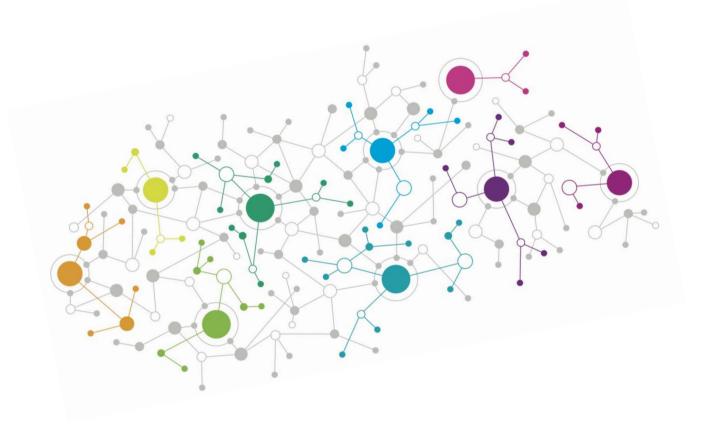# TECH ENTREPRENEURSHIP ECOSYSTEM IN GHANA

NETWORK ANALYSIS AND MAPPING OF INSTITUTIONS SUPPORTING TECH ENTREPRENEURSHIP

FOREWORD

ITC is the joint agency of the World Trade Organization and the United Nations.

This Network Analysis and Ecosystem Mapping report has been conducted under ITC's Netherlands Trust Fund V programme.

The programme's ambition is to contribute to building back better in the targeted countries with a focus on MSMEs in the digital technologies and agribusiness sectors, linking up both for synergies and business opportunities. The programme covers both sectors in Ethiopia, Ghana, Senegal, as well as a multi-country approach aimed at the digital technologies sector in Ivory Coast, Benin, Mali and Uganda. For further information on the project, please consult here NTF V (intracen.org)

The views expressed herein do not reflect the official opinion of ITC. Mention of firms, products and product brands does not imply the endorsement of ITC. This document has not been formally edited by ITC.

Limitations of the analysis

The analysis provided in this report reflects the findings of desk research and interviews.

Some institutions, currently present in the ecosystem might not be represented in this analysis given the characteristics of their mandate (e.g. not including entrepreneurship support) and the sporadic character of their interactions in the network or challenges in outreach). In addition, this report has focused only on support institutions based in Ghana[1], and some initiatives led by international development agencies. The interview questions were based on ITC's Network Analysis methodology designed specifically to understand the interactions of support institutions. Therefore, questions were less focused on the assessment of the situation of start-ups or entrepreneurs. The information gathered on the entrepreneur's perspective represents, via a focus group approach, a small subset of the ecosystem's entrepreneurs and therefore further analysis might be needed to provide a statistically significant assessment of the entrepreneur's journey. This report is a snapshot of the situation in Q1 2022 and therefore might not be representative of past or future interactions.

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[1] Institutions are either local Ghanaian entities, Ghanaian own and incorporated, or local Ghanaian branches of international ones.

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EXECUTIVE SUMMARY

With a GDP of $74.26 billion US dollars in 2021, Ghana is the **second largest economy in West-Africa**. It is an attractive country to do business in due to its continued political stability and liberal business environment. Pre-pandemic, Ghana was an extremely fast-growing economy, with a GDP growth rate of 6.5% in 2019 according to the IMF. Ghana also has the **second highest internet penetration in sub-Saharan Africa**, at 53% in 2022 (datareportal), making it particularly appealing to tech companies. The **services sector is the largest contributor to Ghana's GDP**, representing about 45%.

With Ghana's economic strength in the services sector, stability and comparatively high connectivity, it has become a **start-up-hub in Africa**. Major international companies such as Google AI and Twitter base their African headquarters in Ghana. The start-up ecosystem in Ghana has been further boosted by the introduction of start-up hubs emerging from a mix of international funding, domestic resources, and the sheer determination and enterprising initiative of Ghanaians. Today, Ghana is home to over 50 entrepreneurship-support institutions, spread over the country in different regions.

Current ecosystem

In the space of ten years, the Ghanaian start-up landscape has seen a large number of hubs emerge. What was once only found in the capital of Accra, has spread to all corners of the country, with every region having at least one hub. With an enabling environment, growing tech talent and increasing investment from international companies, the Ghana tech ecosystem raised its positioning in terms of attractiveness and visibility within (West) Africa. The combination of increased money-inflow, greater awareness and attention, and the ever-increasing success of Ghanaian entrepreneurs has helped shift the cultural and societal understandings of entrepreneurship. Where once, the only "prestigious" careers were seen as doctor, lawyer, engineer, now the title of "entrepreneur" has grown in respect, appreciation, and prestige.

Many of the **ecosystem institutions are well connected** with each other and also with the local communities they operate in. One reason being that the tech ecosystem is mostly shaped by Ghanaians. This ensures a strong local "branding" and "grounding", which positively affects ecosystem growth and content creation as local needs are catered too. In particular tech hubs outside the major cities are cited as one of the main factors counteracting rural-urban migration by providing the digital skills and knowledge base to make a living in the community.

Agritech holds high promises for both urban and rural setting in Ghana. The sub-sector is however yet underrepresented in the start-up sphere due to reasons such as land scarcity in conglomerates, little innovation along the

whole value chain, agriculture holding the image of being labour-intense and less attractive to youth etc. Still, some agribusiness companies such as AcquahMeyer, TroTroTracto, Esoko, GrowForMe andTechShelta have entered into the space, hoping to address and solve many of these issues. To support them, there are a few hubs such as Kosmos Innovation Center, Recycle Up Ghana, Tech Farm Hub and AgriCo Hub which place a strong focus on agritech. Most other tech hubs are sector agnostic or have fintech as a sector focus.

Gaps

Ghana's traditional education system does, to a large extent, still **not include business and management soft skills** in its curriculum (Berg, 2021). A few educational institutions are turning this around, such as Asheshi University. Hubs see a need to shift their programming towards these skills to support their entrepreneurs to turn their theoretical business ideas into well-functioning enterprises with efficient structures and excellent personnel.

One of the most reliable methods of bracing this inexperience against uninformed decisions and business mistakes, can be **learning first-hand from mentors and successful entrepreneurs**. Mentoring ensures that knowledge, experience, and hard-won insight transfers from one person to another through personal interaction over time. However, simply providing access to experienced entrepreneurs is often not enough. Moreover, most of entrepreneurship

support programmes currently active in Ghana are limited to local mentoring networks and programmes and **lack access to international expertise** that could help take their start-ups beyond Ghana's borders.

There are only a few hubs that focus their programming on accessing regional or international markets (see Table 1). Hubs such as Impact Hub Accra, MEST, Stanbic Bank Incubator and Société General Ghana Innov8 have partner links across the region or even outside the continent allowing for easier access for their clients. This training and exposure, for example through study trips, mentoring or peer-to-peer exchanges, is particularly necessary in the tech ecosystem. In a fast-moving environment such as the tech sector, entrepreneurs must be exposed to the latest innovation trends, ensuring a good product-market fit.

A certain **misalignment is apparent between entrepreneurs seeking funding, and investors looking for investment opportunities**. Interviews confirmed that private sector funding (from abroad) is available, however, the level of examination for due diligence required by international funders to make an assessment requires often more than Ghanaian start-ups can provide. Overcoming these gaps, should become an integral part of the tech hubs' services, as without proven business models and clean financial records, entrepreneurs will continue to struggle to access finance.

Overlaps

In Ghana, the nature of funding in the ecosystem leads to **significant overlaps and repetitions in programming and lack of diversification in the services being offered**. International donors often provide funding to government entities and ecosystem institutions (such as hubs) simultaneously. While this linkage might suggest a level of integration or cooperation, there is often no intersection and alignment between the agendas. This, in turn, leads to multiple programmes happening at the same time, often with the same hubs. If the efforts of funding organizations were coordinated or aligned, efforts could see programmes covering a wider area, or complimenting one another rather than overlapping and competing.

A consequence of this lack of differentiation and coordination in funding opportunities leads to a **focus on early-stage start-ups** (see Figure 1). Funding for hubs is often provided based on quantity of services provided (e.g. number of people trained), rather than on metrices better suited to evaluate the quality of the services provided (e.g. number of jobs created). Thus, hubs primarily focus on early-stage start-ups, where they can access a larger number of beneficiaries, and deliver more entry-level trainings and services to larger numbers of entrepreneurs. While early-stage services are essential in a thriving ecosystem, the over-focus at the expense of later-stage support often leaves start-ups isolated, right as they are attempting to scale their businesses.

International funding is also often channelled from larger/ more established hubs to smaller / newer ones. Through the engagement of larger hubs, donors are indirectly enabled to reach smaller and more remote hubs that might otherwise have difficulties in accessing international funding. While this allows for wider reach as it provides many smaller hubs with necessary financial means, this is often accompanied by a transfer of programming. This often results in many hubs providing similar programmes and less variety rather than developing a specialized focus or niche of their own.

Due to the overlaps in programming, often the same start-ups join multiple hubs for almost identical programmes. These range from pitching competitions to incubation and acceleration. It is often impossible for a hub to know if these so-called "**programme-hoppers**" **and** "**pitchpreneurs**" **have participated in similar programme**s with other hubs and are therefore "allowed" to participate. This takes up a slot for someone who might be exposed to the knowledge for the first time.

Recommended next steps for the ecosystem

The creation and launch of **a digital entrepreneurship hub** could potentially address many of the challenges highlighted in this report. In addition to **providing a database of existing tech start-ups, active hubs, and support-services available** in the network, such a platform could host a "**programme passport**" to keep track of the progress of entrepreneurs and avoid programme hoppers attending similar training topics repeatedly. The **database of start-ups and hubs** could also provide a major advantage to networking efforts from both sides.

There are a limited number of hubs such as Kosmos Innovation Center, Recycle Up Ghana, Tech Farm Hub and AgriCo Hub which place a strong focus on agritech. **Adding technology to activities along the agricultural value chain holds large economic potentials**, thus one needs to increase the focus on agritech and related support services as well as raise awareness of the opportunities and attractiveness of the sector. Hubs could engage media to showcase successful agritech ventures and promote their programming, for example through hosting specific agritech challenges as done by KIC.

To **increase entrepreneurs' satisfaction and programme specialization,** an **institutionalized pre-programme assessment** could be implemented. This would provide hubs with a more nuanced understanding of specific start-ups' needs, and offer targeted, impactful services designed specifically to address those points. A pre-programme diagnostic could also help hubs uncover challenges facing start-ups that the entrepreneurs themselves are unable or unwilling identify and respond accordingly.

Currently, Ghanaian **hubs rely on external funding to maintain their operations.** Several mechanisms were considered to help hubs supplement their revenue. Hubs could **offer paid business clinics or other specialized services** which would be more tailored and customized to a specific start-up's needs, in exchange for a fee. Other potential models include **hubs taking an equity stake** in their beneficiaries or agreeing to a **revenue-share model**. These latter examples would also incentivise hubs to **maintain after-programme support**, to ensure their beneficiaries continue their success into the growth-stage.

It is also recommended for hubs to **offer more mentoring services, connecting entrepreneurs to their successful peers**. Mentors provide critical support and guidance in navigating pivotal moments of achieving business success. In order for hubs to foster successful mentoring relationships, it is important for them to recruit a wide range of (international) mentors with good industry knowledge. The relationship building, exchange and management should then follow clear guidelines and predefined milestones mixing self-reflection, one-on-one discussions and networking events.

Gap/ Overlap	Recommendation	Summary
Lack of comprehensive information on available programmes, proliferation of repeated participants	Online platform for entrepreneurs	Creation and launch of digital entrepreneurship hub to provide a database of existing start-ups, active hubs, and support-services available in the network.
Overlaps in programming and resource scarcity, especially in more remote regions	Collaboration and synergies inside and outside the local region	Focus on synergies within their programming and increase the specialization, particularly in same regions. Tech hubs should endeavour to take part with their participants in country-wide events.
Limited variety and specialization of programmes and over reliance on early-stage programming	Pre-programme assessment for individualized programming	Implementation of institutionalized pre-programme assessment to provide hubs with a detailed understanding of specific start-ups' needs, and offer targeted, impactful services. Hubs could adapt part of their programme depending on participants needs.
Sole focus on entrepreneurship, which challenges participants without prior experience	Programming for employability basis & stronger team formation	Hubs could provide two-track programmes which also focus on employability. To enable start-up ideas to successfully move towards the growth stage, it could also be interesting to explore a combination of idea and team consolidation.
Overreliance on external funding leading to a lack of financial independence and sustainability of hubs	Sustainability of funding for hubs	Many opportunities exist to facilitate resource mobilisation. Hubs could offer paid business clinics or other specialized services. Hubs could also charge start-ups a small "commitment" fee when initiating a programme. Hubs could also ask their successful alumni to contribute a flexible or fixed percentage of their future profit.
Significant gap between type of funds available and funds needed by entrepreneurs.	Increasing funding opportunities for entrepreneurs	Engage the influential diaspora. Hubs could establish networks with financial service providers to refer promising start-ups. The engagement of investors and exploring other funding sources should also form part of the curriculum and might lead to collaboration with local banks.
Lack of mentoring and coaching services	Mentoring for entrepreneurs & private sector linkages	Increase the availability of mentoring programmes and networking. The private sector linkages formed could also be used by hubs as a second avenue to receive specific expertise.
New hubs enter the ecosystem with a lack of experience as well as missing standardization and impact measurement	Hub exchange and quality assurance	Established hubs serve as valuable guidance smaller, younger hubs. Hubs-to-hubs coaching and regular knowledge exchanges could be intensified to ensure that hub managers have awareness on how to set up a well-functioning organisational culture and structure. Implementation of a standardized approach for the measurement of capacity building.
Little focus in the areas of export and internationalisation	Internationalisation knowledge building	Hubs focusing on accessing regional or international markets to expose entrepreneurs to latest innovation trends and expand customer base.
Lack of sufficient services to boost entrepreneurs essential soft-skills, and high-quality IT skills	Pairing technical skill with soft skill training, & better training on high quality IT skills	Use holistic training programmes to compliment the hard skills taught in programmes. Implement programmes which place a high emphasis on "getting work done" and continuously work on improving the idea or venture. Focus on hands-on high quality IT skills to increase employability.
Low media exposure for start-ups, and low awareness by potential investors of promising ventures	Importance of Awareness Creation	Media engagement needs to continue with both the mainstream media and specialized media agencies, e.g. through the setup a wide-ranging visibility campaign. The more media exposure, the more start-ups gain traction from users, investors and other partners in the ecosystem.
Disconnect between the world of start-ups, tech and entrepreneurship, and agriculture	Increasing focus on agritech	Increase the number of hubs focusing on agritech and the awareness of the opportunities and attractiveness of the sector. In addition, donors could provide dedicated funding opportunities to increase the visibility, too.

1. INTRODUCTION

There is a positive feedback loop among innovation, entrepreneurship, and economic development. New and growing businesses represent the primary sources of job creation and innovative activity in an economy, two factors that generally result in improved standards of living for all. New technologies and digital transformation in particular have the potential to support private sector development and employment growth. As such, tech entrepreneurship plays a key role in driving the economic growth of a country. Linking traditional industries with the tech sector creates new opportunities for innovation, enhanced productivity, business growth and job creation.

However, it is important to understand that the potential impact of tech entrepreneurship and innovation depends on their level of accessibility. For entrepreneurs to bring new ideas to life, they need access to education and a level playing field on which to compete. In this regard, the role of support institutions is to create conditions that allow more entrepreneurs to start businesses by building skills, getting access to finance as well as to international markets and networks, so that businesses can grow. Economic growth suffers when entrepreneurial activity is unevenly spread across socio-economical, demographic, and/or geographic dimensions. Under the right conditions, entrepreneurs have an incredible power: they help regional areas prosper economically, and they serve society through engineering

innovative solutions to problems and challenges.

With a GDP of $74.26 billion US dollars in 2021, Ghana is the second largest economy in West-Africa. It is an attractive country to do business in due to its continued political stability and liberal business environment. It was the first country in Sub Saharan Africa to gain independence and has since maintained its position as a beacon of stable leadership. Pre-pandemic, it was also an extremely fast-growing economy, with a GDP growth rate of 6.5% in 2019 according to the IMF. This rate fell to 0.4% in 2020 but has risen to almost 5.4% in 2021. Ghana is very resource rich and has had a long history in the mining and exportation of a diverse range of resources including gold (of which it is the largest producer in Africa), hydrocarbons, diamonds and bauxite. The services sector is the largest contributor to Ghana's GDP, in 2020, the share of agriculture in Ghana's gross domestic product was 19%, industry contributed approximately 30% and the services sector contributed about 45% (O'Neill, 2022).

Within the services sector, the steadily growing Information and Communication Technology (ICT) contributes around 4% to Ghana's GDP. Within this sector, telecommunication services account for 45% of the ICT employment and most of the value addition. Computer programming, IT consultancy, and related activities employ

13% of the country's workforce. The demand for digital technologies skills is predicted to rise to about 9 million people by 2030. Around 4 million people currently working would need to upscale or build new digital skills. (worldbank.org)

Ghana has the second highest internet penetration in sub-Saharan Africa, at 53% in 2022 (DataReportal 2022). This also means that half of the country is not yet connected. Therefore, the National Information Technology Agency (NITA) is pushing for connectivity in rural areas, where usage is lagging. This will also support in driving the digitalization of the agricultural sector.

With Ghana's economic strength in the services sector, stability and comparatively high connectivity, it has become a start-up-hub in Africa. Major international companies such as Google AI and Twitter base their African headquarters in Ghana. The start-up ecosystem in Ghana has been further boosted by the introduction of start-up hubs funded by corporate organizations such as the Meltwater School of Entrepreneurship and Technology, Kosmos Energy, Stanbic Bank and Société General. Other hubs have emerged with international development funding from organizations such as the World Bank, including Ghana Innovation Hub, Ghana Tech Lab and Ghana Climate Change

Innovation Centre. Today, Ghana is home to over 50 entrepreneurship-support institutions, spread all over the country in every region.

To support Ghana's efforts in improving entrepreneurship and creating an environment in which start-ups and MSMEs can thrive, this report provides an analysis of Ghana's entrepreneurship ecosystem with a specific focus on the interactions between ecosystem actors, and the overlaps and gaps in services supporting entrepreneurs. This analysis is presented in three perspectives:

Perspective 1: Service mapping and gap analysis. Key findings regarding the services offered in the ecosystem based on the interviews conducted with relevant local institutions.

Perspective 2: Network analysis. Assessment of how the institutions within the entrepreneurship ecosystem in Ghana interact using network analysis techniques (cambridge-intelligence.com).

Perspective 3: User experience analysis. Insights from tech entrepreneurs in terms of navigating the entrepreneurship ecosystem.

Finally, the report provides key recommendations for the improvement of the Ghanian tech ecosystem, particularly for institutions.

2. METHODOLOGY

Defining entrepreneurship

This report applies the definition of entrepreneur as a risk taker who embraces uncertainty and innovation constructed as a category within economic theory by the economist Cantillon (de Vries, 1997). Recognizing entrepreneurship as such acknowledges the fact that innovation and entrepreneurship help drive viable and thriving economies and focuses on those individuals that could be considered as 'opportunity entrepreneurs', as someone who sees a gap in the market/a perceived business opportunity whereas 'necessity entrepreneur' is described as someone who starts a business because other work options are absent or unsatisfactory.

Literature recognises that entrepreneurs' experiences differ depending on ethnicity, age, gender, and education levels and business stage. Literature also indicates that there are cultural elements – based on values and worldviews – that may influence what motivates an entrepreneur, and how they define success or failure. Recognising this can affect how governments plan to support and encourage entrepreneurial activity (Mika, Warren, Foley and Palmer, 2018).

Defining entrepreneurship support ecosystems

In the context of this report, an entrepreneurship support ecosystem is a collaborative arrangement through which institutions that support entrepreneurs combine their resources, capabilities, and products to offer a coherent, entrepreneur-oriented solution. When they work, ecosystems allow institutions to create value that no single one of them could create alone. In an ideal world, these economic ecosystems, like biological ones, are self-organizing and deeply co-dependent.

Defining the stages of business growth

Idea Stage: The business idea requires testing and research is conducted to determine whether it is worth pursuing.

Start-up Stage: The business entity is established legally and the focus lies on developing the products/services, adjusting the business model and understanding the customer's expectations.

Early Stage: The business is generating revenue and adding new customers, with a focus on reaching breakeven cash flow and further fine-tuning the business model.

Later Stage: The business has demonstrated viability, with a well-known product/service and strong market presence.

Growth Stage: The business is thriving and established in the industry and focuses on expansion, particularly into new markets.

Mature Stage: The business is on top of its industry, often with two choices, either push for further expansion or exit the business

ITC's Network Analysis methodology

ITC's Network Analysis methodology aims to capture interactions, trends and patterns in collaborations among institutions. The results presented in this section are based on three pillars of analysis:

Desk research
Preliminary research to understand the landscape of institutions in the country and their offerings. Research on specific studies and reports in the field of entrepreneurship support in the country. Research to validate findings.

Entrepreneurship support institutions
Personal interviews to understand the role of the institution in the ecosystem, its contributions, perspectives and specific collaborations within the network.

Entrepreneurs
Personal interviews to validate the institution's offering and to understand the entrepreneur's journey in the ecosystem.

3. ECOSYSTEM MAPPING

Ghana's tech entrepreneurship support ecosystem

When the Meltwater Entrepreneurial School of Technology (MEST) was founded in 2008, the Ghanaian tech ecosystem was in its infancy. Through the concerted efforts of several founding entrepreneurs, driven by their own needs for space and community to foster their ventures, started creating hubs across the country. The first wave of hubs were social enterprises that served multiple purposes: from training centres, co-working spaces and central points for entrepreneurs to meet. Additionally, for hubs outside of Accra, the proliferation of hubs provided a means to curb urban migration. The Ghana start-up ecosystem has taken great strides forwards and is now considered one of the most active and vibrant ecosystems.

Government has a significant part to play in any entrepreneurship-support ecosystem, and Ghana is no different. The Ghanaian government's ability to provide general safety in the country, on top of political stability, economic growth and a major focus on providing education to all, have made Ghana an entrepreneurship destination of choice. RMB's "Where to Invest in Africa 2021" ranks Ghana in sixth place last year across the continent and first place in West Africa. (RMB, 2021). The country offers the most favourable business environment in the region, its attractiveness is particularly high in terms of starting a business (Dokua Sasu, 2021). Still there is room for improvement particularly with regard to a burdensome business registration and formation process, and comparatively high taxes for those entrepreneurs that are not eligible for a five-year tax break.

The so called 'no and low tax incentives' was introduced in 2018 as a support measure to reduce the unemployment rate of especially young graduates. Entrepreneurs exempt from tax for five years are those with businesses in manufacturing, information and communications technology, agro processing, energy production, waste processing, tourism and creative arts, horticulture and medicinal plants. After those first five years, the young entrepreneurs benefit from reduced taxes based on the location of their business.

Government policy has been instrumental, not only in creating the environment but also in actively pursuing private-public partnerships to boost the entrepreneurial activity in the country. From 2017 and 2018 on, the country saw huge shifts in the start-up landscape with the government launching the National Entrepreneurship and Innovation Plan programme (NEIP) and the World Bank, in partnership with the Ministry of Communication, creating the Accra Digital Centre. This centre hosts the Ghana Innovation Hub and the Ghana Tech Lab. TechCabal referred to the Digital Centre as Ghana's Silicon Valley (Adeyemi, 2022). The

Government has also created agencies like the National Entrepreneurship and Innovation Plan that have run programmes and trainings across the country. In addition, initiatives such as YouStart enable entrepreneurs to gain access to capital. Multiple government Ministries have sections in their remit that focus entrepreneurship and innovation such as the Ministry of Environment, Science, Technology and Innovation (MESTI), which is pursing innovation exchanges with South Korea, Ministry of communication that has a focus on the digital economy and Ministry of Trade and Industry.

Non-government organizations also play a major role in the strength of Ghana's entrepreneurship-support ecosystem. The Meltwater Entrepreneurial School of Technology is an Africa-wide technology entrepreneur training programme, seed fund, and incubator was founded in Ghana first before expanding to Nigeria, Kenya and South Africa. Asheshi University, founded in 2002, grew into one of the leading universities in West Africa and has launched its own incubator. The university offers higher-quality education in technology paired with strong entrepreneurial thinking, particularly when compared with other educational institutions in Ghana.

The success of Ghana's efforts to cultivate a thriving tech and start-up ecosystem has been seen in recent years with the arrival of major international tech companies. Google AI first settled in Ghana, and the most significant success of late is Twitter selecting Ghana as its African HQ. The choices of these global tech giants demonstrate Ghana's pulling power to lure large tech companies to choose it over the other 53 African nations (Ndukwe, 2021).

In the space of ten years, the Ghanaian start-up scene has seen a large number of (tech) hubs emerge. What was once only found in the capital of Accra has spread to all corners of the country, with every region having at least one hub. A hub plays various roles in the life of a start-up and in cities and towns outside of Accra, their significance goes beyond just developing talent. Hubs in local communities serve to up-skill talent for the local job market and serving as an official youth centre in the absence of alternatives. In the words of several hub founders, these services are crucial in "curbing the brain drain" out of the area.

Many of the ecosystem institutions are well connected with each other and also with the local communities they operate in. One reason being that the tech ecosystem is mostly shaped by Ghanaians. This ensures a strong local "branding" and "grounding", which positively affects ecosystem growth and content creation as local needs are catered too in a targeted manner. In particular, tech hubs outside the major cities were cited as one of the main factors counteracting rural-urban migration by providing the digital skills and knowledge base to make a living in the community. In addition, hubs are aiming to provide the

necessary digital savviness and technical infrastructure as well as space for events and meetings, thereby opening an additional platform for the exchange of ideas, networking and connection.

With an enabling environment, growing tech talent and increasing investment from international companies, the Ghana tech ecosystem raised its positioning in terms of attractiveness and visibility within (West) Africa. The "more established" hubs have often adopted a coaching and capacity building approach with regard to knowledge transfer, sharing of programmatic approaches and setting up institutional structured.

The combination of increased money-inflow, greater awareness and attention, and the increasing success of Ghanaian entrepreneurs has helped shift the cultural and societal understandings of entrepreneurship. Where once, the only "prestigious" careers were seen as doctor, lawyer, engineer, now the title of "entrepreneur" has grown in respect, appreciation, and prestige.

With increasing media coverage of entrepreneurial success in the region, more ecosystem players have continued entering the space including ecosystem support organizations such as tech focused news agencies and specialized training services. With that, "becoming a hub manager" has increasingly become en vogue. The cultural popularity of the job seems to be due to a mix of increased funding/ income opportunities

as well as the "cult" around outstanding hub managers who serve as role model for others.

Agritech in Ghana

According to the United Nations Food and Agriculture Organization (FAO), about 52% of the Ghanaian labour force is engaged in agriculture, with women making up close to 40% of that figure. Agriculture in Ghana contributes to almost 20% of Ghana's GDP, 40% of export earnings are derived from its exports. With agriculture predominantly being done by smallholder, traditional and rain-fed farmers, there is a lot of improvement that technology can bring. Specifically, for agritech, there are myriad opportunities along the entire value chain.

Agritech holds high promises for both urban and rural setting. In urban agriculture, innovation is needed to make profits within limited space, whereas in rural areas large plots of land allow for experimentation. Various companies have entered into the space hoping to address and solve many of these issues.They range from companies like AcquahMeyer who use drones to provide crop pest and disease management, to TroTroTractor offering mechanised farming services in the form of a platform that connects farmers and tractor operators. Companies such as Esoko provide market information for farmers to make the most informed decisions, while GrowForMe commodifies owning a farm as a service. Enterprises like TechShelta provide greenhouse farming and develop and share best practises.

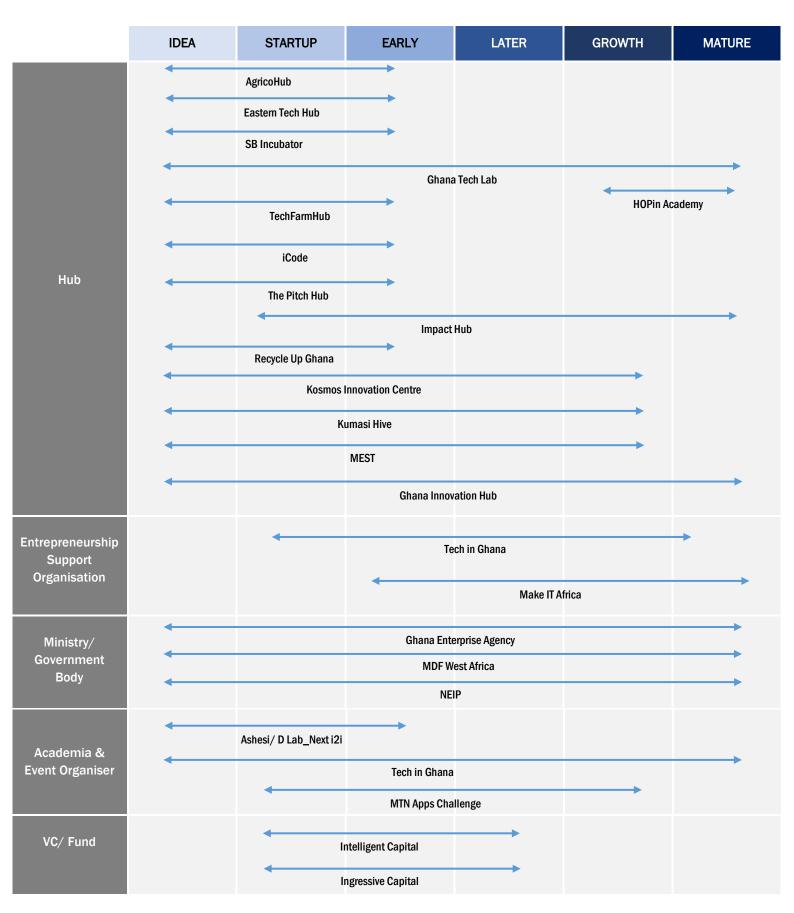|	IDEA	STARTUP	EARLY	LATER	GROWTH	MATURE
Hub						
	AgricoHub					
	Eastern Tech Hub					
	SB Incubator					
	Ghana Tech Lab					
	HOPin Academy					
	TechFarmHub					
	iCode					
	The Pitch Hub					
	Impact Hub					
	Recycle Up Ghana					
	Kosmos Innovation Centre					
	Kumasi Hive					
	MEST					
	Ghana Innovation Hub					
Entrepreneurship Support Organisation						
	Tech in Ghana					
	Make IT Africa					
Ministry/ Government Body						
	Ghana Enterprise Agency					
	MDF West Africa					
	NEIP					
Academia & Event Organiser						
	Ashesi/ D Lab_Next i2i					
	Tech in Ghana					
	MTN Apps Challenge					
VC/ Fund						
	Intelligent Capital					
	Ingressive Capital					

Figure 1: Tech ecosystem actors by category and business stage, Source: Interviews with institutions

Institutions	Business Training	Mentor-ing	Technical Training (STEM)	Soft Skill Training	Co-working	Funding	Proto-typing	Entrepreneurship Events/ Talks	Market Information	Investor Linkages	Business Support (e.g. Legal, HR)	Trade Fairs/ B2B
Agrico Hub	✓	✓		✓	✓			✓				
Ashesi/ D Lab_Next i2i	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
Eastern Tech Hub	✓	✓	✓	✓	✓			✓				
Founder Institute	✓	✓		✓	✓			✓				
Ghana Enterprise Agency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ghana Innovation Hub	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Ghana Tech Lab	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HOPin Academy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
iCode												
Impact Hub	✓		✓	✓	✓	✓	✓	✓	✓	✓		
Intelligent Capital	✓	✓						✓		✓		
Kosmos Innovation Centre	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
Kumasi Hive	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Make IT in Africa	✓	✓		✓		✓		✓	✓	✓	✓	✓
MDF West Africa	✓	✓		✓			✓	✓		✓		
MEST	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SB Incubator	✓	✓		✓	✓			✓	✓	✓	✓	
Recycle Up Ghana	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
Tech in Ghana	✓	✓	✓	✓				✓	✓	✓	✓	✓
TechFarm Hub	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
The Pitch Hub	✓	✓		✓				✓				

Table 1: List of services by institutions in the tech ecosystem, Source: Feedback questionnaires received after interviews with Institutions

IDENTIFIED GAPS

Programming to bridge the digital divide

While statistics for mobile internet penetration show Ghana to be close to 70%, this penetration does often not equally extend to rural areas, particularly when it comes to fast / fibre connectivity needed for tech-business related activities (GSMA, 2018). Another hurdle is the comparatively high cost of internet connectivity. While penetration is remarkably high, the cost of that service is often prohibitive, especially for early-stage start-ups (GhanaWeb, 2021). IT infrastructure, such as internet connectivity, equipment, space and networks, is the foundation of viable tech entrepreneurship. Bridging disparity in infrastructure, particularly in more remote areas where tech entrepreneurs are often present, is critical for cultivating a thriving sector.

The digital divide also affects the services that hubs are able to offer to entrepreneurs. Whereas hubs based in large cities can provide more targeted, later-stage support to start-ups in reaching growth and even mature stages, the ones in more remote areas still focus on providing basic technical literacy skills for digital inclusion (see Table 1). Without technologically savvy expert personnel or mentors available through local hubs, it can be challenging to help start-ups reach beyond the prototyping stage and break through to the next stage of growth. Often, these start-ups are forced to migrate to larger cities to find adequate support structures, contradicting the original objectives of many hub founders to reduce rural-urban migration.

Programming for soft skills and increased mentoring offering

Ghana's traditional education system does, to a large extent, still not include business and management soft skills in its curriculum (Berg, 2021). A few educational institutions are turning this around, such as Asheshi University. Hubs see a need to shift their programming towards these skills to support their entrepreneurs to turn their theoretical business ideas into well-functioning enterprises with efficient structures and excellent personnel.

Often, recent university graduates start down the entrepreneurship path without having much previous industry experience. One of the most reliable methods of bracing this inexperience against uninformed decisions and business mistakes, is learning first-hand from mentors and successful entrepreneurs. Mentoring ensures that knowledge, experience, and hard-won insight transfers from one person to another through personal interaction. Practical advice from experienced entrepreneurs or industry experts can have a direct, positive impact on the start-up growth.

Several mentoring programmes are currently offered by Ghanaian entrepreneurship support institutions. However, simply providing access to experienced entrepreneurs is often not enough. Indeed, the success of mentoring programmes

depends largely on the effectiveness of the relationship between mentor and mentee. Their capacity to work successfully together, learn from each other with humility, and appropriately leverage the talents of both parties is critical to a successful mentorship relationship. Moreover, most of entrepreneurship support programmes currently active in Ghana are limited to local mentoring networks and programmes and lack access to international expertise that could help take their start-ups beyond Ghana's borders.

Support investment readiness

There seems to be a misalignment between entrepreneurs seeking funding, and investors looking for investment opportunities. Interviews confirmed that private sector funding (from abroad) is available. However, the ticket sizes that start-ups are often asking for, to mature past ideation and MVP stages do not align with the large investment amount sought for by investors, latest tech investments in Ghana had an average ticket size of nearly $7 million US (Partech, 2021). Thus, Ghanaian start-ups often find (international) funders out of reach or prohibitively costly to go through the due diligence process as the level of examination for due diligence required by funders to make a thorough investment analysis is often more than Ghanaian start-ups can provide (and afford). Often, basics such as business registration but also more advanced technical documentation as audited financial statements and governance structures

aligning with investor interests are missing. Overcoming these gaps should become an integral part of hubs' services as without proven business models and financial records, entrepreneurs will struggle to access finance.

In addition to these more technical factors, entrepreneurs often do not possess the necessary soft skills to link up and negotiate with investors. This can be further complicated by a lack of awareness of common practices in early-stage investment. For example, entrepreneurs were quoted as not being open or ready to give up stakes of their enterprise, viewing the loss of equity and exclusive ownership as an unreasonable expectation in exchange for funding.

Provide business advisory services

Linked to the above is the concern that hubs provide comprehensive entrepreneurship programmes but are sometimes lacking in specific business support and/ or advisory schemes, particularly for legal and financial matters (see Table 1). Once a programme is finished, regular follow-ups and individual support, for example through coaching by hubs or dedicated business development personnel, are not always in place or available. To navigate the jungle of certification, registration and legislation, guidance is needed. Business advisory services can be offered starting from business formalization and registration to compliance with certain trademarks and intellectual property protections as these can be difficult for early entrepreneurs while they

are needed during start-ups' initial growth stages to ensure business structures and fundamentals are laid out correctly. This early stage, however, is precisely when their enterprises can least afford the extra expense of such experts.

Increase regional and international exposure

There are only a few hubs that focus their programming on accessing regional or international markets. Hubs such as Impact Hub Accra, MEST, Stanbic Bank Incubator and SG Innov8 have partner links across the region, allowing for easier access for their clients. However, this access does not always translate into a good quality offering of internationalisation training. This training and exposure, for example through study trips, mentoring or peer-to-peer exchanges, is particularly necessary in the tech ecosystem. In a fast-moving environment, entrepreneurs must be exposed to latest innovation trends, ensuring a good product-market fit. It is also critical for entrepreneurs to understand the nuances and differences of foreign markets that may be quite different from their own, even within the same region.

Missing linkages between different ecosystem players

In Ghana, international donors often provide funding to government entities and ecosystem institutions simultaneously. While this linkage might suggest a level of integration or cooperation, there is often little intersection and alignment between the agendas. While donor agencies have a similar mission in using funds to provide training and entrepreneurship support in the country, there tends to be little interaction and planning between the donor agencies. This, in turn, leads to multiple programmes happening at the same time, often with the same hubs. If the efforts of funding organizations were coordinated or aligned, efforts could see programmes covering a wider area, or complimenting one another rather than overlapping and competing.

Furthermore, universities operate independently from market needs and private sector demand. As a result, hubs have oriented their programming around taking the raw technical skills developed in university and complementing them with the entrepreneurial and business management skills that are not yet included as a part of standard university curriculum. Consequently, hubs are seen as a required extension of traditional education, necessary to succeed in the entrepreneurial market.

One of the clearest examples of this disconnect between available education and business needs, is the highly competitive market for experienced labour in the tech sector. For start-ups as well as larger companies, it is a challenge to attract experienced, highly skilled IT candidates with good soft skills. If/ when businesses are able to find and hire these people, the next challenge is to retain them. The most experienced IT professionals either go abroad to pursue greater opportunity or job-hop frequently as they receive better offers

elsewhere. Despite this lack of technically skilled workers with real job experience, neither universities nor hubs seem to focus on providing hands-on skills through internships or work-experience, perpetuating this scarcity of experience at the expense of Ghanaian businesses.

IDENTIFIED OVERLAPS

Client selection

In the interviews, several hubs mentioned that often the same start-ups joining them for a programme also enrol in similar programmes at other hubs. This ranges from pitching competitions to incubation and acceleration. It is often impossible for a hub to know if these so-called "programme-hoppers" and "pitchpreneurs" have participated in similar programmes at other hubs. This takes up a slot for someone who might be exposed to the knowledge for the first time. A platform to have the full record of start-ups as they engage with the ecosystem (such as "Start-up Passport" in which they get 'stamps' from the programmes they attend) would enable the next hub to have information to make informed decisions about programme participation.

Focus on start-up and early-stage businesses

While Ghana's tech ecosystem is considered to be amongst the most advanced in West Africa, most of Ghana's hubs still focus on providing start-up and early-stage programming (see Figure 1). Heavy focus is placed on the early stage with a focus on trying to get entrepreneurs, especially the youth, into the entrepreneurship ecosystem.

Moreover, as there is a funding gap to further scale-up businesses past initial stages, it becomes less attractive for hubs to focus on this segment. This challenge is further exacerbated as funding for hubs is often provided based quantity of services provided (such as the number of people trained), rather than on metrices better suited to evaluate the quality of the services provided, such as number of jobs created or the number of businesses surviving in the long-term. Thus, hubs are not encouraged to follow-up on the progress of their participants after programmes end and are incentivised to provide more superficial support to as many entrepreneurs as possible.

Channelling of institutional funding and duplication of programming

International funding often seems to be channelled from larger/ more established hubs to smaller/ newer ones. While this provides many smaller hubs with necessary financial means, some hubs are more visible than others which increases competition between hubs. This competition often leads hub managers to work in siloes when pursuing funding, preferring isolation to potential competition. Furthermore, this channelling of funding from one hub to another is often accompanied by a transfer of programming. This results in many hubs providing similar programmes and less variety rather than developing a specialized focus or niche of their own, which result as in a lack of diverse offering to start-ups at different stages with different needs.

4. NETWORK ANALYSIS

The following section summarizes the findings of the network analysis as well as the conclusions drawn about the community within the Ghanian tech entrepreneurial ecosystem. The analysis provides insights on density, betweenness centrality and three types of network connections: information sharing, funding and, service provision collaborations. To represent and visually capture the interactions and linkages among the interviewed institutions, this section of the report provides qualitative and quantitative insights supported by a network analysis software. The section provides answers to two key questions:

1. *What are the main connections in the network?* The analysis explores how the landscape of institutions interact with each other, which are the most connected institutions, with who are they connecting and why are they connecting. The aim of this analysis is to understand what stimulates collaboration or what might be preventing it and therefore, what can be done to continue strengthening the ecosystem.

2. *What are the different types of connections?* To respond to this question, the network analysis focuses on three key factors of collaboration: information, funding collaborations and service delivery. In the case of information exchanges, the analysis looks into aspects such as sharing of database of entrepreneurs, events information or market intelligence. Regarding financial exchanges, the analysis focuses on the exchanges of funds between institutions. This would be the case of institutions providing financial support for events to other institutions or logistics support. Finally, service delivery collaboration involves support for trainings, such as training material and training staff and collaboration for the organization of events and competitions.

ECOSYSTEM NETWORK ANALYSIS

The information on the next page summarizes key features of the network:

INSTITUTIONS CONNECTING IN THE NETWORK	
35 Hub **7** ESO **5** Event Organizer **4** Ministry/ Government Body **4** VC / Fund **4** Academia **3** Media	Overall, the network analysis took into consideration 62 institutions which were classified along seven different categories. The twenty-three institutions interviewed (see Annex I) were a sub-set of this larger set of institutions actively supporting the Ghanian tech ecosystem. The ecosystem supporting tech entrepreneurs is mostly focused on hubs (35) providing a wide range of training and services, particularly to start-ups in their early life-cycle stages. Most of these hubs offer varieties of incubation programmes, some also provide acceleration programmes. Entrepreneurship Support Organisations (ESOs) (7) are facilitating access to networks, training and investment opportunities. The network analysis also recognizes event organisers (5) and media companies (3) providing visibility and connections to tech entrepreneurs. Government bodies and agencies (5) which are focused on youth development, entrepreneurship and business development, have a presence in the network, too. There is only a limited number of institutions (4) providing specific funding opportunities to entrepreneurs. The scarcity of these important players in the ecosystem represents one of the main challenge faced by Ghanian entrepreneurs. There are four (4) academic institutions offering dedicated entrepreneurship programmes, mostly on incubation.
CONNECTIONS IN THE NETWORK	
− 368 Sharing/ exchanging of information with − 269 Service delivery/ collaboration − 104 Provide funding to/ from	Connections on information sharing are most common among ecosystem actors (368). There is also a significant amount of collaboration on service delivery (269) while funding connections are less well developed (104).

Network density

Measured using the ties between actors, which represent interactions within the ecosystem, the study establishes that connections within the ecosystem are not at their full potential. The density of the Ghanian network, which describes the portion of the potential connections in the network that are actual connections, is relatively low. Comparing the number of actual connections to the number of potential connections, Ghana remains at a lower end, scoring 0.4 (`1` being the highest possible density number, and `0` the lowest). This figure can serve as a baseline for the ecosystem to increase connections. In this case, this would manifest as more connections between already-established actors. Specific connections are examined later in this section.

Ghana's tech ecosystem – Network density:

0 — No network

0.4

1 — Network connected to full potential

Institutional Centrality

Institution nodes are ranked according to betweenness centrality. This type of centrality measures how many times a node (institution) acts as a gateway in the network. The higher the betweenness centrality of an institution, the more paths run through that entity to connect two other actors. When an institution has a high betweenness centrality, and therefore a bigger node size in the map, it means that a node is a key bridge or facilitator between different actors. Institutions with high betweenness may have considerable influence within the network by virtue of their control over information flows. They are also the ones whose removal from the network will most disrupt communications between other institutions. This report has also evaluated degree centrality, defined as the number of links upon a node (i.e., the number of ties that a node has). This indicates which institutions have built the largest networks for themselves but does not provide insights on their work as ecosystem builders.

Figure 2 shows the overall network of institutions supporting entrepreneurs in Ghana. The size of the nodes (institutions) corresponds to their betweenness centrality score (the larger the node, the higher the betweenness centrality).
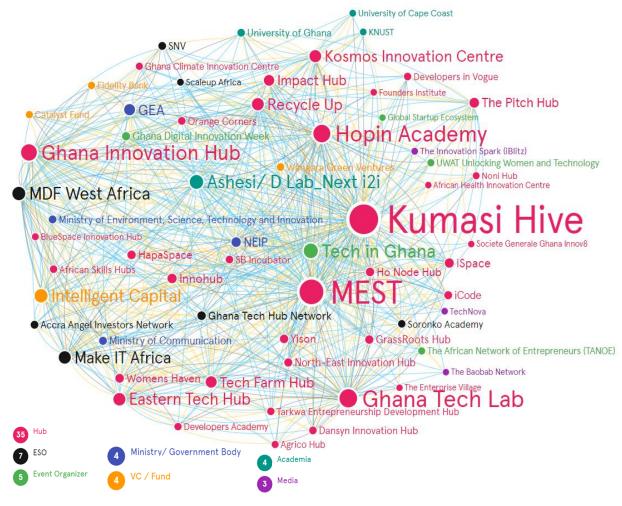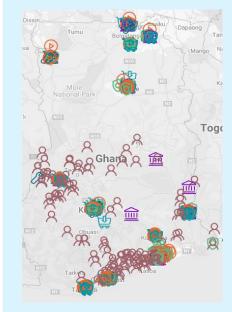

Figure 2: Ghana's Tech Ecosystem Network

Connections concentrated around the three main city hubs

Most institutions supporting tech entrepreneurs in Ghana are located in the large cities of Accra, Kumasi and Tamale, and have limited potential to reach entrepreneurs in other regions of the country. As pointed out previously, this results in a significant service delivery gap where hubs in more remote areas focus on providing basic technical literacy skills and can rarely support start-ups in the growth stages. If connectivity were available, the more "advanced" offerings of large city hubs could be extended to more rural communities through collaboration with local hubs.

The Ghana Start-up Ecosystem portal

To inform the ecosystem about available support and infrastructure, available markets as well as existing policies and regulations, Ghana Tech Lab has created a platform to capture institutions and services present in the ecosystem for different sectors.

The Ghana Start-up Ecosystem Portal has been designed to provide a digitized platform with reliable, easily accessible, and readily available information on the entrepreneurial ecosystem of Ghana with regional ecosystem focal data points across the country. This portal gives insights and analysis of data gathered on the ecosystem mapping programme by Ghana Tech Lab.

Catapulting the ecosystem to the next level

Figure 2 indicates the following possibilities for growth in the network: To enable promising start-ups to tap into funding possibilities, there is need to increase linkages with venture capitalists and other funding institutions. Such collaboration could be in the form of hubs sharing information about upcoming ventures with high growth potential and acting as the first-line talent scouts for investors. In case of a common service delivery, hubs and funding institutions could strengthen their co-programming to deliver investment readiness programmes that trained entrepreneurs in the specific skills and diligence most sought by investors.

The previously highlighted missing link between technical university training and hubs' entrepreneurship programming is also visible in the network visualization: universities with incubation programmes sporadically connect to hubs, missing out on

the potential to push their early-stage start-ups through hubs' support to the next level.

From a government perspective, the regionally dispersed offices of the Ghana Enterprise Agency (GEA) provide a well-functioning model to increase linkages with other ecosystem players. Ministerial bodies primarily located in the capital show less ties with hubs and other ecosystem players. Hubs could also increase the exposure of their start-ups by further developing linkages with event organisers to increase their visibility and offer further networking possibilities.

Potential connections

Table 2 provides an overview of institutions acting as bridges to expand and strengthen the tech ecosystem network. This indicates that when connecting to these institutions,

actors will potentially improve their reach to less connected actors in the ecosystem. If a new or existing actor connects and collaborates with Kumasi Hive, MEST, Ghana Tech Lab, Hopin Academy or Ghana Innovation Hub, it connects to a wide network of smaller institutions, all linked through those central hubs.

Table 3 provides a ranked list of institutions with a strong individual network (degree centrality). These institutions have a large network but do not serve the same connecting role. When connecting with them, actors might be able to increase visibility and access new opportunities, but do not increase their connectivity to the entire ecosystem, only that hub's individual network.

Overview of Actors by Betweenness Centrality	(High bridging capabilities)
Kumasi Hive	570.80
MEST	321.76
Ghana Tech Lab	97.01
HOPin Academy	79.27
Ghana Innovation Hub	77.90

Table 2 Ranking by betweeness centrality

Overview of Actors by Degree Centrality	(Strong individual network)
Kumasi Hive	139
MEST	110
Ghana Tech Lab	73
HOPin Academy	69
Ghana Innovation Hub	62

Table 3: Ranking by degree centrality

When looking at the distribution of the results (see Annex II) the first five hubs, with special regard to the first two ones, listed in tables 2 and 3 appear as outliers, especially with

regards to betweenness centrality (bridging capabilities). At the same time, such a high number implies that when connecting to these institutions, actors will potentially

improve to their reach to less connected actors in the ecosystem. All other institutions a betweenness centrality number of less than 50, seven other institutions have between 50 and 30. There are eleven institutions having individual networks between 52 and 35. If a new or existing actor connects and collaborates with Kumasi Hive, MEST, Hoping Academy, Ghana Tech Lab or Ghana Innovation Hub, it connects to a wide network of smaller institutions, all linked through those central hubs.

This showcases the key role the "established" hubs have as key ecosystem enablers and potential ecosystem leaders. The Ghana Enterprise Agency also has a good level of degree centrality with a score of 33 – the other governmental bodies lag behind.

Institutions have the potential to increase their presence in the ecosystem by increasing the overall number of connections by sharing information with other actors, proposing collaborations to deliver joint services, and supporting other institutions to deliver on their mandate. Linking to highly connected institutions would immediately boost connectivity and density in the ecosystem. A major growth for the ecosystem would be to identify actors not yet included in the network and bring them in through collaborations and information sharing with these bridging institutions. When additional entities are included in the network, institutions connected to new actors increase their bringing capabilities and therefore their relevance within the ecosystem.

Connections in the network

Information sharing and exchanges are most common among actors, closely followed by service delivery and collaboration. Funding connections are less common.

Sharing / exchanging of information

According to interviews, information sharing between hubs and other ecosystem actors mostly consists of start-ups. What is interesting to see is that all hubs seem to share information to a similar extent, including those further out in the network. Still, there is no centralized platform connecting institutions and programme participants to monitor activities and upcoming initiatives, despite many ecosystem actors being active in various platforms like whatsapp groups together.
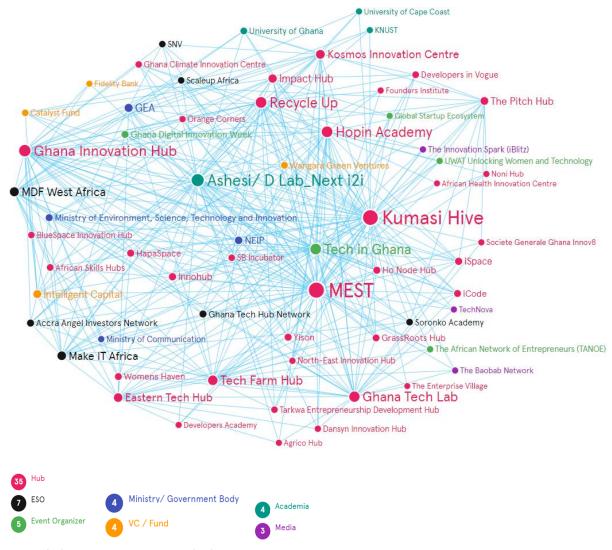
Figure 3: Sharing / exchanging of information among ecosytem players

Service delivery / collaboration

Service delivery collaboration is also common amongst all actors. For hubs, primarily concerns sharing of programming. The "more established" hubs have often adopted a coaching and capacity building approach with regard to knowledge transfer, sharing of programmatic approaches and setting up institutional structures for smaller, younger hubs. However, this results in an ecosystem of actors that provide similar services, which reduces the need to collaborate to offer a

more complete service. Additionally, this overlap fuels competition for visibility and funds, hindering collaboration. Institutions should foster synergies as well as link to other ecosystem players, particularly funding institutions and the private sector. In addition, the use of convening platforms to communicate with other ecosystem actors could potentially address service gaps.

Tech hubs should endeavour to take part with their participants in country-wide events such

as Tech in Ghana or the Ghana Digital Innovation week to ensure networking opportunities, knowledge increase, funding options and engagement with all relevant stakeholders. These larger events can also serve as platforms to highlight and promote successes, allow entrepreneurs to showcase their services and solutions and attract regional and international buyers and investors.

Universities can play a significant role in shaping the mindset of entrepreneurs and providing a chance to get exposure to the support ecosystem. Linkages between academia and the ecosystem have been growing. Significantly, universities have begun establishing their own incubation hubs. Additionally, universities have begun stepping into the space of hackathons and start-up programmes, further fuelling interest in the field and providing a platform for hubs and ecosystem players to engage with potential start-ups. Start-ups can also use the university campuses as means of recruitment. Hubs are seen as an extension of required education to succeed in the labour market. Hubs' programming builds on the technical education received during studies as entrepreneurial education often does not yet form part of the university curriculum.
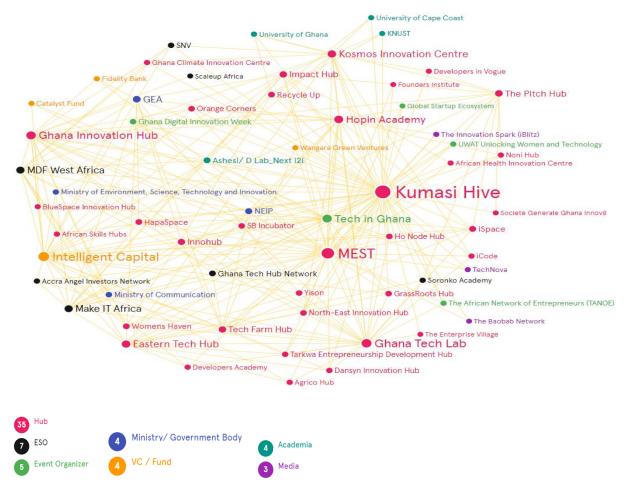

Figure 4: Service delivery / collaboration among ecosystem players

Financial collaboration

These linkages comprise exchanges of funds between institutions. This also includes institutions offering financial or logistical support to other institutions for events, activities or programmes.

Institutions compete for funds due to donor dependency and are reluctant to act as bridge institutions to channel funds and share potential projects. Ideally, collaboration should be included as a requirement to access funds from donors. such an ecosystem approach could benefit both the donor agency and the support

institutions who would be incentivized to collaborate and therefore explore synergies. From governing bodies, GEA seems to be providing most of the funding to ecosystem players. From the universities mapped, all receive financial support. However, there are no funding connections to media. This shows a missed opportunity, if stakeholders provided more incentives to media, visibility of their programming and start-ups could be increased. International funding often seems to be channelled from larger/more established hubs to smaller newer ones, which provides hubs with the necessary financial means to secure their functioning.
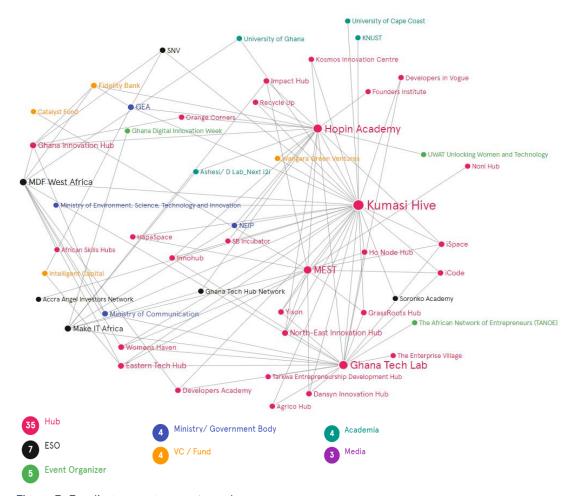

Figure 5: Funding among ecosystem players

5. USER EXPERIENCE ANALYSIS

Analysing the entrepreneurship ecosystem of a country requires not only the insights of its institutional actors but also that of the entrepreneurs, or "users". Interviews were conducted with a selected group of young entrepreneurs in the tech sector to complement the above network analysis. This section provides an overview of the user experience in terms of support received. The following data presents the profile of the young tech entrepreneurs interviewed (20 participants in total, thereof 30% female, 6 active in fintech, and 5 in agritech). Based on the insights gathered from the focus group discussion, the following key trends can be outlined regarding the user experience in the Ghanaian entrepreneurship ecosystem

Programme design, execution and participation

Feedback from the start-ups that have been in the system for a while indicated that many programmes often have similar offerings (business model canvas, forecasting, pitching....). It would be beneficial for more tailored approaches to support. Specific coaching is usually only done towards the end of the programme. An idea would be to either have mentors come in earlier in the process, or have a diagnostic conducted on participating start-ups (ITC NTF 360 Assessment) to assess what trainings are most beneficial for the start-up. Start-ups attending multiple accelerators or incubation programmes was also discussed. Start-ups often do so as they need the grant money

distributed to survive with their business idea. The consensus was that the size of funds given should be higher and start-ups participation in events should be limited.

Monitoring and evaluation

More hubs need to do long-term monitoring and evaluation of their start-ups post-programme-participation. They are often focused on the training aspect or completing the programme and do not consider the longer-term life cycle of their beneficiaries. There is a need for more formalized infrastructure in hubs to support organisations after completing an incubation or early-stage programme.

Targeted training solutions

A discussion was also held around what training solutions could benefit start-ups the most. One idea that emerged was the creation of a diagnostic engine or platform where a start-up could enter their details, and have the system provide an analysis on where they are in terms of business stage and which events, trainings ecosystem support organisations would be beneficial for them to get in touch with. A next step would be to match them to investors that fit their sector, stage, traction and other demographics (e.g. youth or female led).

Corporate and Investor training

When compared to other countries such as Nigeria, Ghanaian corporations and investors do not have a history of being as deeply involved with start-ups. Therefore, their

demands, expectations and degree of willingness are often not aligned. Communication campaigns such as workshops, storytelling (media, reports, round tables) would help build knowledge of other countries' successes and might encourage investors to take a more active part as start-ups need more funds especially in early stages.

Legal Support

One major sector that the in the focus group discussion participating entrepreneurs agreed on was missing legal support. In their early stages, start-ups often do not put a strong emphasis on legal matters such as structure and contracts. As they grow, this early disregard can lead to major challenges which are hard to resolve in the case of a dispute. Moreover, having an official body or independent agency that can support with business valuations would enable start-ups to engage potential investors with more confidence and also help new or early-stage investors understand what they are buying into.

Managing expectation and onboarding talent

The steady growth of the support ecosystem and the increased attention and publicity received by successful entrepreneurs has led to a strong awareness and steady interest, particularly amongst youth. More and more young Ghanaians, particularly university graduates, are interested in starting their career by founding a tech venture. Interviews confirmed that they bring with them the basic know-how around the topic of entrepreneurship but are often lacking a realistic understanding of the actual work, dedication and investment which is required to successfully grow a start-up as well as the chances of success. While generating excitement and interest in entrepreneurship is critical for fostering a thriving start-up ecosystem, this expectation-gap can lead to a comparatively high start-up failure rate, and eventually to disillusionment with entrepreneurship. This expectation gap should be addressed in college, university or by hubs early in their programmes.

Creating the right mindset and having people that fit the organizational culture is key. One hub (Peki Hub) makes potential interns go through training videos and pass tests before they can join. This way they know what is expected of them, and how to behave. Another company hires interns and pays them at equivalent rate they receive during their compulsory national service of Ghana and gives them training and exposure. They then take them on as staff and increase the salaries if they show their eagerness and capability.

6. RECOMMENDATIONS

Based on the service mapping, identified gaps and overlaps, network analysis and user experience analysis, this section summarizes the recommendations to support the growth and success of the Ghanaian tech entrepreneurship ecosystem. These recommendations are intended as guidance to local ecosystem actors, particularly hubs. They serve the overall aim to further boost the Ghana tech ecosystem visibly on the international stage, and to foster innovation and collaboration to create Ghanaian unicorns.

Actors involved	Time horizon	Recommen-dation	Summary	Related Gap/ Overlap
Public-Private	Long-term	Online platform for entrepreneurs	Creation and launch of digital entrepreneurship hub to provide a database of existing start-ups, active hubs, and support-services available in the network.	Lack of comprehensive information on available programmes, proliferation of repeated participants
Public-Private	Long-term	Collaboration and synergies inside and outside the local region	Focus on synergies within their programming and increase the specialization, particularly in same regions. Tech hubs should endeavour to take part with their participants in country-wide events.	Overlaps in programming and resource scarcity, especially in more remote regions
Hubs	Medium-Term	Pre-programme assessment for individualized programming	Implementation of institutionalized pre-programme assessment to provide hubs with a detailed understanding of specific start-ups' needs, and offer targeted, impactful services. Hubs could adapt part of their programme depending on participants needs.	Limited variety and specialization of programmes and over reliance on early-stage programming
Hubs:	Medium-Term	Programming for an employability basis & stronger team formation	Hubs could be providing two-track programmes which also focus on employability. To enable start-up ideas to successfully move towards the growth stage, it could also be interesting to explore a combination of idea and team consolidation.	Sole focus on entrepreneurship, which challenges participants without prior experience
Hubs	Medium-Term	Sustainability of funding for hubs	Many opportunities exist to facilitate resource mobilisation. Hubs could offer paid business clinics or other specialized services. Hubs could also charge start-ups a small "commitment" fee when initiating a programme. Hubs could also ask their successful alumni to contribute a flexible or fixed percentage of their future profit.	Overreliance on external funding leading to a lack of financial independence and sustainability of hubs
Hubs	Medium-Term	Increasing funding opportunities for entrepreneurs	Engage the influential diaspora. Hubs could establish networks with financial service providers to refer promising start-ups. The engagement of investors and exploring other funding sources should also form part of the curriculum	Significant gap between type of funds available and funds needed by entrepreneurs.

			and might lead to collaboration with local banks.	
Hubs	Medium-Term	Female Involvement	Design and implement specific programmes exclusively for female participants and offer child-care.	Entrepreneurship skewed towards men
Hubs	Medium-Term	Mentoring for entrepreneurs & private sector linkages	Increase the availability of mentoring programmes and networking. The private sector linkages formed could also be used by hubs as a second avenue to receive specific expertise.	Lack of mentoring and coaching services
Hubs	Medium-Term	Hub exchange and quality assurance	Established hubs serve as valuable guidance smaller, younger hubs. Hubs-to-hubs coaching and regular knowledge exchanges could be intensified to ensure that hub managers have awareness on how to set up a well-functioning organisational culture and structure. Implementation of a standardized approach for the measurement of capacity building.	New hubs enter the ecosystem with a lack of experience as well as missing standardization and impact measurement
Hubs	Medium-Term	Internationali sation knowledge building	Hubs focusing on accessing regional or international markets to expose entrepreneurs to latest innovation trends and expand customer base.	Little focus in the areas of export and internationalisation
Hubs	Short-Term	Pairing technical skill with soft skill training, and better training on high quality IT skills	Use holistic training programmes to compliment the hard skills which are taught in various programmes. Implement programmes which place a high emphasis on "getting work done" and continuously work on improving the idea or venture. Focus on hands-on high quality IT skills to increase employability.	Lack of sufficient services to boost entrepreneurs essential soft-skills, and high-quality IT skills
Media	Short-Term	Importance of Awareness Creation	Media engagement needs to continue with both the mainstream media and specialized media agencies, e.g. through the setup a wide-ranging visibility campaign. The more media exposure, the more start-ups gain traction from users, investors and other partners in the ecosystem.	Low media exposure for most start-ups, and low awareness by potential investors of promising ventures
Public-Private	Short-Term	Increasing focus on agritech	Increase the number of hubs focusing on agritech and the awareness of the opportunities and attractiveness of the sector. In addition, donors could provide dedicated funding opportunities to increase the visibility, too.	Disconnect between the world of start-ups, tech and entrepreneurship, and agriculture

Table 4: Summary of recommendations

Public-Private Dialogue: An online platform for entrepreneurs – Long-term

The creation and launch of a digital entrepreneurship hub could potentially address many of the issues highlighted by this report. In addition to providing a database of existing start-ups, active hubs, and support-services available in the network, such a platform could host a "programme passport" to keep track of the progress of entrepreneurs and avoid programme hoppers. The database of start-ups and hubs could also provide a major advantage to networking efforts.

> Entrepreneurs could be approached to participate in specific events, trainings etc. depending on their level/progress. Amongst themselves, the platform could encourage peer-to-peer exchanges.

- Hubs could showcase their programme offering to entrepreneurs but also to donors. In addition, resource mobilisation and collaborative project implementation could be facilitated as hubs could extent their existing network of partnerships and engage with lesser known but complementary institutions

- Potential investors could easily screen the database to see whether the venture's business model is interesting to them and see if they like to engage in further discussions.

As an incentive to register in this platform, a decrease of the minimum threshold for foreign investment could be used, entrepreneurs receiving preferential access

to programming and hubs increasing their visibility and specialization. Despite the necessity of hub-training for aspiring entrepreneurs, hubs themselves often only recruit top-ranked students from prestigious universities. This effectively denies proper training to a significant portion of aspiring entrepreneurs.

Potentially, this database could be set-up by the government through the National Entrepreneurship and Innovation Plan in collaboration with The Ghana Hub Network and Ghana Tech Lab to have a national, yet neutral platform. The Ghana ecosystem website could also be used. Most important is that all stakeholders can access information about what institutions are providing what support to which entrepreneurs. Overall, the ecosystem would benefit immensely from actors connecting to one common platform where all opportunities are published. This platform could then also serve to avoid duplication of efforts.

Hubs: Collaboration and synergies inside and outside the local region – Long-Term

In a similar manner, it could be interesting for hubs to focus on synergies within their programming. Having an overview of what hubs are offering, where there are overlaps and potential synergies could lead to stronger programming. It could increase the specialization of hubs, improve the precision of targeted support, and subsequently improve the success rate of ventures.

Particularly in same regions, resources such as trainers/ experts and even funding could be pooled. In the larger cities where there is already high density of hubs and specialization, this could be extended out to other areas of the country by fostering peer-to-peer learning and knowledge exchanges amongst hubs. The Ghana Hubs network, for example, has meetups across the country ensuring that the ecosystem is able to come together.

Another option for further collaboration would be through "road shows". In such arrangements, a institutions go together on tour around the country, much like entertainer or musician, to showcase their service offering. An example of this is "25 Days of WOW", a major catalyst for bringing hubs and ecosystem players together. Finding focused touring opportunities and being able to mobilize the right stakeholders could enable a new cross-country unification between the stakeholders.

Hubs: Pre-programme assessment for individualized programming – Medium-term

To increase entrepreneurs' satisfaction and programme specialization, an institutionalized pre-programme assessment could be implemented. This diagnostic could help hubs uncover challenges facing start-ups that the entrepreneurs themselves are unable or unwilling identify and respond accordingly. This would provide hubs with a much more nuanced understanding of specific start-ups' needs, Consequently, they could offer targeted, impactful services

designed specifically to address those points which deliver significantly greater impact as a result. Alternatively, in addition to the "normal" training programme, hubs could adapt part of their programme depending on participants needs. There could be a variety of modular programmes available which offer training on the same broad topic (e.g. business management, or pitching), but cater the content to the various business lifecycle phases, sectors, etc.

Moreover, hubs in the same region could collaborate and refer participants between institutions if diagnostics uncover needs more in-line with another organization's capabilities. For more remote hubs, virtual exchanges could be set-up to digitally bridge the physical distance. Having a variety of "plug and play" modules between different hubs, particularly for growth-stage programmes, could be explored, also for online delivery. This could help reduce the relocation of high-growth potential start-ups from rural to more urban centres.

Hubs: Programming for a general employability basis and stronger team formation – Medium-Term

To avoid programme dropouts, hubs could focus on providing general employability programmes and later on, focus more on entrepreneurship. The potential for such a two-track-programme is shown by Ghana Tech Lab with their Mobile App Development programme. Following an initial start-up training round, it was decided through a pitch which winning start-ups go further to

incubation while the others were added to an employability track to be placed into internships after. Such programmes have the benefit allowing participants to 'test the waters' of entrepreneurship. If they feel they are not ready for self-employment, they can apply what they have learnt in a different context – and maybe come back to entrepreneurship once they have gained more experience.

To enable start-up ideas to successfully move towards the growth stage, it could also be interesting to explore a combination of idea and team consolidation. Often, founders have similar ideas but might possess different skill sets. Thus, they could be brought together in teams to enable a complementary staffing of the venture to develop it further and to avoid a thin-spreading of funds between a larger quantity of business ideas. A regular exchange between hubs could serve as means to link similar and/ or complementary business ideas and founders. Thereby, start-ups could also increase the customer base and outreach to attract more funding.

Hubs: Sustainability of funding for hubs-Medium-Term

Currently, Ghanaian hubs rely heavily on external funding to maintain their operations. Most funding coming to the institutions are programme based, mainly from international donors. Only a few of the hubs have been able to diversify their business model through monetizing co-working spaces, offering innovation consulting services and hosting paid events. The ITC report on Supporting Start-ups Tech Hubs in Africa, highlighted best-practice business models for Tech Hubs. Some of the models are grants from donors, government and corporates, consulting fee from services provided to client, event management, revenue sharing with start-ups, investment success fees, training fees, co-working space, programme-based funding and equity from acceleration support to start-ups.

- Hubs could offer paid business clinics or other specialized services. These services would be more highly specialized and needed by start-ups ad-hoc. It would not make sense for hubs to offer these services full-time, but if a start-up could pay it would enable the hub to offer more specialized programmes, while simultaneously supplementing its revenues.

- Hubs could charge start-ups a small "commitment" fee when initiating a programme (it should not be a significant burden or barrier to the entrepreneur). Rather, it would incentivise participants to dedicate their time and energy towards the completion of the programme while simultaneously providing supplemental revenue for the hub. In addition to providing supplemental revenue for the hub, it such a mechanism would be a major incentive for hubs to take start-ups through to the growth stage, and not abandon them after an early-stage programme is completed. Linking the hubs own revenue to the long-term

success of start-ups could serve to fundamentally shift the over-focus on the earliest business stages.

- Alternatively, hubs could also ask their successful alumni to contribute a flexible or fixed percentage of their future profit to help fund the hub. This "reversed" invoicing could be acceptable by successful ventures, as the condition of payment pre-supposes profit. An un-profitable enterprise would never be left with debts it could not pay back, or a financial burden that would push its losses or expenses further. Peki Hub operates their cohorts as cooperative, and therefore the success of one start-up in the cohort benefits both the hub, and the other members of the cohort.

Hubs: Increasing funding opportunities for entrepreneurs – Medium-Term

To increase funding opportunities in the "missing middle" and bridge the gap between accessing grants and high-value investments, hubs could establish networks with financial service providers to refer promising start-ups. Through exploring linkages with financial service providers, banks could be incentivized to develop specific credit lines for aspiring entrepreneurs. Access to finance can be bridged when funding entities are able to improve their knowledge about the tech entrepreneurs' profiles and the business models in which they operate. This improvement of knowledge can be facilitated by hubs inviting the funding entities to arranged events where investors meet and learn about their potential clients. Without having such initial touchpoints, large investments supporting venture growth are rare. Hubs could concretely focus on (e.g. through role-plays) introducing participants to the various funding opportunities and thereby teaching participants the language of investors. Exploring other funding sources, particularly loans, should also form part of the curriculum and might lead to collaboration with local banks.

Another means to provide fitting financial support to start-ups in their growth stages, could be through the engagement of Ghanaian diaspora. They might be more prone to provide fitting investment ticket sizes as they understand the local needs. One way to promote investment in Ghanaian companies would be to engage for instance the Ghana Angel Investor network or the Ghana Hubs. ZidiCircle a Dutch based ESO lead a Green Investment syndicate round of investment in Ghana with new first-time investors from the diaspora. By having rounds of training sessions for the investors on what they needed to look out for and explaining the legal details and risk potential risks, ZidiCircle worked with hubs in Ghana to get the start-ups investment ready.

Hubs: Female Involvement – Medium-Term

Due to the increased gender-gap awareness, hubs have also started to design and implement specific programmes exclusively for female participants, such as Developer's in Vogue (DiV) or Tech by her. One simple, yet

enormously impactful way that hubs can make a difference in supporting women entrepreneurs would be to add child-care to the services offered. The government is supporting such endeavours through its "Girls-in-ICT" initiative started in 2018. The initiatives pave a way for a more balanced landscape for female involvement.

Hubs: Mentoring & coaching follow-up for entrepreneurs and forming linkages with the private sector – Medium-Term

Based on the interviews and focus group discussion, the availability of mentoring programmes and networking opportunities does not seem to have increased significantly since the last ecosystem mappings. However, numerous studies have shown that mentors have direct impact on the growth and survival of businesses. Mentors provide critical support and guidance in navigating pivotal moments of achieving business success. For a successful mentoring relationship it is important to recruit a wide range of mentors with good industry knowledge. The relationship building and exchange should then follow clear guidelines and predefined milestones mixing self-reflection, one-on-one discussions and networking events.

Usually, the critical and/ or limiting factor is to get a decent quality and quantity of mentors on-board. There are three options to reach out to potential mentors:

- Hubs could engage their (successful) alumni to commit to sharing their experiences and best practices with the next generation of entrepreneurs and provide them with the necessary networks – either on an individual or group basis. These interactions could take place live, or virtually. Therefore, platforms such as Home page (ghanamentorship.com) could be incredibly useful.

- Hubs could encourage their participants to sign up to entrepreneurship support platforms such as the Ye! Community (yecommunity.com) which have a dedicated mentoring scheme but also an innovative online mentoring initiative, called the Ye! Coffee Roulette. It pairs entrepreneurs with experienced business mentors around the world, thereby leveraging technology to connect mentors and mentees across borders and time zones, to facilitate greater interaction and knowledge sharing. International mentors can bring additional value by sharing their international experience and broadening the entrepreneur's vision and perspectives on challenges and opportunities that transcend local barriers. Entrepreneurship support institutions could tap into international mentoring networks through collaborations with incubators and accelerators in other countries in the region or beyond. The Ye! Community podcast offers additional insights and guidance around the relationship between mentor and mentee:

[Mentorwise Podcast | Ye! Community (yecommunity.com)](yecommunity.com)

- Hubs could reach out to the private sector to form partnerships. Reasons for companies to engage could be to improve their CSR appearances but also the intention to tap early into future business development/M&A potentials. Sectoral proximity could be interesting, what counts however is the dedication, and willingness to share of the people engaged.

The private sector linkages formed could also be used by hubs as second avenue to receive specific expertise (e.g. in marketing, finance, HR) from larger businesses. Contacts could be more formalized to offer internship programmes or job shadowing, which could provide participants with the valuable practical and specialized experiences as well as opportunities to meet connections and grow their personal networks. Similarly, for those programme participants who in the end do not want to follow the entrepreneurship route, they could have an easier access to the job market as they have already created necessary linkages. Lastly, if private sector partners are regionally or internationally active, hubs could get valuable foreign expertise in-house. Such activities could also be fostered by international donors who create these linkages to companies in their country of origin. Eventually, a strong network of venture capitalists, industry specialists, and other local experts will create a strong support network.

Hubs: Hub exchange and quality assurance-Medium-Term

Much as a business-mentor can be a critical resource for an entrepreneur, established hubs can serve as valuable guidance smaller, younger hubs. Mini Internships could be established for newer ones to understand the process, services and methods of industry best practice. Whether a few days visit or an extended traineeship, this will help establish a train-the-trainer model to support newer hubs. Access to such mentorship will help reduce new hubs learning curves and enable them to deliver truly valuable services to their clients from day one. An additional benefit is that there are now established ties between the two hubs, thus making future collaborations easier due to awareness and familiarity. In addition, the Ye! community hosts regular hubs workshops on specific topics for virtual capacity building which are relevant to hub managers: [Ye! Hubs Network | Ye! Community (yecommunity.com)](yecommunity.com)

In addition, hubs-to-hubs coaching and regular knowledge exchanges could be intensified to ensure that hub managers have awareness on how to set up a well-functioning organisational culture and structure. Therefore, there could be a standardized training/ examination which ensures a certain level of common quality. Ghana Tech Lab or the Ghana Hubs Network could link up with AfriLabs, who have already conducted successfully the AfriLabs Capacity Building Programme, to share best practices for hub management. There could be specific

offerings on the functions of a hub, hub strategy and fundamentals of a start-up lifecycle so that they can better support the ventures within the hub. Moreover, a standardized approach for impact measurement and monitoring & evaluation could be developed and shared through such trainings. Hubs could be trained on how to capture and use relevant data to improve their services and measure their successes in form of capacity built, finance accessed, jobs created etc. The previously named organisations could then serve as gate keepers for quality assurance and regulators.

Internationalisation knowledge building – Medium- Term

As discussed before, many tech hubs are not self-sustaining and focus on similar support areas which leaves several specific needs of entrepreneurs uncovered. In particular, start-ups receive little support at mature stage and with that in the area of internationalisation.

There are only a few hubs that focus their programming on accessing regional or international markets. Some hubs have partner links across the region allowing for easier access for their clients, they could leverage these links to provide good quality offering of internationalisation training to mature start-ups. This training and exposure, for example through study trips, mentoring or peer-to-peer exchanges, is particularly necessary in the tech ecosystem as it is a fast-paced environment that is constantly changing. It is important for start-ups to learn how to assess and access other markets in

the African region or even beyond as building a project in their own market will be very different than building that same product in other markets due to differences in language, culture, business partners, ecosystem, infrastructure and more.

Hubs: Pairing technical skill with soft skill training – Short-Term

It is widely agreed that soft skills are of utmost important to long-term success of a business, and on a personal level, enhance employability and the longevity of employment. More holistic training programmes such as the I am Worth It Project can be used to compliment the hard skills which are taught in various programmes. It is the combination of the two that is needed. Linking with a mentor is one avenue for entrepreneurs to develop soft skills such as communication, leadership or motivation.

Programmes which place a high emphasis on "getting work done" and continuously work on improving the idea or venture could be fostered. Rather than having long theoretical lectures, programme participants receive regular, short training sessions and tasks to concretely practice a skill or actually apply the learning to their own business. As an additional benefit, the provision of shorter training sessions could make programmes more easily adaptable to online formats.

Alternatively, hubs could take a hybrid approach, particularly for more early-stage start-ups. The initial stages of the programme would consist of more intense in-class

sessions to lay the theoretical foundation of entrepreneurship. The programme would then process into a more spread-out phase where the focus is redirected to practical application of theory, individualized mentoring, and peer-to-peer support. To keep track of the individual development during this phase would require regular check-ins and reporting procedures.

Universities and tech hubs should focus on providing hands-on high quality IT skills so there is a better offer for tech companies to hire good quality IT employees. IT Training institutions such as CodeTrain, Blossom Academy and Developers in Vogue provide a good bridge between graduates and hiring tech companies, however the educational systems should address teaching good quality IT skills in this earlier stage already. An opportunity would be to create collaboration between the IT training institutions and universities and hubs.

Media: Importance of Awareness Creation - Short-Term

Media engagement with the topic of entrepreneurship and technology needs to continue with both the mainstream media and specialized media agencies. More awareness is needed about the tech start-ups and the tech ecosystem to spotlight both founders and their services, partners and investors in this space. Thus, it could be an option to setup a wide-ranging visibility campaign together with media agencies along the lines of "uncovering the raw talent". Such a campaign could help channel

investments towards innovation and other economic growth potentials. The more media exposure, the more likely the start-up is to gain traction from users, investors and other partners in the ecosystem. It has long term effects of encouraging more people to enter the space as they find the start-up world a viable and successful career option.

Public-Private Dialogue: Increasing focus on agritech – Short-term

There are a limited number of hubs such as Kosmos Innovation Center, Recycle Up Ghana, Tech Farm Hub and AgriCo Hub which place a strong focus on agritech. Most other tech hubs are sector agnostic or have fintech as a primary client base. This can partly be explained by the fact that other institutions in the ecosystem consider tech support as a crosscutting need for all entrepreneurs, and often do not perceive the need to specialize further. To increase the focus on agritech, awareness of the opportunities and attractiveness of the sector needs to be increased equally. Hubs could engage media to regularly showcase successful agritech ventures and promote their programming, e.g. through hosting specific agritech challenges as done by KIC. The network analysis also shows that mostly the larger, more established hubs are well connected to media, whereas smaller ones remain under the radar. Donors themselves could also provide dedicated funding opportunities to increase the visibility of this sector or link their participants from agricultural projects to tech hubs.

7. OUTLOOK

The entire African tech sector is still in the early phases of development. One of the most significant concerns that persisted for early investors on the continent often is whether there will be a successful exit. In October 2020 Stripe acquired the Nigerian fintech start-up Paystack for over $200 million USD, paving the way for a 2021 that broke all previous investment records and saw multiple unicorns emerge. With the rise of these unicorns a trend began to emerge of founders investing in other founders. While Ghanaian start-ups have not yet hit the same highs as its neighbour, signs of founders supporting one another are beginning to emerge with the likes of mPharma and Zeepay founders investing in and supporting the local ecosystem. With the current growth rate in Ghana combined with the continued support from many local and international ecosystem stakeholders, as well as the boldness of local Ghanaians to champion change, the ecosystem looks bright.

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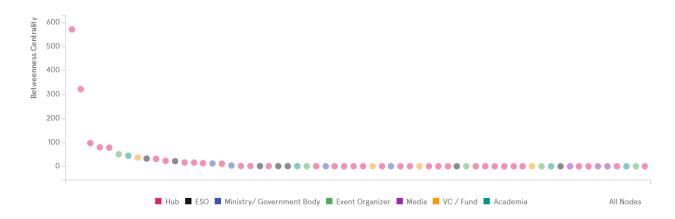
ANNEX I: INSTITUTIONS INTERVIEWED

Organisation	Website	Description
Agrico Hub	http://www.agricohubgh.com/	AgriCo Hub Ghana is a Business Innovation Hub that trains, incubate, networks and funds women and young entrepreneurs in agribusiness, trade & commerce and services.
Ashesi / Next i2i	https://www.nexti2i.com/	Ashesi / Next i2i is a values-driven incubator that trains emerging entrepreneurs with the focus on the United Nations Sustainable Development Goals, (SDG)-driven outcomes in their business models.
Eastern Tech Hub	https://www.easterntechhub.com/	Eastern Tech Hub Ghana is a technology innovation center located in the Eastern Regional capital of Ghana - Koforidua. It is committed to innovatively implement Sustainable Development Goals (SDGs) through tech and entrepreneurial support focused on creating a pipeline of investment ready start-ups (more than 70% women-led firms), and linking young people to employment opportunities.
Founder Institute	http://fi.co/ghana	Founder Institute believes there are talented people everywhere whose potential can be unlocked to make an impact on the world through entrepreneurship. The Founder Institute is the world's largest pre-seed start-up accelerator.
Ghana Enterprise Agency	http://gea.gov.gh/	The Ghana Enterprises Agency (GEA) formerly National Board for Small Scale Industries (NBSSI) was established by Act 1043 of Parliament, 2020. It is the apex governmental Agency responsible for the promotion and development of the Micro, Small and Small Enterprises (MSMEs) Sector in Ghana. It has the mandate to coordinate, implement and monitor the activities of the MSME Sector
Ghana Tech Lab	https://Ghanatechlab.com	Ghana Tech Lab takes simple ideas and turning them into big start-ups. Their goal is to become the platform for digital innovations in Africa and beyond. Tehir unique programs and curriculum are designed to make your idea a product/solution that addresses a situation in the society.
HOPin Academy	https://www.hopinacademy.org/	HOPin Academy provides pragmatic and innovative approaches towards exploring the various fields of entrepreneurship with the aid of technology, thus beating the competition in labor markets. Entrepreneurs are resourced with the best content available on internet platforms and in apps and are also trained to develop key competencies in the realization of their goals.
iCode	https://icodegh.com	A hub for tech start-ups, entrepreneurs and the community in Western Region Takoradi
Impact Hub	https://accra.impacthub.net/	Impact Hub builds a home for the city's entrepreneurs & bold thinkers at the nexus of Talent, Tech & Capital for social impact.
Ingressive Capital	https://ingressivecapital.com	Ingressive Capital is a multi-million-dollar venture capital fund backing high growth tech-enabled businesses across Sub-Saharan Africa.

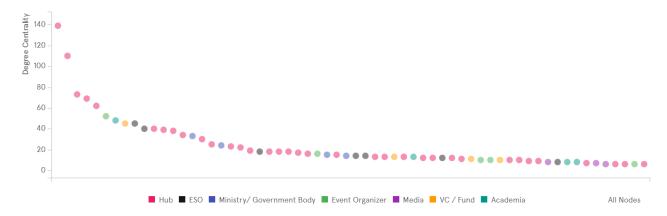|		
Intelligent Capital	https://www.intelligentcapitalgroup.com/	Intelligent Capital is an entrepreneurship development organization founded with the belief that aspiring and early-stage entrepreneurs need more than just financial capital to launch and scale their businesses.
Kosmos Innovation Centre	https://www.kosmosinnovationcenter.com/	The KIC uses the concept of "Impact Investing" to create a new breed of young entrepreneurs who will accelerate Ghana's economic growth, create wealth, and positively impact Ghana. KIC takes a sector-by-sector approach to problem solving, using analysis and expertise to identify the barriers to growth.
Kumasi Hive	https://kumasihive.com/	Kumasi Hive is an innovation, tech & entrepreneurship-support community and space in Kumasi which provides needed support for the Kumasi entrepreneurship ecosystem and beyond
Make IT in Africa	https://make-it-initiative.org/africa/	Commissioned by the Federal Ministry for Economic Cooperation and Development (BMZ) Make IT in Africa's goal is to make these InnovationEcosystems future-ready—to build a resilient environment for digital visionaries and their partners, so, they can create impactful change in Africa—socially, environmentally, and economically.
MDF West Africa	https://mdf.nl/ghana	MDF - West Africa is part of the world wide operating MDF Training & Consultancy Group with headquarters in the Netherlands. MDF has regional offices in Sri Lanka, Belgium, Colombia, Tanzania, Indonesia, Vietnam and\ R.D. Congo. "Our mission is to enhance the management capacities of professionals and organisations in the development sector by providing participatory and experiential training and consultancy services"
MEST	https://meltwater.org/	MEST is an Africa-wide technology entrepreneur training program, internal seed fund, and network of hubs offering incubation for technology start-ups in Africa. For young aspiring and established African entrepreneurs, MEST Africa provides the skills, mindset, and experiences to build a globally successful tech company.
MTN Apps Challenge		The MTN Apps Challenge seeks to bring together app developers, animators and tech enthusiasts for a chance to create products which would bring in value and advance the tech scene in Ghana. The theme for this year's competition was Empowering the Youth in Developing Innovative Digital Projects.
NEIP	http://neip.gov.gh	The National Entrepreneurship & Innovation Programme (NEIP) is a flagship policy initiative of the Government of Ghana. It's primary objective is to provide an integrated national support for start-ups and small businesses. NEIP primarily focuses on providing business development services; start-up incubators and funding for young businesses to enable them grow and become successful
SB Incubator	http://www.sbincubatorgh.org	The Stanbic Bank Incubator is 3rd generation Business Incubator, a Corporate Social Initiative setup by Stanbic Bank Ghana to contribute towards the promotion of entrepreneurship among the youth and women in Africa.

Recycle Up Ghana	www.recycleupghana.org	RECYCLE UP GHANA aims to educate young people, create awareness and co-create local solutions to the plastic waste problem in Ghana through youth empowerment.
Tech in Ghana	https://techinghanaconference.com/	Tech in Ghana is the leading platform bringing together Ghana's tech ecosystem for global knowledge sharing, valuable networking, and to showcase innovation.
TechFarm Hub	http://techfarmhub.com/	TechFarm Hub is a Pan-African Business Development and Innovation Hub empowering next generation Agripreneurs, Innovators and Entrepreneurs with disruptive skills, incubation and resources.
The Pitch Hub	https://thepitchhub.org/	The Pitch Hub is an African organisation that is aimed at equipping young entrepreneurs in Africa with the soft skills that are needed to build and sustain competitive business in the 21st century.

ANNEX II: ADDITIONAL NETWORK DATA

Distribution of nodes by Betweeness Centrality:

Distribution of nodes by Degree Centrality:

ANNEX III: TECHNICAL ANNEX

ITC Network Analysis Methodology
Questions to institutions during the interviews

General Questions
1. Which year was your institution established?
2. Where are your office locations?
3. How many employees do you have? Please specify full-time, part-time, female percentage?
4. What were the main reasons for opening the hub/ supporting hubs?
5. Do you have a strategy? If so, please expand on it
6. What is your organisation's role in the entrepreneurial ecosystem?
7. What are the key milestones/achievements of the organisation in supporting entrepreneurship?

Support provided
8. What sectors does your institution cover?
9. Do you have a focus on agritech?
10. What business lifecycle stages does your institution target?
11. What services and trainings do you offer?
12. What geographic regions inside your country do you cover or offer your services?

Target beneficiaries
13. Who are your main target beneficiaries for the services you offer (please elaborate on number, target group/ audience and their size (# of employees / revenue or profit level?)?
14. How many businesses are you working with?
15. How many graduates/ start-ups have you supported in the past and/ or how many cohorts (for acceleration/ incubation) have you run?
16. What is the average age of the entrepreneurs your organization supports? What is the percentage of female ones?
17. Do you monitor or track the progress of the entrepreneurs that have received support from you? Any key findings?
18. What trends have been noticed from the entrepreneurs / graduates as they navigate the different entrepreneurial stages in terms of challenges, gaps etc.? What major factors influence the growth of entrepreneurs? From your point of view, what can be done to mitigate the challenges / further bridge the gap?
19. Funding is usually a challenge for many youth-led start-ups. What funding models do you think could be most effective in supporting young entrepreneurs? How much investment have your entrepreneurs raised so far?

Ecosystem roles and linkages
20. Do you have a focus on international markets (please provide details on the target markets and products)? Who do you partner with for delivery?
21. Do you have links with Academia? If so, with who and what is the nature of the partnership?
22. Do you organize events for entrepreneurs? If so, who do you partner with? How do you follow-up after the events? Or do you participate in events organized by other organizations? If so, which key institutions (both public and private) usually organize these events that you participate in?
23. If you provide training, how did you design the training content? How much do you focus on technical skills vs. soft skills? Do you evaluate the satisfaction of entrepreneurs after the trainings?
24. Who provides your institutional funding? If you have external funding, is it equity or grant? Do entrepreneurs/clients need to pay a fee for their services? If so, what percentage of your overall revenue comes from services charged to start-ups?
25. Are there other institutions providing services similar to yours? If so, are you working with them? Are you considering them as competitors?

26. Are you aware of any incubators/accelerators or other entities that support entrepreneurship for tech entities in Ghana? Is investment in agripreneurship given institutional support and/or encouraged?

Ecosystem actors

27. Considering the network as a whole, do you sense any overall trends in the way it operates? (e.g. more or less silos with groups of institutions becoming more or less apparent, more or less concentration of power in a single institution etc.)
28. What are the main positive attributes of the ecosystem? What has worked?
29. What could be improved? What are the challenges/issues facing key actors in the entire network/ecosystem?
30. What can be done to mitigate the challenges / further bridge the gap?
31. From your perspective, which are the most relevant actors in the local entrepreneurial ecosystem in terms of providing support and driving entrepreneurial success in a significant way? What do they do?
32. Do you think there are important players or services missing in the entrepreneurial ecosystem? If yes, what support services would you like to also provide for entrepreneurs?
33. In which way are you actively contributing to the strengthening of the ecosystem? What are some of the success factors/challenges that you can point to within your role in the ecosystem as an ecosystem builder? Is there enough support for your institution?
34. In your experience, which are the main barriers to effective interaction between actors in the local entrepreneurship ecosystem?
35. What roles does government play? Do you engage with any of the government agencies? Are the start-ups you are working with beneficiaries to any start-up support by government?
36. Are there other topics/areas/issues that you want to discuss or tackle in relation to strengthening the entrepreneur ecosystem in Ghana?

Questions to Entrepreneurs during the Focus Group Discussion

1. You have a new business idea and want to test its viability. You need help to understand the steps to get it started and test the viability of your business idea. You will need to find funding to make your idea into reality. Who would you approach for help and why?

2. You want to expand your existing business. You need help to understand how (input management, production, market linkages) and where (markets, customers) you can expand. You will need to find funding for this expansion. Who would you approach for help (local, national or international support) and why? What kind of support do you expect?

3. If they were not mentioned, with which entrepreneurship support institutions were you already in contact with? What is the nature of the connection? What do you receive from them? What do you give in return?

4. What other services could be offered in the ecosystem? What is working well? What could be improved in the system?

5. Please share your experience in developing your business:
- What challenges and successes did you have from idea to having your enterprise fully ready?
- Have you participated in a mentoring and/ or coaching programme? If yes, what are your experiences?
- What would you keep, what change? If no, why not?
- Have you benefited from specific business advisory support?
- Have you already approached investors? If yes, how, if no, why not?