the continent, while U.S. entrepreneurs may focus on technological innovation and market expansion, including international markets.

The growth of tech hubs in Africa presents emerging investment opportunities, particularly in fintech, agritech, and healthtech, addressing critical needs. Conversely, in the U.S., emerging technologies like AI, blockchain, and quantum computing offer frontier investment prospects. Investors should consider different risk profiles in each region, including political instability and infrastructure challenges in Africa, and market saturation and high valuation risks in the U.S. Cross-regional collaborations hold significant potential, leveraging the strengths of each ecosystem to drive innovation and foster global market access for startups. Recommendations include conducting thorough due diligence, considering impact investing, and exploring cross-regional investment opportunities leveraging comparative advantages. Ultimately, addressing the specific needs and leveraging the strengths of each region can foster vibrant and sustainable tech ecosystems contributing to global innovation and economic development.

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### 5. Conclusion

The comparative analysis of ICT entrepreneurship ecosystems in African and U.S. tech hubs has revealed unique characteristics and commonalities contributing to their growth and challenges. Key findings include:

- Ecosystem Structure: U.S. tech hubs benefit from mature ecosystems characterized by abundant venture capital, a robust talent pool, and supportive government policies. African tech hubs, while less mature, demonstrate remarkable innovation and adaptability, focusing on solving local challenges and showing a growing attraction for international investment.
- Government and Policy Impact: Supportive government policies play a critical role in fostering the development of tech hubs in both regions. However, African tech hubs often face more significant challenges related to infrastructure and regulatory environments.
- Access to Capital: The availability of funding is a crucial driver of tech hub success. While U.S. tech hubs enjoy access to a wide range of financing options, African hubs are increasingly attracting attention from global investors, though challenges remain.
- Talent and Market Access: Both regions recognize the importance of a skilled workforce and market access. The U.S. benefits from global talent attraction, while Africa is increasingly leveraging its growing pool of local talent and diaspora networks.
- Role of Tech Hubs as Catalysts: Tech hubs in both regions act as catalysts for innovation and entrepreneurship, providing essential support services, networking opportunities, and access to resources.

This review contributes to the theoretical understanding of ICT entrepreneurship ecosystems by integrating frameworks that consider the complex interplay of factors contributing to tech hub development. Practically, it provides insights into the operational dynamics of tech hubs, offering valuable information for policymakers, entrepreneurs, and investors interested in fostering or engaging with these ecosystems.

The analysis highlights the importance of a supportive policy environment, access to capital, talent development, and the role of tech hubs in catalyzing growth. For policymakers, the findings underscore the need for policies that reduce barriers to entrepreneurship, invest in infrastructure, and foster education and skill development. Entrepreneurs can draw on the insights related to leveraging local resources, networking, and scaling strategies. For investors, the review illuminates emerging opportunities and the importance of understanding regional challenges.

#### *Future Research Directions*

To further enhance our understanding of ICT entrepreneurship ecosystems, future research could explore several areas:

- Investigating how tech hubs evolve over time can provide insights into the factors that contribute to their sustainability and impact on local and global markets.
- Examining the role of digital transformation initiatives in emerging markets can offer a deeper understanding of how technology is used to address local challenges and spur economic development.
- Analyzing the impact of global economic trends on tech hubs can help stakeholders anticipate and navigate investment flows, market access, and international collaboration challenges.
- Expanding the comparative analysis to include tech hubs in other regions, such as Latin America and Asia, could provide a more comprehensive view of global ICT entrepreneurship ecosystems.
- This review has laid the groundwork for a nuanced understanding of ICT entrepreneurship ecosystems in African and U.S. tech hubs. By continuing to explore these dynamic environments, stakeholders can contribute to building resilient, innovative, and inclusive tech ecosystems that drive global progress and economic development.

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#### **Compliance with ethical standards**

##### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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