

From incubation to scaling: How innovation hubs and incubators drive digital entrepreneurship in Tanzania, 2015–2025

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ABSTRACT

Over the past decade, Tanzania has invested heavily in innovation hubs and business incubators as instruments for advancing digital entrepreneurship and inclusive economic transformation. Yet, evidence on whether these initiatives translate early-stage innovation into scalable digital enterprises remains limited. This study examines the incubation-to-scaling trajectory of digital entrepreneurship in Tanzania between 2015 and 2025. The Resource-Based View (RBV) was used to frame the study. The study population comprised innovation hubs and incubators operating in Tanzania between 2015 and 2025; digital enterprises that had participated in hub or incubation programmes; and hub managers, innovation officers from higher learning and tertiary institutions, and policymakers involved in ecosystem governance. A multistage sampling technique was employed. Purposive sampling was used to select major innovation hubs and incubators across the identified regions. Stratified random sampling was used to select digital enterprises that had participated in incubation programmes to ensure representation across sectors and regions. Purposive sampling was used for key informants to capture expert perspectives on commercialization and policy operationalization. Quantitative data were analyzed using descriptive statistics (frequencies, means, trends) to map hub evolution and startup characteristics and regression analysis to test hypotheses on hub support services, startup performance and scale-up outcomes. Qualitative interview data were analyzed thematically to identify commercialization barriers, financing gaps and policy operationalization patterns. Mixed-methods approach was applied whereby, quantitative survey data from 422 digital enterprises were analyzed alongside qualitative interviews with entrepreneurs, hub managers, university innovation officers and policymakers. Descriptive results show that 64 percent of surveyed enterprises participated in hub or incubation programmes, with nearly half of incubated firms located in Dar es Salaam. Regression findings indicate that hub-provided mentorship, technical training and business development services significantly improve early-stage startup performance. However, scale-up outcomes are strongly determined by access to follow-on finance, revealing a persistent financing gap beyond incubation. Qualitative evidence further shows that while hubs effectively support ideation and prototyping, weak commercialization pathways, limited investor networks and fragmented policy implementation constrain sustained enterprise growth. This study concludes that innovation hubs are necessary but insufficient drivers of digital-led industrial transformation in Tanzania without complementary financing and market-creation mechanisms. The findings offer policy-relevant insights for designing integrated innovation, financing and commercialization frameworks to unlock the scale-up potential of digital enterprises in emerging economies. The findings of this study recommends that Tanzania should establish a blended public-private innovation financing facility linked directly to certified innovation hubs. The government should institutionalize GovTech and civic-tech procurement channels allowing ministries, agencies and local governments to pilot and purchase solutions developed within innovation hubs. Universities should adopt standardized IP policies, establish professional tech-transfer units, and introduce performance incentives for academic entrepreneurship to bridge the research-to-market gap.

Keywords: Business Incubation, Digital Entrepreneurship, Financing Gaps, Innovation Hubs; Startup Scale-Up

I. INTRODUCTION

Digital entrepreneurship is increasingly recognised as a central engine for economic transformation, job creation and knowledge-intensive growth in the twenty-first century, with scholars and policy bodies arguing that digitally enabled firms can accelerate industrial upgrading, youth employment and inclusive growth if embedded in supportive innovation ecosystems (Comins & Kraemer-Mbula, 2016; Friederici, 2019; World Bank, 2021; Ngene *et al.*, 2021; Tafese, 2022). Innovation hubs and incubators have been widely promoted as practical institutional instruments to nurture digital entrepreneurship by providing critical services such as business development support, technical mentoring, prototyping facilities, networking and legitimacy that reduce startup entry barriers and stimulate venture formation (Comins & Kraemer-Mbula, 2016; De Beer *et al.*, 2016; Friederici *et al.*, 2020; Mwantimwa *et al.*, 2021; Zahoro & Banele, 2024).

Evidence from advanced economies shows that, when hubs are embedded within mature financial markets, structured higher learning and tertiary institutions–industry commercialisation pathways and procurement ecosystems, they can act as powerful catalysts for startup survival and scale-up (Silvestro *et al.*, 2025; Kato, 2025; Karuri-Sebina & Maciko, 2025; Flego & Tei, 2025; Amoah *et al.*, 2026). In middle-income contexts, the literature suggests that, innovation hubs and incubators successfully stimulate early-stage entrepreneurial activity but that scaling frequently depends on complementary ecosystem functions particularly access to venture finance, demand-side market channels, and robust commercialisation mechanisms within higher learning and tertiary institutions (De Beer *et al.*, 2016; Mutegi *et al.*, 2023; Kato, 2025; Flego & Tei, 2025; Silvestro *et al.*, 2025). Across Africa, and especially in East Africa, a proliferation of innovation hubs and incubators has expanded entrepreneurial training, digital-skilling and idea incubation, yet multiple studies emphasise persistent challenges including fragile funding pipelines, uneven geographic distribution of services, and weak market linkages that limit widespread scale-up of digital ventures (Friederici *et al.*, 2020; Mutegi *et al.*, 2023; Gumbo & Moos, 2024; Ndlovu, 2024; Lugero *et al.*, 2025).

In Tanzania specifically, the post-2015 period witnessed an active expansion of innovation hubs and incubators' activity anchored by higher learning and tertiary institutions' innovation centres (e.g. University of Dar es Salaam Information and Communication Technology Incubator), national innovation spaces (e.g. Buni Hub), and a cluster of private and Non-Governmental Organizations -run accelerators reflecting policy interest captured in major documents and programmes such as the World Bank's Digital Tanzania Project (2021), the National Digital Economy Strategic Framework (ICTC, 2024) and national startup ecosystem reports (Tanzania Startup Association, 2024). Empirical studies corroborate that these innovation hubs and incubators have delivered measurable gains in founder skills, prototype development and early venture formation (Mwandosya *et al.*, 2016; Mwantimwa *et al.*, 2021; Pasape, 2022; Zahoro & Banele, 2024; Hooli *et al.*, 2024). Notwithstanding these advances, Tanzanian evidence points to a recurring pattern i.e. hub-supported ventures frequently remain at pilot or micro-enterprise stages and only a minority progress to sustained scale-up in revenue, employment or external investment, owing to systemic constraints that include limited follow-on financing, weak university–industry commercialisation pathways, and demand-side barriers such as low public procurement of local digital solutions (World Bank, 2021; Pasape, 2022; Hooli *et al.*, 2024; Zahoro & Banele, 2024; Tanzania Startup Association, 2024). Geographic concentration of innovation hubs and incubators in Dar es Salaam further narrows access to incubation services for entrepreneurs in secondary cities and rural areas, raising concerns about regional inclusivity and the capacity of innovation hubs and incubators to catalyse a nationally distributed digital economy (Mwantimwa *et al.*, 2021; Ngene *et al.*, 202; Kiologwe *et al.*, 2023; Tanzania Startup Association, 2024; Nkonoki *et al.*, 2025).

Despite the policy attention and growing scholarship, several critical knowledge gaps persist for Tanzania's 2015–2025 window. First, there is a dearth of longitudinal, outcome-oriented evidence that systematically tracks whether hub-incubated digital firms achieve scalable growth in revenue, employment, market reach or investment attraction (De Beer *et al.*, 2016; Mwantimwa *et al.*, 2021; Pasape, 2022; Zahoro & Banele, 2024; Hooli *et al.*, 2024). Second, although higher learning and tertiary institutions' innovation hubs and incubators are widely documented, institutional analyses of commercialisation pathways including intellectual property regimes, incentives for academic engagement, and structured tech-transfer mechanisms remain limited (De Beer *et al.*, 2016; Mwandosya *et al.*, 2016; Misso & Ismail, 2024; Thetsane *et al.*, 2024; Kerefu & Machuve, 2026). Third, there is insufficient empirical mapping of funding flows and capital gaps across the seed-to-scale continuum for hub-supported ventures, leaving policymakers and investors with limited guidance on appropriate blended-finance instruments (World Bank, 2021; Pasape, 2022; Gumbo & Moos, 2025; Kato, 2025; Kerefu & Machuve, 2026). Fourth, tested models for regional or virtual incubation that would extend innovation hubs and incubators' benefits beyond Dar es Salaam are sparse in the Tanzanian literature (Mwantimwa *et al.*, 2021; Kiologwe *et al.*, 2023; Tumuhimbise *et al.*, 2024; Nkonoki *et al.*, 2025; Lugero *et al.*, 2025). Finally, although national strategies acknowledge innovation hubs and incubators as instruments for digital transformation, evidence on the operationalisation of these policies particularly how procurement, public pilots and industrial policy instruments link to innovation hubs and incubators' outputs is limited (World Bank, 2021; ICTC, 2024; Hooli *et al.*, 2024; Tanzania Startup Association, 2024; Karuri-Sebina & Maciko, 2025).

Accordingly, this study addresses the central research problem that, despite substantial investment in innovation hubs and incubators between 2015 and 2025, Tanzania has yet to demonstrate proportional growth in scalable, market-embedded digital enterprises, primarily due to commercialisation bottlenecks, fragmented financing pathways, spatial concentration of support, and limited policy operationalisation linking hubs to demand and industrial strategy (World Bank, 2021; Pasape, 2022; Zahoro & Banele, 2024; Hooli *et al.*, 2024; ICTC, 2024).

1.1 Research Objectives

- i. To map the landscape and evolution of hubs and incubators in Tanzania (2015–2025),
- ii. To assess the influence of hub-provided business and technical support on early-stage startup performance, and
- iii. To evaluate scale-up outcomes of hub-incubated digital enterprises.

II. LITERATURE REVIEW

2.1 Theoretical Foundations on Innovation Hubs, Incubation and Digital Entrepreneurship

The paper is built on the Resource based View that explains how an organization can achieve competitive advantage and better performance by effectively utilizing its internal resources and capabilities. These resources can be technology, skills, financial resources, physical assets and organizational capabilities which are explained in this paper. Innovation hubs and incubators are increasingly conceptualized as institutional intermediaries that connect knowledge generation, entrepreneurial experimentation and market formation within broader innovation systems. From an innovation systems perspective, innovation hubs and incubators serve as localised platforms that coordinate interactions among higher learning and tertiary institutions, firms, investors and public agencies, thereby enhancing knowledge circulation and collective learning processes that underpin entrepreneurial ecosystems (Comins & Kraemer-Mbula, 2016; De Beer *et al.*, 2016; Mwandosya *et al.*, 2016; Hooli *et al.*, 2024; ICTC, 2024). Entrepreneurial ecosystem theory further frames hubs as orchestrators of interdependent actors and resources whose density and quality shape the probability of new venture emergence and growth, emphasising connectivity, finance, institutional support and market access as key determinants of entrepreneurial success (World Bank, 2021; Nkontwana, 2022; Gumbo & Moos, 2024; Flego & Tei, 2025; Karuri-Sebina & Maciko, 2025).

From a resource-based and capability-building perspective, innovation hubs and incubators enhances digital entrepreneurial performance by providing tangible assets such as workspace, infrastructure and seed support, as well as intangible assets including mentorship, legitimacy and social capital, which collectively reduce liabilities of newness and accelerate opportunity recognition in digital markets (Friederici, 2019; Friederici *et al.*, 2020; Thetsane *et al.*, 2024; Silvestro *et al.*, 2025; Amoah *et al.*, 2026). Digital entrepreneurship theory adds that digitally enabled ventures exhibit rapid scalability, data-driven innovation and platform-based value creation, thereby requiring incubation models that integrate agile prototyping, digital skills development, and early market testing mechanisms (Tafese, 2022; Misso & Ismail, 2024; Cruz, 2024; Bunde, 2024; Kato, 2025).

Synthesising these theoretical perspectives suggests that, innovation hubs and incubators influence digital entrepreneurship through three interlinked mechanisms: structuring entrepreneurial ecosystems, strengthening early-stage venture capabilities, and connecting startups to commercialisation, financing and market sub-systems. However, theory equally predicts that where commercialisation frameworks, venture finance ladders and demand-side innovation policies are weak, incubation may generate entrepreneurial activity without corresponding scale-up outcomes (De Beer *et al.*, 2016; World Bank, 2021; Gumbo & Moos, 2025; Flego & Tei, 2025; Kerefu & Machuve, 2026). This theoretical tension between incubation success and scale-up failure provides the analytical lens guiding this study.

2.2 Empirical Review

2.2.1 Evolution and Landscape of Hubs and Incubators

Empirical evidence from mature innovation ecosystems shows that, innovation hubs and incubators have evolved from shared workspaces into comprehensive incubation and acceleration platforms integrating entrepreneurship education, venture finance connectivity, corporate innovation programmes and structured commercialisation pipelines (Silvestro *et al.*, 2025; Amoah *et al.*, 2026; Flego & Tei, 2025; Karuri-Sebina & Maciko, 2025; Comins & Kraemer-Mbula, 2016). Studies in middle-income countries demonstrate rapid expansion of hub infrastructures after 2015, though often characterized by uneven institutional maturity and sustainability, reflecting reliance on donor or public funding rather than self-financing operational models (World Bank, 202; Nkontwana, 2022; Gumbo & Moos, 2024; Flego & Tei, 2025; Thetsane *et al.*, 2024).

In East Africa, Kenya and Rwanda display comparatively dense and stable hub ecosystems with strong accelerator programmes, venture capital linkages and public procurement of startup solutions, producing structured pathways from incubation to market entry for digital enterprises (Cruz, 2024; Mutegi *et al.*, 2023; Lugero *et al.*, 2025; Karuri-Sebina & Maciko, 2025; Kato, 2025). Tanzania's empirical evidence shows substantial hub expansion since 2015 through higher learning and tertiary institutions' innovation centers, national hubs and emerging regional spaces, yet with persistent geographic concentration in Dar es Salaam and limited diffusion into secondary cities, alongside fragile hub sustainability mechanisms (Mwandosya *et al.*, 2016; Mwantimwa *et al.*, 2021; Hooli *et al.*, 2024; Tanzania Startup Association, 2024; ICTC, 2024). This suggests that while structural incubation infrastructure has been established, institutional depth and regional reach remain comparatively limited.

2.2.2 Hub Support Services and Early-Stage Digital Startup Performance

Empirical studies across global contexts confirm that incubation services such as mentoring, entrepreneurial training, technical assistance and networking significantly improve early-stage digital venture legitimacy, product readiness and market entry capacity (Friederici, 2019; Friederici *et al.*, 2020; Silvestro *et al.*, 2025; Amoah *et al.*, 2026; Misso & Ismail, 2024). Evidence from middle-income countries similarly shows that hub-provided services enhance

founders' entrepreneurial capabilities and reduce early venture mortality, although effectiveness varies depending on service depth and ecosystem integration (Flego & Tei, 2025; Gumbo & Moos, 2024; Thetsane *et al.*, 2024; Ngene *et al.*, 2021; Nkontwana, 2022).

East African research indicates that structured mentorship, investor readiness programmes and technology-focused bootcamps in Kenyan and Rwandan hubs have improved early-stage survival and financing outcomes for digital startups, particularly in fintech and digital outsourcing sectors (Mutegi *et al.*, 2023; Lugero *et al.*, 2025; Karuri-Sebina & Maciko, 2025; Kato, 2025; Cruz, 2024). In Tanzania, empirical assessments confirm that, hub-provided business development and technical support services positively influence early-stage digital startup performance by strengthening business structuring, prototype development and market testing readiness (Mwantimwa *et al.*, 2021; Pasape, 2022; Zahoro & Banele, 2024; Misso & Ismail, 2024; Hooli *et al.*, 2024). However, Tanzanian studies also note variability in programme quality, donor-driven project cycles and limited integration of incubation curricula into higher learning and tertiary institutions' commercialisation systems, raising concerns regarding continuity and consistency of early-stage support (Hooli *et al.*, 2024; Thetsane *et al.*, 2024; Kerefu & Machuve, 2026; Tanzania Startup Association, 2024; ICTC, 2024).

2.2.3 Scale-Up Outcomes of Hub-Incubated Digital Enterprises

Evidence from developed innovation ecosystems demonstrates that incubated digital enterprises achieve higher probabilities of revenue growth, employment expansion and external investment when incubation is complemented by venture capital markets, corporate innovation partnerships and public-sector demand for startup solutions (Silvestro *et al.*, 2025; Karuri-Sebina & Maciko, 2025; Flego & Tei, 2025; Kato, 2025; Amoah *et al.*, 2026). Conversely, empirical studies from middle-income countries show that absence of follow-on financing and weak commercialisation pipelines remain major barriers preventing digital startups from transitioning beyond incubation into scale-up stages (World Bank, 2021; Nkontwana, 2022; Flego & Tei, 2025; Gumbo & Moos, 2025; Thetsane *et al.*, 2024).

In East Africa, Kenyan and Rwandan digital ecosystems exhibit relatively higher scale-up outcomes due to established accelerator programmes, angel investment networks and procurement-driven market creation for locally developed digital solutions (Cruz, 2024; Mutegi *et al.*, 2023; Lugero *et al.*, 2025; Karuri-Sebina & Maciko, 2025; Kato, 2025). In contrast, Tanzanian empirical research reveals that most hub-incubated digital ventures remain at micro or pilot stages, with limited graduation into high-growth enterprises because of discontinuous financing ladders, weak university technology transfer systems and restricted domestic market absorption for digital products (World Bank, 2021; Pasape, 2022; Hooli *et al.*, 2024; Gumbo & Moos, 2025; Kerefu & Machuve, 2026). Furthermore, spatial concentration of hubs in urban centers constrains exposure of rural and secondary-city entrepreneurs to scale-up opportunities, limiting inclusive participation in digital enterprise growth (Ngene *et al.*, 2021; Kiologwe *et al.*, 2023; Tanzania Startup Association, 2024; ICTC, 2024; Nkonoki *et al.*, 2025).

III. METHODOLOGY

3.1 Research Philosophy

This study is guided by a pragmatic research philosophy, recognising that understanding how innovation hubs and incubators influence digital entrepreneurship in Tanzania requires combining objective measurement of venture outcomes with contextual interpretation of institutional and ecosystem dynamics. Pragmatism is appropriate for innovation and entrepreneurship research where complex social, economic and policy processes interact, and where both quantitative indicators (startup performance, scale-up outcomes) and qualitative insights (commercialisation pathways, hub practices) are necessary to explain observed phenomena (De Beer *et al.*, 2016; World Bank, 2021; Mwantimwa *et al.*, 2021; Hooli *et al.*, 2024; Gumbo & Moos, 2024). This philosophical stance allows the study to integrate statistical analysis of hub-supported venture performance with interpretive examination of policy operationalisation and institutional arrangements shaping Tanzania's incubation ecosystem (ICTC, 2024; Tanzania Startup Association, 2024; Flego & Tei, 2025; Karuri-Sebina & Maciko, 2025; Kerefu & Machuve, 2026;).

3.2 Research Approach

A mixed-methods research approach is adopted, combining quantitative and qualitative techniques to address the three specific objectives of mapping hub evolution, assessing early-stage startup performance, and evaluating scale-up outcomes. Quantitative methods enable measurement of hub distribution, service provision, startup performance indicators and scale-up metrics, while qualitative methods capture deeper insights into commercialisation processes, financing gaps and policy implementation mechanisms (Zahoro & Banele, 2024; Pasape, 2022; Mwantimwa *et al.*, 2021; Hooli *et al.*, 2024; Ngene *et al.*, 2021). Mixed-methods designs are widely recommended in innovation ecosystem studies because they allow triangulation between numerical venture outcomes and explanatory institutional narratives (World Bank, 2021; Nkontwana, 2022; Gumbo & Moos, 2025; Silvestro *et al.*, 2025; Kato, 2025).

3.3 Research Design

The study employs a cross-sectional explanatory research design complemented by retrospective longitudinal mapping of hub evolution between 2015 and 2025. This design is suitable for examining relationships between hub support services and digital startup performance while also capturing scale-up outcomes over time using archival and recall data (Mwantimwa *et al.*, 2021; Zahoro & Banele, 2024; Hooli *et al.*, 2024; Tanzania Startup Association, 2024; ICTC, 2024). Additionally, embedded multiple-case study elements are incorporated for selected innovation hubs and incubators to explore commercialisation and financing pathways in depth (De Beer *et al.*, 2016; Mwandosya *et al.*, 2016; Misso & Ismail, 2024; Gumbo & Moos, 2025; Kerefu & Machuve, 2026).

3.4 Area of the Study

The study is conducted in Tanzania, focusing on regions hosting active innovation hubs and incubators, notably Dar es Salaam (Buni Innovation Hub, Dar Teknohama Business Incubator [DTBi], Sahara Accelerator, Ndoto Hub, SmartLab; dLab, Seedspace Dar es Salaam, Robotech Lab, STICLab, UDSM ICT Incubator); Arusha (innovation spaces for science-based startups by NM-AIST, other local private/regional hubs focusing on tech and agriculture); Dodoma (Institute of Rural Development Planning [IRDPI]-a key node for rural-focused entrepreneurial training, Dodoma University [UDOICT]); Iringa (Kiota Hub: Part of the Center for Entrepreneurship and Innovation at the University of Iringa, RLabs Iringa-a community-focused hub specialising in inclusive innovation and youth development, Tatua Hub-focused on social innovation and community solutions); Mbeya (Mbeya University of Science and Technology (TISC)-hosts innovation spaces for students and local youth); and Morogoro (Sokoine University Graduates Entrepreneurship Cooperative) [SUGECO]-focused on agribusiness and agricultural innovation, Ifakara Innovation Hub [IIH]-focuses on fostering rural innovation in agriculture, climate, and SMEs, TAOTIC-a local NGO and venture builder operating that supports and incubates early-stage startups; Mzumbe University entrepreneurship and incubation center).

These locations represent the concentration of national and higher learning and tertiary institutions'-based hubs and emerging regional innovation spaces (Mwantimwa *et al.*, 2021; Kiologwe *et al.*, 2023; Hooli *et al.*, 2024; Tanzania Startup Association, 2024; ICTC, 2024). Tanzania provides an empirically relevant setting because it has experienced rapid expansion of incubation infrastructure since 2015 but continues to face scale-up constraints in digital entrepreneurship (Pasape, 2022; Zahoro & Banele, 2024; Kerefu & Machuve, 2026; Gumbo & Moos, 2025; World Bank, 2021). The ecosystem partners and supporters of these innovation hubs and incubators are Tanzania Startup Association (TSA), Tanzania Commission for Science and Technology (COSTECH), UNDP Tanzania (Funguo Program), UNCDF Tanzania (PesaTech Accelerator), Vodacom Tanzania, and international partners/investors such as Mastercard Foundation, DeveloPPP Ventures, Y-Combinator, Baobab Network, and Launch Africa, and Government Agencies including the Ministry of Communications and Information Technology (MCIT), the Capital Markets and Securities Authority (CMSA), and the Bank of Tanzania.

3.5 Population and Sampling

The study population comprises innovation hubs and incubators operating in Tanzania between 2015 and 2025; digital enterprises that have participated in hub or incubation programmes; and hub managers, higher learning and tertiary institutions' innovation officers and policymakers involved in ecosystem governance. National ecosystem mapping reports estimate over 90 active entrepreneurship and innovation support organizations (EISOs) in Tanzania, predominantly concentrated in urban centers (Mwantimwa *et al.*, 2021; World Bank, 2021; ICTC, 2024; Hooli *et al.*, 2024; Tanzania Startup Association, 2024). Digital startups form a dynamic and partially undocumented population; therefore, the population size of hub-incubated digital enterprises is considered unknown, justifying sample-size estimation using infinite population formulas (Zahoro & Banele, 2024; Pasape, 2022; Ngene *et al.*, 2021; Nkonoki *et al.*, 2025; Kato, 2025). Since the exact population size of hub-incubated digital enterprises is unknown, the study adopts the Cochran (1977) formula for infinite populations to estimate a representative sample size at a 95% confidence level and 5% margin of error:

$$n = \frac{Z^2 p(1 - p)}{e^2}$$

Using $Z = 1.96$, $p = 0.5$ and $e = 0.05$, the minimum sample size is 384 digital entrepreneurs. To account for non-response, a 10% adjustment is applied, resulting in a final target sample of 422 respondents. This sample size aligns with comparable entrepreneurship and incubation studies in East African contexts (Ngene *et al.*, 2021; Mutegi *et al.*, 2023; Zahoro & Banele, 2024; Pasape, 2022; Kato, 2025). For qualitative inquiry, 15–20 key informants (hub managers, higher learning and tertiary institutions' incubation officers, policymakers and investors) are selected, consistent with

ecosystem case-study standards (De Beer *et al.*, 2016; Misso & Ismail, 2024; Hooli *et al.*, 2024; Gumbo & Moos, 2025; Kerefu & Machuve, 2026).

A multistage sampling technique is employed. First, purposive sampling selects major innovation hubs and incubators across identified regions to address Objective 1 (mapping hub evolution). Second, stratified random sampling selects digital enterprises that have participated in incubation programs to ensure representation across sectors and regions. Finally, purposive sampling is used for key informants to capture expert perspectives on commercialisation and policy operationalisation.

3.6 Variables and Measurement

Table 1

Variables and Measurement Indicators

Variable Category	Measurement Indicators	Measurement Scale	Source Support
Evolution of hubs and incubators (Objective 1)	Number of hubs; type of services offered; years of operation; regional distribution	Nominal, Ratio	Mwantimwa <i>et al.</i> (2021); Hooli <i>et al.</i> (2024); ICTC (2024); Tanzania Startup Association (2024); World Bank (2021)
Hub support services (Independent Variable, Objective 2)	Business mentorship; technical training; networking; access to finance; prototyping support	Likert scale (1–5)	Zahoro & Banele (2024); Pasape (2022); Misso & Ismail (2024); Friederici (2019); Ngene <i>et al.</i> (2021)
Early-stage startup performance (Dependent Variable, Objective 2)	Business formalisation; prototype readiness; market testing; revenue generation	Likert scale & ratio	Zahoro & Banele (2024); Pasape (2022); Mwantimwa <i>et al.</i> (2021); Hooli <i>et al.</i> (2024); Ngene <i>et al.</i> (2021)
Scale-up outcomes (Dependent Variable, Objective 3)	Revenue growth; employment growth; market expansion; external investment raised	Ratio scale	Hooli <i>et al.</i> (2024); Kerefu & Machuve (2026); Gumbo & Moos (2025); Kato (2025); World Bank (2021)

3.7 Data Collection Methods

Primary data were collected through structured questionnaires administered to digital entrepreneurs and semi-structured interviews with hub managers, higher learning and tertiary institutions' innovation officers and policymakers. Secondary data include hub reports, national ecosystem documents, policy frameworks and startup databases. Combining primary and secondary sources enhances depth and triangulation in innovation ecosystem research (De Beer *et al.*, 2016; Ngene *et al.*, 2021; Kato, 2025; Gumbo & Moos, 2025; Silvestro *et al.*, 2025).

3.8 Validity and Reliability

Instrument validity was ensured through expert review by innovation hub practitioners and academic specialists, consistent with incubation research protocols (De Beer *et al.*, 2016; Zahoro & Banele, 2024; Misso & Ismail, 2024; Hooli *et al.*, 2024; Kerefu & Machuve, 2026). Construct validity was assessed through factor analysis, while internal consistency reliability is tested using Cronbach's alpha, targeting a threshold of ≥ 0.70 . Triangulation between survey data, interviews and document analysis further strengthens credibility and trustworthiness.

3.9 Data Analysis

Quantitative data were analyzed using descriptive statistics (frequencies, means, trends) to map hub evolution and startup characteristics and regression analysis to test hypotheses on hub support services and startup performance and scale-up outcomes. Qualitative interview data were analysed thematically to identify commercialisation barriers, financing gaps and policy operationalisation patterns. Integration of quantitative and qualitative findings allows holistic interpretation of incubation-to-scaling dynamics.

3.10 Ethical Considerations

Ethical clearance was obtained from relevant higher learning and tertiary institutions' research ethics committees and national research authorities. Participation was voluntary, informed consent was secured, confidentiality of respondents and business information was guaranteed, and data are used strictly for academic purposes. Anonymization of startup identities and secure data storage protocols ensure compliance with research ethics standards in entrepreneurship and innovation studies.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Growth and Evolution of Innovation Hubs and Incubators in Tanzania (2015–2025)

Descriptive analysis of survey data, ecosystem reports, and hub directories demonstrates a substantial expansion of innovation hubs and incubators during the study period. As shown in Table 2, 64% of surveyed digital enterprises ($n = 270$) reported participation in incubation or hub programmes, indicating widespread penetration of organised innovation support structures within Tanzania's digital economy.

Table 2

Participation in Incubation or Hub Programmes ($n = 422$)

Participation Status	Frequency	Percentage (%)
Participated in hub/incubation	270	64.0
Not participated	152	36.0
Total	422	100

Regional distribution results (Table 3) further reveal diversification of hub presence beyond Dar es Salaam, with measurable participation across Arusha, Dodoma, Morogoro, Mbeya, Iringa, and other regions. However, Dar es Salaam alone accounts for 44.8% of all hub-incubated enterprises, confirming persistent spatial concentration despite national expansion.

Table 3

Regional Distribution of Hub-Incubated Digital Enterprises ($n = 270$)

Region	Frequency	Percentage (%)
Dar es Salaam	121	44.8
Arusha	28	10.4
Dodoma	26	9.6
Morogoro	24	8.9
Mbeya	25	9.3
Iringa	19	7.0
Other regions	27	10.0
Total	270	100

Functional capacity is reflected in the mean hub support score of 3.73, indicating moderate to high availability of mentorship, training, workspace, and networking services (Table 4.). The relatively strong early-stage performance mean score (60.62) further suggests that hubs have enhanced their operational effectiveness since 2015. However, the low scale-up index (mean = 33.36) and limited financing access (mean = 0.35) indicate that functional capacity remains skewed toward early-stage support rather than growth-stage enablement.

Table 4

Descriptive Statistics ($n = 422$)

Variable	Mean	Std. Dev.	Min	Max
Hub support score (1–5)	3.73	0.82	1.10	5.00
Early-stage performance score (0–100)	60.62	15.06	16.50	100
Financing access (0–1)	0.35	0.17	0.03	0.80
Revenue growth (%)	36.65	19.63	-16.20	93.70
Employment growth (jobs created)	5.07	2.59	0	13
Investment raised (USD '000)	68.62	74.03	0	529.20
Scale-up index (0–100)	33.36	12.04	7.60	69.80

In addition to the quantitative results, some qualitative support on evolution and spatial concentration of hubs were as well obtained. Interview participants consistently described rapid growth of hubs after 2015, accompanied by persistent spatial concentration. A hub manager noted:

“In 2016, there were only a few innovation hubs in Tanzania. Today, every major city wants to have one. But in reality, Dar es Salaam still dominates in terms of resources, networks and opportunities” (Hub Manager H2 20th March 2026).

A policymaker confirmed uneven diffusion that:

“We have expanded hub infrastructure across the country, but entrepreneurs outside Dar es Salaam still face limited access to quality incubation services and investor networks” (Policy Officer P1 15th February 2026).

Higher learning and tertiary institution’s innovation officers emphasised the rise of campus-based incubators:

“Our institute hub has generated many student startups since 2017. The challenge is not lack of ideas; it is moving them beyond the university environment” (Innovation Officer U3 25th January 2026).

These narratives reinforce the descriptive statistics showing strong hub participation nationally, yet continued clustering in Dar es Salaam and limited regional diffusion. Generally, the quantitative and qualitative evidence confirms significant growth in the number, diversity, and functional capacity of innovation hubs between 2015 and 2025, albeit with spatial and functional imbalances. *Therefore, decision on H₁ is accepted.*

4.1.2 Effect of Hub-Provided Support Services on Early-Stage Startup Performance

This hypothesis was tested using an ordinary least squares regression model, with early-stage startup performance as the dependent variable. As shown in Table 5, hub support score has a strong, positive, and statistically significant effect on early-stage performance. A one-point increase in hub support score is associated with an 11.76-point increase in early-stage performance ($p < 0.001$). Additionally, incubation status contributes an independent 5.43-point performance increase ($p < 0.001$). These findings demonstrate that structured mentorship, technical training, business development support, and networking services significantly enhance startup readiness.

Table 5

Effect of Hub-Provided Support Services on Early-Stage Startup Performance (n=422)

Predictor	Coefficient	Std. Error	t-value	p-value
Hub support score	11.76	0.68	17.34	0.000
Incubated (1 = yes)	5.43	1.21	4.48	0.000
Financing access	2.35	3.10	0.76	0.449
Founding year	-0.15	0.17	-0.93	0.355

Adjusted R² = 0.554

Regarding qualitative support on how hub services improve early-stage performance, the qualitative results demonstrate that entrepreneurs consistently described hub participation as transformative in shaping technical and business capabilities. One digital entrepreneur explained:

“Before joining the hub, I only had a technical idea. The hub trained us on business models, customer discovery and pitching. That is when our idea became a real startup” (Entrepreneur E5 10th February 2026).

Another highlighted technical support:

“The hub gave us access to prototyping tools and mentors. We tested our product quickly and got real market feedback” (Entrepreneur E2 10th February 2026).

Hub managers confirmed this role:

“Our strength is early-stage transformation turning ideas into viable products and preparing teams to face the market” (Hub Manager H1 20th March 2026).

These accounts explain the strong statistical effect of hub support on early-stage performance. They illustrate how mentorship, training, prototyping and networking services translate directly into improved startup readiness. In fact, these results explain the magnitude and statistical significance of the hub support coefficient observed in the regression model. *The decision on H₂ is accepted.*

4.1.3 Scale-Up Outcomes of Hub-Incubated Digital Enterprises

Hypothesis 3 was tested using a regression model with a composite scale-up index as the dependent variable. The results in Table 6 reveal that incubation significantly improves scale-up outcomes. Hub-incubated enterprises achieve, on average, an 8.53-point higher scale-up index than non-incubated enterprises ($p < 0.001$). Furthermore, early-stage performance significantly predicts later scale-up success, confirming that capability-building during incubation contributes to growth potential. Most importantly, financing access exhibits the strongest marginal effect on scale-up outcomes. A one-unit increase in financing access is associated with an 11.02-point increase in the scale-up index ($p < 0.001$). This result provides robust quantitative evidence that access to follow-on finance is the principal determinant of whether incubated digital startups in Tanzania successfully transition into scalable enterprises.

The model explains 47.2% of the variation in scale-up outcomes, indicating that incubation, early-stage performance and financing access jointly provide substantial explanatory power for understanding growth trajectories of Tanzanian digital enterprises. These results confirm that while innovation hubs in Tanzania effectively nurture early-

stage entrepreneurship, scale-up success remains strongly constrained by limited growth-stage financing, consistent with national startup ecosystem assessments and innovation policy reviews.

Table 6

Regression Results–Incubation, Early Performance and Scale-Up Outcomes (n=422)

Predictor	Coefficient	Std. Error	t-value	p-value
Incubated (1 = yes)	8.53	1.05	8.09	0.000
Early-stage performance	0.31	0.03	9.59	0.000
Financing access	11.02	2.70	4.09	0.000
Founding year	-0.16	0.14	-1.14	0.255

Adjusted R² = 0.472

With qualitative support on financing gaps and commercialisation constraints, it is noted that across entrepreneurs, hub managers and policymakers, the dominant theme was difficulty transitioning from incubation to growth due to financing and commercialization barriers. An entrepreneur explained:

“Inside the hub, everything is structured. Once you graduate, it feels like entering a financing desert. Banks say startups are too risky, and local investors are few” (Entrepreneur E3, February 10th 2026).

Another founder stated:

“We had a working product after incubation, but without growth capital, we could not expand or hire staff. Eventually, progress slowed” (Entrepreneur E7, 11th February 2026).

Hub managers echoed this challenge:

“We prepare startups for demo days, but follow-on investors are limited. Incubation works well, but scaling is where most ventures struggle” (Hub Manager H3 20th March 2026).

Higher learning and tertiary institution’s innovation officers emphasized commercialization gaps:

“Many student innovations stop at prototype level. There is no strong technology transfer structure to push them into the market” (University Innovation Officer U2 25th January 2026).

Policymakers acknowledged coordination issues:

“Our innovation policies support hub creation, but financing instruments and commercialization mechanisms have not grown at the same pace” (Policy Officer P2 15th February 2026).

These narratives explain why financing access statistically emerges as the strongest predictor of scale-up. They also clarify why incubation improves early capability but does not automatically guarantee growth-stage success. By integrating quantitative and qualitative results with both strands of evidence, some consistent patterns are notable. Both results indicate that, Tanzania has rapidly expanded innovation hubs since 2015, but spatial concentration persists; hub services significantly enhance early-stage entrepreneurial capabilities; and scale-up success is primarily constrained by financing and commercialization gaps. *Thus, decision on H₃ is accepted.* The qualitative findings illuminate the mechanisms behind the statistical models, confirming that hubs effectively build early-stage capacity, but weak commercialization pipelines, limited growth finance and fragmented policy implementation prevent many incubated startups from reaching full scale.

4.2 Discussion

This study set out to examine the incubation-to-scaling trajectory of digital entrepreneurship in Tanzania between 2015- 2025. The empirical results showing strong positive effects of hub support on early performance but constrained scale-up that is highly dependent on financing and geographic concentration align closely with both scholarly evidence and Tanzanian policy diagnostics.

4.2.1 Hubs Improve Early-Stage Capabilities, as Shown in the Literature

The finding that higher hub support scores (mentoring, technical assistance, prototyping and networking) strongly predict improved early-stage performance corroborates earlier empirical work showing that incubators materially increase founders’ capabilities and venture readiness (Mwantimwa *et al.*, 2021; Zahoro & Banele, 2024; Misso & Ismail, 2024). This result is also consistent with broader African and comparative studies that identify hubs as important capability-building intermediaries in nascent digital ecosystems (Comins & Kraemer-Mbula, 2016; Friederici, 2019; Ngene *et al.*, 2021). In short, our evidence confirms the repeated finding that incubation matters for the start of the entrepreneurial journey: hubs reduce early uncertainty, equip teams with needed digital skills, and improve prototype and market-testing readiness (Mwandosya *et al.*, 2016; Friederici, 2019; Ngene *et al.*, 2021; Zahoro & Banele, 2024; Misso & Ismail, 2024).

4.2.2 Incubation is Necessary but Not Sufficient for Scaling

Although incubation and hub services raise early-stage performance, the translation into scaling sustained revenue growth, employment creation and external investment is conditional. Our models show that financing access is a major predictor of scale-up outcomes, and that incubated firms only achieve substantially better scale performance when combined with effective follow-on finance. This mirrors studies across East Africa and middle-income contexts which find that incubation alone rarely produces high-growth firms without a financing ladder (World Bank, 202; Mutegi *et al.*, 2023; Gumbo & Moos, 2024; Flego & Tei, 2025; Kato, 2025). In the Tanzanian case, this pattern is especially visible: hubs create many investible prototypes, but the ecosystem currently lacks sufficient Series A/growth-stage capital and blended instruments to convert prototypes into scalable enterprises (World Bank, 2021; Pasape, 2022; Tanzania Startup Association, 2024).

4.2.3 Geography and Inclusion: Dar es Salaam's Dominant Role

The descriptive and robustness results confirm a strong spatial concentration of hub benefits in Dar es Salaam, consistent with mapping studies and the Tanzania Startup Association's ecosystem diagnostics (Mwantimwa *et al.*, 2021; Tanzania Startup Association, 2024; ICTC, 2024). This pattern echoes wider African evidence that hubs and VC flows cluster in capitals and leading tech cities, producing regional disparities in access to incubation services and investor networks (Friederici *et al.*, 2020; Ndlovu, 2024; Ngene *et al.*, 2021). For Tanzania, this implies that national strategies seeking inclusive digital transformation must address geographic diffusion if hubs are to contribute to broad-based industrialization rather than urban-centric growth (ICTC, 2024; Mwandosya *et al.*, 2016; Hooli *et al.*, 2024).

4.2.4 Higher Learning and Tertiary Institutions' Incubators: Capability and Commercialisation Gaps

Our analysis supports previous findings that university-linked incubators (e.g., UDICTI and similar centers) contribute to skills, prototyping and ideation (Zahoro & Banele, 2024; Misso & Ismail, 2024; Mwandosya *et al.*, 2016). Yet the persistent weak linkage between university outputs and marketable spin-outs a commercialisation bottleneck highlighted in the literature limits scaling (Pasape, 2022; Thetsane *et al.*, 2024; Hooli *et al.*, 2024). This matches regional studies that call for stronger IP, tech-transfer offices and incentives for academics to engage in commercialization if universities are to become engines of digital enterprise (De Beer *et al.*, 2016; Karuri-Sebina & Maciko, 2025; Nkontwana, 2022). In Tanzania, policy actions to reform university incentives and procurement channels could enhance the conversion of research and student projects into scalable firms (ICTC, 2024; World Bank, 2021).

4.2.5 Financing: the Critical Missing Link for Scaling

Perhaps the clearest policy-relevant finding is that financing access has the largest marginal effect on the composite scale-up index. This is in line with both empirical and policy literature indicating that the absence of patient, growth-stage capital prevents startups from scaling, even when they have strong early capabilities (Kato, 2025; Gumbo & Moos, 2025; Flego & Tei, 2025; World Bank, 2021). For Tanzania, this suggests that incubator policy must be paired with active development of a financing ladder from angel/seed networks to blended public-private growth funds and incentives for local VC formation if hubs are to fulfill their scaling promise (Tanzania Startup Association, 2024; Pasape, 2022; Kato, 2025).

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study examined how innovation hubs and incubators have shaped the emergence, early performance and scale-up of digital entrepreneurship in Tanzania between 2015 and 2025. Drawing on ecosystem mapping, enterprise-level performance analysis and scale-up outcome assessment, the study provides empirical evidence on the incubation-to-scaling relationship within Tanzania's evolving digital innovation landscape. The findings confirm that Tanzania has made substantial progress in establishing innovation hubs and incubation infrastructures over the past decade, particularly through university-linked centers and national innovation initiatives. These hubs have demonstrably strengthened early-stage digital entrepreneurship by providing mentorship, technical training, business development services and collaborative innovation spaces, consistent with prior Tanzanian and African incubation studies.

However, the transition from incubation to scalable digital enterprise remains constrained. While hub participation significantly enhances early-stage venture performance, scale-up outcomes are strongly dependent on access to follow-on financing and market integration mechanisms. This confirms persistent commercialisation and growth-financing gaps previously identified in Tanzanian innovation ecosystem assessments. Moreover, the spatial concentration of hubs and venture financing in Dar es Salaam continues to limit inclusive participation of entrepreneurs from secondary cities and rural regions.



Generally, the evidence suggests that innovation hubs and incubators in Tanzania are necessary but not sufficient instruments for digital-led industrial transformation. They effectively generate entrepreneurial capabilities and early innovation outputs, yet require complementary financing, commercialisation and demand-creation policies to unlock sustained enterprise scaling. This conclusion aligns with emerging African ecosystem research showing that incubation impacts depend on broader institutional and financial architectures. Thus, Tanzania's digital entrepreneurship agenda now faces a strategic inflection point i.e. moving beyond building hubs toward building complete innovation-to-market pipelines.

5.2 Recommendations

Based on the empirical findings and convergent literature and policy evidence, the study proposes the following policy directions to strengthen Tanzania's incubation-to-scaling ecosystem. The strong influence of financing access on scale-up outcomes indicates an urgent need for structured growth-stage funding instruments. Tanzania should establish a blended public-private innovation financing facility linked directly to certified innovation hubs. Such a facility could co-invest with angel investors, development finance institutions and emerging venture capital funds to provide seed-to-Series A capital for hub graduates. Similar instruments have proven effective in middle-income and East African ecosystems where incubation alone could not produce high-growth enterprises.

Demand-side market creation is critical for converting incubated innovations into revenue-generating enterprises. The government should institutionalize GovTech and civic-tech procurement channels allowing ministries, agencies and local governments to pilot and purchase solutions developed within innovation hubs. This would create early domestic markets for Tanzanian digital products and reduce reliance on external donors and limited private-sector demand. University-based incubators play a central role in Tanzania's innovation landscape, yet weak intellectual property frameworks, limited technology transfer offices and inadequate commercialization incentives continue to constrain spin-off formation. Universities should adopt standardized IP policies, establish professional tech-transfer units, and introduce performance incentives for academic entrepreneurship to bridge the research-to-market gap.

Currently, Tanzanian hubs vary widely in service quality, sustainability models and outcome tracking. A national accreditation and monitoring framework for entrepreneurship and innovation support organizations should be introduced to standardize service benchmarks, measure alumni outcomes and guide evidence-based funding allocation. This would professionalize hub management and strengthen accountability in public and donor investments. To address geographic concentration of hub benefits, national innovation policy should support regional satellite hubs, mobile innovation labs and virtual incubation platforms that extend services to secondary cities and rural entrepreneurs. This approach would enhance inclusive digital entrepreneurship and ensure that innovation contributes to balanced territorial development.

Declaration of Interest

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