

Harnessing Ghana youth innovation potential for the SDGs



1. Background

The 2030 Agenda, adopted at the United Nations Sustainable Development Summit in September 2015, positioned Science, Technology and Innovation (STI) as key means of implementation of the SDGs, and launched the UN Technology Facilitation Mechanism (TFM). The Annual Multi-Stakeholder Forum for Science, Technology and Innovation (STI Forum), supported by the Inter-Agency Task Team on Science, Technology and Innovation for the SDGs (IATT), has been the main fora for TFM to discuss topics of common interests of Member States and STI stakeholders in the context of the 2030 Agenda.

STI roadmaps and action plans to help realize the SDGs have been among the central topics through the first three STI Forums. In the Addis Ababa Action Agenda, Member States had committed to “adopt science, technology and innovation strategies as integral elements of our national sustainable development strategies” (para 119). In the 2017 STI Forum, participants highlighted that the STI roadmaps and action plans are needed at the subnational, national and global levels, and should include measures for tracking progress. These roadmaps incorporate processes that require feedback loops, evaluate what is working and not working, and produce continual revisions that create a real learning environment.

There is important knowledge and experience scattered across the 43 IATT members and other stakeholders. Therefore, this initiative is expected to add value through facilitating a common approach and developing a coherent framework to examine gaps, synergies and trade-offs, prioritize actions, strengthen national STI systems, and promote cross-sectoral collaborations and Goal-specific “deep dives” for the SDGs.

SUMMARY

The youth constitute a significant and important demography of the world population. Particularly in Africa, almost 60% of the population is under the age of 25. It is important that this demographic dividend is harnessed. As the active participation of the youth in development is crucial in achieving sustainable and inclusive communities by 2030. As a demography born in the “knowledge society”, which has brought about several tools and technologies they are strategically positioned to provide alternative solutions to our developmental challenge. For innovation to thrive, it requires actors in the innovation ecosystem play their respective roles. This paper seeks to assess the extent to which Ghana is harnessing the innovation potential of the Ghanaian youth for the attainment of the SDGs.

To this objective data a qualitative research design was employed. Data was collected from both primary and secondary sources. Government and private sector youth focused policies and intervention were reviewed. A round table of innovation ecosystem experts was organized to gather in-depth insights as well.

The study identified that most of the activities of ecosystem actors is centered on training. Moreover, the ecosystem is fragmented with not enough collaboration among actors. Little has been done in other areas to strengthen the ecosystem. The study recommends that future innovation-focused policies should highlight specific sections that detail the crucial role of the youth in its implementation. The legal and regulatory framework on business registration should be digitized. Our education curriculum which is critical to develop creative and problem-solving innovators must be reformed. Furthermore, new sources of finance should be unlocked for innovation as well implementing policies that incentive individuals and private institutions to invest in innovation. Again, investment must be made to build sustainable infrastructures particularly the digital infrastructure. Finally, more platforms should be created to foster industry-academia collaborations.

The purpose of the IATT Policy Briefs is to provide a channel for interested stakeholders to discuss and review issues relevant to the UN Technology Facilitation Mechanism. For further information on this Brief, contact: author(s). - Browne, L., Quaye, W., Essegbey, O.G., Akon-Yamga, G., Asafu-Adjaye N.Y., Addo-Yobo, F. (2020).



2. Methodology

To achieve the objective of this study, qualitative research design was employed. This involved collecting and analyzing non-numerical data to understand concepts or experiences in order to gather in-depth insights into the problem. Data collected were from primary and secondary sources. A sample of government policies and interventions as well as private sector inventions were reviewed and analyzed. Peer-reviewed literature on policies that spurred youth-led innovations were further analyzed. Finally, actors in the innovation ecosystem were interviewed on their experiences.



3. Policies and initiatives that harnesses youth-led innovations in Ghana

Findings

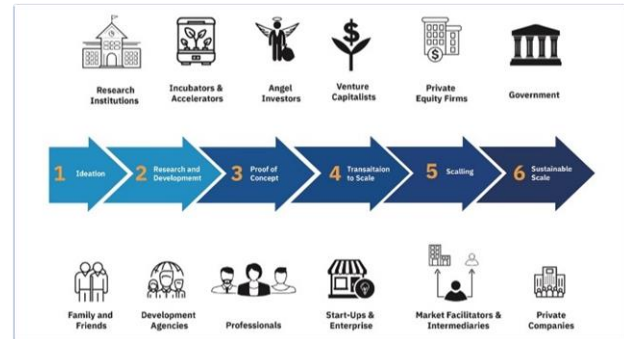
The findings have been framed in the context of the various components of an innovation ecosystem to provide some insight into ongoing activities as well as highlighting the strengths, weaknesses, opportunities and challenges.

Ghana's National Innovation Ecosystem

"It takes a village to raise a child, and it takes an ecosystem to scale innovation." The innovation ecosystem is defined by the British economist Christopher Freeman as the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies. Nurturing and scaling innovation, requires the support of a robust innovation ecosystem. The influence of the national education system, industrial relations, technical and scientific institutions, government policies, cultural traditions, private sector institutions and many other national institutions is fundamental to harness youth-led innovation. This section seeks to discuss the components of the innovation ecosystem in Ghana and how they spur innovation.

Figure 1:

Components of innovative ecosystem



Government

The government/ public sector is a major player in the innovation ecosystem. The public sector has the responsibility of creating an environment that ignites innovation and supports entrepreneurs. There are ideally two approaches governments across the globe employ in the ecosystem namely the top-down and the bottom-up approach. With the top-down approach, the government acts as a planner and directly involves itself in the innovation ecosystem such as building incubators and technology parks, providing subsidies in research and promoting technology commercialization. On the other spectrum i.e., bottom-up, governments act as a facilitator and promote innovation through market mechanisms such as indirect incentives. Both approaches have their merits and demerits, as such some governments use a hybrid approach. From the interventions of the successive governments, it can be concluded that the state plays a hybrid role in the innovation ecosystem. Some of the broad-based policy directives to support the youth and promote innovation are detailed below.

National Youth Policy

The National Youth Policy was promulgated in 2010. Themed "Towards an empowered youth, impacting positively on national development". It is intended to provide guidelines for all stakeholders involved in the implementation of policies, programmes and projects for the development of the youth. The implementation plan of the policy was launched in 2015 and highlights specific interventions in the areas of human development and technology; economic empowerment; youth participation in governance; youth leadership; and sports and national orientation. To practicalize the agenda of the policy, necessary steps have been taken to



restructure the curriculum of Youth Leadership and Skills Training Institutes and to align it with the competency-based approach within the Council for Technical and Vocational Educational Training framework for the formal sector skills training development (NDPC, 2017: 212).

National Science and Technology Innovation Policy (STI)

The STI Policy is the primary document guiding Ghana's efforts to mainstream Science, Technology and Innovation in its pursuit of development. More specifically, Ghana's vision is to develop to become a high-income country which fully applies and integrates STI into national development strategies (MESTI, 2017: 24). The policy highlights programmes and activities in selected sectors which can be driven by application of STI. One of the key focus areas is youth innovation. Some specific interventions to be implemented to harness youth innovation include promoting innovation at all levels of the educational system, providing scholarships to promising science students, initiating mechanisms to identify and mentor early identify young talented scientists and establishing award schemes that reward innovation from the youth.

National Entrepreneurship & Innovation Plan (NEIP)

NEIP is a policy initiative with the primary objective of providing an integrated, national support for start-ups and small businesses, focusing on the provision of business development services, business incubators, and funding for youth-owned businesses. NEIP is a special purpose vehicle launched in 2018 by the President H.E Nana Akufo Addo to stimulate entrepreneurship and job creation. The government seeded the program with \$10m. The policy is focused on the following: access to business advisory services, training and incubation, access to funding, access to markets and policy formulation to create an enabling environment. The targeted sectors include agribusiness and agro processing, ICT, sports, tourism and creative arts, health, sanitation and waste management, transport and logistics, fashion and beauty, manufacturing and industrial processing.

Other initiatives under the NEIP are the Presidential Pitch, School Entrepreneurship Initiative (SEI), Greenhouse Estates Project and Youth in Industry. The Presidential Pitch provides financial support to

entrepreneurs under 35 years who are in the ideation stage of business. In 2019, the winner of the pitch competition was a team of two females of Kwame Nkrumah University of Science and Technology who process sanitary pads using plantain and banana fibre. SEI inculcates entrepreneurship mindsets among students through the creation of student clubs in secondary schools. The Greenhouse project seeks to modernize vegetable production and produce import-substituted goods and solve the problem of food security. The last initiative, Youth in Industry's goal is to build a sub-contracting industry to feed the larger industries. The various initiatives will be the springboard to stoke creativity in young people.

Nation Builders Corps (NABCo)

To tackle the challenge of unemployment and provide decent jobs to the youth, the government introduced the National Builders Corps. The program places unemployed graduates in both the public and private sector to enable them to develop skills for the workplace. The debut recruitment engaged 100,000 graduates who are placed in seven modules namely Educate Ghana, Heal Ghana, Feed Ghana, Revenue Ghana, Digitize Ghana, Civic Ghana and Enterprise Ghana.

Education

The educational institutions represent another crucial actor in the innovation ecosystem. These institutions play three key roles and are important due to their knowledge generation, impartation and diffusion roles they play. First, educational institutions are responsible for feeding the ecosystem with the raw materials i.e. human resources. Secondly, through their research activities, they play a role in discovering and inventing for the future and various ground-breaking solutions have been generated by such institutions. An example of this would be The Council for Scientific and Industrial Research, Ghana (CSIR) who are continuously researching and introducing several disease-resistant seeds to the market for farmers in Ghana. Finally, these institutions transfer knowledge to industry. While the universities produce the knowledge, industries implement it. For instance, the CSIR's egg powder innovation has been commercialized by entrepreneurs into marketable products.

Free Senior High School Policy

The policy seeks to eliminate the cost barrier and create an equal playing field for Ghana's youth to access education to the secondary school level. In the words of



the President of the 69th Session of the United Nations General Assembly, H.E Sam K. Kutesa, “the more young people grow into well-educated adults with fewer dependents and new opportunities to acquire wealth, savings and purchasing power, the more they will be able to accelerate economic growth and development”. The policy will produce a pipeline of skilled youth for the industry. As a result of the policy, the enrolment in 2018 (490,882) represented an increase of 36% over the 2017 enrolment (361,771).

Incubators and Accelerators

The third component of the innovation ecosystem is the business incubators, accelerators and entrepreneurial support organizations. These organizations are “designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections.” Incubators provide a “safe space” for entrepreneurs to test and validate their ideas before they enter the market. An incubator such as MEST Ghana, provides individuals with software and entrepreneurial training. Through these initiatives, innovators and entrepreneurs are able to identify several landmines which could have cut short their entrepreneurial life. Accelerators in addition to the education, mentoring and networking often provide financial investment as well. Limited data exists on the impact of incubators/accelerators in Ghana. However, findings from the Acceleration in Sub-Saharan Africa report points to the fact that direct funding, network and business skills were the main benefits entrepreneurs received from the sampled entrepreneurs. Research also shows that attending an accelerator is positively associated with three outcomes measures: survival, employee growth, and funds raised.

Public/Private Sector interventions

Ghana Tech Lab

The Ministry of Communications under their eTransform project has implemented ICT projects to promote digital entrepreneurship and create digital jobs. With support from the Ministry and World Bank, the Ghana Tech Lab project is being implemented by Kumasi Hive and Innohub which are both private institutions with demonstrated experience in incubating and accelerating youth innovation in the country. The lab harnesses youth

innovation by providing prototype testing labs, maker and creative spaces, robotics and artificial intelligence labs and coworking spaces. As part of its programs, the lab trains young people in web and application development.

Ghana Innovation Hub

Ghana Innovation Hub is another project under the eTransform project of the Ministry of Communications. The hub was set up by a consortium made up of BlueSpace Africa, the Ghana Technology University College and MDF West Africa. These private organizations support youth innovations by providing business development, investor matchmaking services among others. The hub also hosts other initiatives like the Orange Corners of the Netherlands Embassy which is also designed to support early-stage businesses.

Ghana-Oracle Digital Enterprise Program (GODEP)

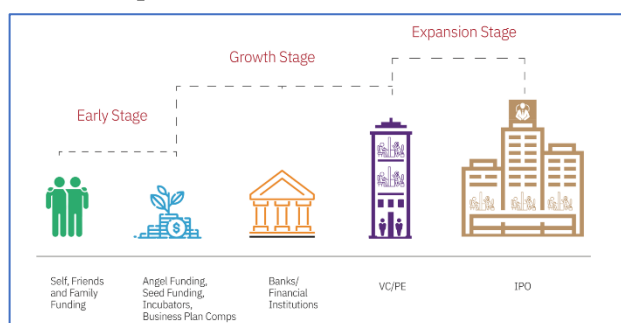
GODEP is an initiative launched in 2019 by the government of Ghana and implemented by the Accra Digital Centre in partnership with Oracle’s Global Startup Ecosystem. An acceleration program which provides startups with modern business resources and technologies. GODEP aims to accelerate 500 local startups. The program accelerates startups in the areas of agritech, cybersecurity, digital health, industry 4.0, fintech, watertech. Selected startups go through a 3-month incubation period where they are exposed to modules in designing, developing and deploying their technologies. Participants are awarded access to oracle’s ecosystem, experts, hands-on workshop on cloud technology, mentorship and advisory, networking opportunities and publicity.

The first two startups (Health Direct Global and Techshelta) selected to join the program have gone on to win international awards. Techshelta which builds internet-of-things devices to enable greenhouse farmers to remotely control their operations won the 2019 African Green Revolution Forum Pitch AgriHack competition. Health Direct Global, a healthtech startup which leverages on artificial intelligence to build electronic health records which match users to health providers in real-time and also provide alternative health financing for people at the bottom of the pyramid won the PwC Japan Prize for Business Model, Innovation and Scalability at the Japan/Africa Pitch Competition held during the 2019 Tokyo International Conference on African Development Forum.

Finance

Access to finance, the fourth pillar also plays a critical role in the innovation ecosystem. Finance enables organizations to conduct research, adopt technologies necessary for inventions as well as develop and commercialize innovations. The different stages of innovation require different types of financial support. The image below illustrates this.

Figure 2
Stages of innovation and financial support required for each step



Source: Adioma

Angel Investors are high net worth individuals who provide financial support in exchange for equity. They are normally the first external option for startups because of their high tolerance for risk. These financiers come in quite early in the life cycle of a business. Apart from providing money, they provide entrepreneurs with mentorship and access to their network. At the early stage (i.e. ideation or proof-of-concept), angel investors are instrumental in the innovation ecosystem because they spur innovation through financing, as well as “de-risking” innovation at the early stage for future investment. The Accra Angels Network has been established to play this role. Similar to angel investors, venture capital firms (VCs) also provide capital to early or growth stage companies. Unlike angels who often operate informally. In developed economies, banks often step in to provide capital to start-ups and Small Medium Enterprises (SME). In emerging markets, however, commercial banks tend to shy away from lending to startups and SMEs, as it is risky and costly. Although, in Ghana, some banks have developed products for SMEs this has not yet been extended to start-ups.

In summary, the entrepreneurial finance ecosystem i.e., angels, venture capital and banks are instrumental in the development of the innovation landscape. In Ghana the entrepreneurial finance ecosystem is in its nascent

stages with capital flow for innovation generated mainly from foreign investors. Policies must be implemented to incentivize local high net worth individuals and financial institutions to support innovation in the country.

Tax Amendment Act

To stimulate entrepreneurship and innovation, the government in 2018, amended the income tax act to provide tax relief for young entrepreneurs under the age of 35. Government through the National Entrepreneurship and Innovation Plan grants tax holidays to startups. The policy exempts the income of businesses in the manufacturing, information and communications technology, agro processing, energy production, waste processing, tourism and creative arts, horticulture and medicinal plants sectors from tax for a period of five years. Entrepreneurs are also entitled to carry forward any unrelieved loss for a period of five years. Furthermore, post the five years tax holidays, the business will also enjoy reduced tax rates based on their location. Businesses located in Accra and Tema will be taxed at 15%. Business located in other regional capitals outside the three Northern regions will be taxed at 12.5% while those located outside the other regional capitals will be taxed at 10%. Those located in the three Northern regions however, will be taxed at 5%. The empirical analysis suggests that the most effective way to increase innovation and productivity is through government tax subsidies and grants.

Venture Capital Trust Fund Act

The Venture Capital Trust Fund (VCTF) was established by Venture Capital Trust Fund ACT, 2004, (ACT 680) which aims “to provide financial resources for the development and promotion of venture capital financing for Small and Medium Enterprises (SMEs)”. Since its creation in 2004 by the Venture Capital Trust Fund Act (Act 680), the VCTF has leveraged its seed funding to increase the pool of funds available for SME investing over US\$40 million through the private partnership agreements.

Accra Angels Network

Accra Angels Network a private sector initiative that provides the platform for ‘mid-to-high’ net worth individuals or institutions to invest their funds and resources in Ghanaian based early-stage businesses, which have a significant growth potential. Besides investment, the network also provides training for both investors and entrepreneurs, mentorship and access to networks and markets.



Private Sector

Innovation typically sits within the private sector as they conduct research and development, drive knowledge-sharing networks, and investment in infrastructure. These activities catalyze, and increase innovation. Investment in telecommunication infrastructure over the years has facilitated the mobile money/ fintech revolution in Ghana.

Furthermore, the private sector also provides platforms which nurture future innovations. Corporate hackathons such as the Ecobank Fintech Challenge provides entrepreneurs in fintech the opportunity to birth solutions using the bank as a sandbox. Moreover, the private sector are potential customers or acquirers of innovation. In developed countries, corporations are always on the search for acquisitions of innovative ideas.

In Ghana the private sector has begun to play an active role in the innovation ecosystem. These activities and interventions undertaken by corporates now go beyond the idea of corporate social responsibility. Corporates now contribute to society from the perspective of shared value. Shared value is defined “as policies and practices that enhance the competitiveness of companies while improving social and environmental conditions in the regions where they operate”. This business strategy focuses on creating economic benefit while identifying and solving social problems. For a program to be deemed as a shared value, there must be an identified economic benefit to the company as well as a measurable social or environmental impact. The concept of doing well while doing good is exhibited in these circumstances. In other words, corporates ensure that their bottom line is impacted as well as impacting the socio-economic environment they operate in.

Through corporate interventions, new solutions are provided, jobs are created, income is generated for individuals and governments, governments that are dedicated to the growth and development of efficient ecosystems should prioritize private sector/ corporate participation for accelerated results.

Stanbic Bank Ghana, offers a shared value program through their Stanbic Business Incubator. The program offers a safe space for youth innovation. Innovators and entrepreneurs through the incubator have the opportunity to test their ideas and get the needed support to scale. Although the bank is helping to solve societal problems through this initiative, it also contributes to its growth strategy. This is key considering an initiative as a shared value. The incubator provides the

bank with a pipeline of future customers and innovative business models it can tap into.

The Kosmos Innovation Center (KIC), an intervention of Kosmos Energy Ltd. was established in 2016 to tackle the numerous challenges in the agriculture sector. According to the Chairman and CEO, Andy Inglis "it's in our company culture to tackle tough challenges, so we decided to grapple with the issues facing agriculture – Ghana's most important sector and largest employer". Through this intervention, 500 budding entrepreneurs have been trained and 19 startups have been launched out of which 14 have joined the incubator program. KIC has facilitated over \$300m in seed funding for the startups which has led to the creation of more than 200 new jobs.

Another important sub-component of the private sector is the media. The media educates, informs, persuades and entertains the public. In the innovation ecosystem, the media helps to put a spotlight on innovation. Furthermore, private sector plays a role in advocacy, engaging government and policy makers through the vehicle of networks and associations.

The 'Joy Business Van' – an entrepreneurship-focused series by Joy TV seeks to give Small and Medium Scale enterprises and startups visibility to attract potential markets. The show also highlights their issues and challenges. Similarly, Citi FM's Citi Trends host Ghana's bright talents in the technology ecosystem on conversations on technology solutions in an emerging market as Ghana. Ashesi University's Y Campus Express Radio also runs programs that are aimed at sensitizing the students and the general public on the concept of entrepreneurship.

Another actor to be discussed in the innovation ecosystem are the civil society organizations. According to the World Bank, civil society includes “the wide array of non-governmental and not-for-profit organizations, labour unions, indigenous groups, charitable organizations, faith-based organizations, professional associations, and foundations.” These organizations play several roles in the ecosystem. Economic development focused foundations support new and creative solutions to end persistent global problems. They implement their goals by providing diverse support to innovators. Other civil society organizations are also involved in lobbying, monitoring and policy advocacy and are often advocating for changes in the innovation ecosystem.

The final actor under lens are the development agencies. Development agencies being an actor, are usually governmental agencies which support

development. Development agencies seek to find alternate routes to social and economic development in developing countries. In that vein, they support the innovation ecosystem by providing blended finance instruments to de-risk early-stage innovations as well as providing ecosystem building support. In 2019, the French Development Agency through their Chose Africa agenda dedicated 2.5 billion euros to support African entrepreneurs by 2022. The German Development Agency (GIZ) Ghana, through its “Digital skills for entrepreneurial women” project, provides digital skills for women. Development agencies provide key support for economic development in developing countries however more work needs to be done to ensure alignment between their objectives and the host country.

There are also sector specific policies to encourage youth participation namely agriculture and financial technology. The agriculture sector is the largest employer in Ghana however this is not reflective in the contribution to GDP. The government is therefore encouraging youth participation and innovation in this sector. The policies listed below are a reflection of this.

Youth in Agriculture Programme

The Youth in Agriculture Programme (YIAP) is a Government of Ghana (GOG) agricultural sector initiative with an objective of motivating the youth to accept and appreciate farming/food production as a commercial venture, thereby taking up farming as a lifetime vocation. The YIAP has the task and responsibility of mobilizing the youth to take up farming and its other related activities as a lifetime vocation. By so doing the following benefits will be derived from the employment for the youth, through the provision of tractor services and agro-inputs; In advance economies, governments’ policies help spur commercial innovation and governments invest heavily in research and development. Research is often commercialized which can lead to innovative products and services which drive economic growth. In comparison in developing economies, governments lack the financial and human resources to do so. Governments encourage private sector participation to fill the necessary gaps however policies and incentives are yet to be developed to catalyse this.

Rural Enterprises Programme ENABLE Youth 1 District 1 Factory Initiative

The Rural Enterprises Programme is funded by the Government of Ghana, African Development Bank and the International Fund for Agricultural Development. The

project seeks to reduce poverty and improve living conditions in rural areas by improving technology and skills needed for private sector development. A sub-component of the project is the Enable Youth initiative which seeks to encourage young graduates to own and manage agro-processing factories in selected districts across the country. To ensure sustainability, Enable Youth 1D1F adopts a continuum of value chain approaches in ensuring that young entrepreneurs own and manage Strategic Business Units (SBUs) representing major operations entry points of the factories. Enable Youth will provide holistic support to entrepreneurs by offering a comprehensive and integrated package of training in agribusiness, financing, continuous mentorship and partnership with the private sector, business and professional associations. According to the Minister of Finance, 58 small processing factories are expected to be set up in 2020.

Digital Finance Policy

Advancement in technology and improved internet connectivity has led to a new era of digital financial services in Ghana disrupting the business models of traditional financial institutions. Financial technology has accelerated financial inclusion providing access to financial services to the unbanked. With a budding digital finance infrastructure, the government through the policy seeks to build on the gains made to create a resilient, inclusive and innovative DFS ecosystem that contributes to social and economic development. The policy identifies six areas for action; governance, enabling regulation, capacity building, market infrastructure, digital payment use cases and support for fintech. As part of the short-term action plan, the government is expected to provide direct support for fintech entrepreneurship. Through the National Entrepreneurship and Innovation Plan, specific innovation hubs that support young fintech entrepreneurs will be developed. These hubs are the platform which provides entrepreneurs with business development services, access to finance and mentorship opportunities. Furthermore, the government is expected to promote tech and entrepreneurship-focused curricula in universities and technical schools to help groom the next generation of fintech entrepreneurs. The policy has the potential to spur youth-led innovation and access to finance will contribute to the decent work and economic growth of the people.



4. Policy Recommendations

Strategies to enhance the critical contributions of STI and the role of the youth and private sector in achieving the SDGs.

From the sample of policies reviewed that were targeted at promoting innovation, the following had a specific reference to youth involvement (Science Technology and Innovation Policy (2017), Income Tax (Amendment) Act, (2017), Free Senior High Policy, Digital Finance Policy (2019) and the National Youth Policy (2019)). We recommend that policy development should take a more collaborative approach and increase the level of youth consideration and engagement particularly in light of the demographics of the population and the predicted demographics by 2030.

The legal and regulatory processes could to be simplified to encourage youth to participate in the economy at a formal level also allowing for better data collection. Digitalizing processes will encourage more youth to formalize their businesses and seek the correct licensing for their innovations. The entire process can be simplified by moving applications online, some work is ongoing in this area which is being led by the Vice Presidents digital transformation unit.

The intellectual property (IP) system in the country needs to be strengthened and could also benefit from a digital transformation. Additional funding should be channeled to the enforcers of IP rights (i.e., Customs Excise and Preventive Service, the Police Service and the Judiciary) to allow them to operate effectively. On the continental front, the two regional IP frameworks i.e., the African Regional Intellectual Property Organization and the Organization Africaine de la Propriété Intellectuelle which guarantees IP rights for Anglophone and Francophone countries respectively need to be linked. In its current state, patents issued under the Anglophone framework are not recognized under the Francophone framework and vice versa. A unified framework, provides innovators with the assurance that they are protected particularly in light of the onset of the Africa Free Trade Area.

The importance of human capital development cannot be overlooked. Although the government has implemented the Free SHS policy a bold and necessary step in the right direction. African youth need to receive

an education that is relevant and is directed towards developing the skills needed to be productive adults. School curricula must be reviewed to suit global standards. Public education institutions lack the requisite tools and equipment needed to enhance the teaching and learning of science and technology. Local innovators are attempting to solve for some of these challenges. This presents an opportunity for collaboration between government, private sector and innovators strengthening several components of the ecosystem.

The anticipated NEIP Fund could act as a catalyst for investors to participate in the venture capital asset class. In addition, policies must be instituted to stimulate participation and encourage angel investment. The minimum capital requirement of \$200,000 for joint venture investments must be re-evaluated. Early-stage entrepreneurs typically raise funding from angel investors who invest approximately \$10-50,000, the \$200,000 threshold is therefore a deterrent. There are several examples of best practice across the continent as well as globally and the Africa Venture Capital Association in addition to the Africa Business Angels Network are available to provide support to local actors.

Studies show that reducing the price of R&D by 10% increases investment in innovation by 10% in the long run. Interventions such as the Kosmos Innovation Center and SB Incubator as well as technology hubs and innovation centers across the country could be included in the tax incentive regime. The President's pledge of ensuring that at least 1% of Ghana's GDP goes towards research and development, and subsequently increased to at least 3% overtime presents an opportunity to aggregate and channel the necessary funding toward the ecosystem. In South Africa 2.5% of corporate tax is allocated to innovation parks to support the development of the local ecosystem. Also, the establishment of the National Research Fund will stimulate interest in research and development at the tertiary institutions level.

Furthermore, the construction of sustainable infrastructure such as roads, electricity and communication networks are key for development. A thriving digital sector requires adequate digital infrastructure, technology-literate end-users, technology talent with an entrepreneurial spirit, and a friendly business environment. Although mobile penetration in Ghana is estimated at 130% of the population, however, internet penetration is as low as 48%. Investment in digital infrastructure should be prioritized.

Academia-industry collaboration is critical, currently, both industries are disconnected with limited

collaboration. The basic function of universities is to create knowledge through research, to act as long-term guardians of this knowledge and to transmit it to others through education. Industries on the hand practicalize the theories produced in universities. An academia-industry collaboration is a win-win situation for both parties. Universities will have the opportunity to test the practical application of their research, access funds for academic research, gain insights on research, further the universities outreach mission and look for a business opportunity. Industries will have the opportunity to solve specific technical or design problems, develop new products and processes, conduct research leading to new patents, improve product quality, reorient R&D agenda and have access to new research via seminars and workshops.

Finally, the implementation of policies and the monitoring and evaluation of projects and initiatives should remain a priority. The recent establishment of the Ministry of Planning and the Ministry of Monitoring and Evaluation could be considered best practice if they are able to combine efforts and work together to ensure that there is first cohesion across policies and second joint efforts toward implementation.



5. Conclusion

Although Ghana's ecosystem is in nascent stages, there has been rapid development over the last 10 years. With an intentional strategy the next 10 years could see Ghana positioning themselves as one of the most vibrant ecosystems on the continent. The decade of action could be used as an opportunity to develop partnerships across the continent and globally to harness best practice for accelerated growth. Ghana has laid a strong foundation however it appears that there isn't a specific objective or a target in place in relation to the innovation ecosystem or contributions towards the attainment of the SDGs.

References

A New Chapter for the Kosmos Innovation Center – Kosmos Energy | Deepwater Exploration and Production. (2019). Retrieved 15 October 2020, from <https://www.kosmosenergy.com/latest-news/a-new-chapter-for-the-kosmos-innovation-center/>

Adu, G., Marbuah, G., & Mensah, J. (2013). Financial development and economic growth in Ghana: Does the measure of financial development matter? *Review of Development Finance*, 3(4), 192-203. doi: 10.1016/j.rdf.2013.11.001

Africa's first challenge: the youth bulge stuck in 'waithood'. (2019). Retrieved 15 October 2020, from <https://mo.ibrahim.foundation/news/2019/africas-first-challenge-youth-bulge-stuck-waithood>

Ben S. Bernanke, "Promoting Research and Development: The Government's Role," Federal Reserve, May 2011

Bloom, Nicholas, John Van Reenen, and Heidi Williams. 2019. "A Toolkit of Policies to Promote Innovation." *Journal of Economic Perspectives*, 33 (3): 163-84

Bone, J., Gonzalez-Uribe, J., Haley, C., & Lahr, H. (2019). The impact of business accelerators and incubators in the UK.

Business Incubator Definition - Entrepreneur Small Business Encyclopedia. (2020). Retrieved 15 October 2020, from <https://www.entrepreneur.com/encyclopedia/business-incubator>

Chichilnisky, Graciela, 1998. "The knowledge revolution," MPRA Paper 8891, University Library of Munich, Germany.

Choose Africa. (2020). Retrieved 15 October 2020, from <https://choose-africa.com/en/>

Civil Society (2005). Retrieved 15 October 2020, from <https://www.worldbank.org/en/about/partners/civil-society/overview>

Digital 2020: Ghana — DataReportal – Global Digital Insights. (2020). Retrieved 15 October 2020, from <https://datareportal.com/reports/digital-2020-ghana>

Financing Innovation. (2020). Retrieved 15 October 2020, from <https://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/content/financing-innovation/index.html>

Freeman, C. (1995). The 'National System of Innovation In historical perspective. *Cambridge Journal of economics*, 19(1), 5-24.

Global Accelerator Learning Initiative (2018). Retrieved 15 October 202, from <https://cdn.ymaws.com/www.andeglobal.org/resource/>



resmgr/research_library/ssafrica_data_summary__feb_1.pdf

Growth Driver: Developing Digital Services. (2013). Retrieved 15 October 2020, from http://reports.weforum.org/delivering-digital-infrastructure/growth-driver-developing-digital-services/?doing_wp_cron=1597740784.2213830947875976562500

Here's what millennials really want from business, and why. (2017). Retrieved 15 October 2020, from <https://www.weforum.org/agenda/2017/09/heres-what-millennials-really-want-from-business/>

Human Development Reports. (2019). Retrieved 15 October 2020, from <http://hdr.undp.org/en/countries/profiles/GHA>

Implementation of the Ghana Shared Growth and Development Agenda (GSGDA) II, 2014-2017 (2017). Retrieved 15 October 2020, from <https://s3-us-west-2.amazonaws.com/new-ndpc-static1/CACHES/PUBLICATIONS/2019/05/31/2017+APR.pdf>

Innovation Is the Only Way to Win the SDG Race. (2019). Retrieved 15 October 2020, from <https://www.bcg.com/publications/2019/innovation-win-sdg-race>

Ministry of Finance. National Budget (2019). Retrieved 15 October 2020, from <https://www.mofep.gov.gh/sites/default/files/budget-statements/2019-Budget-Speech.pdf>

National Science, Technology and Innovation (2017 – 2020) (2020). Retrieved 15 October 2020, from <https://mesti.gov.gh/wp-content/uploads/2017/07/Draft-National-STI-Policy-Document-10-July-2017.pdf>

Rosenberg N. (2014). Innovation and Economic Growth. Retrieved from <https://www.oecd.org/industry/tourism/34267902.pdf>

Transforming our world: the 2030 Agenda for Sustainable Development: Sustainable Development Knowledge Platform. (2015). Retrieved 15 October 2020, from <https://sustainabledevelopment.un.org/post2015/transformingourworld>

UNCTAD (2017). New innovation approaches to support the implementation of the Sustainable Development Goals

United Nations Development Programme (2016). Retrieved from

<https://www.undp.org/content/dam/undp/library/innovation/Version%2024%20web%20friendly%20-%20August%2020-%20Annual%20Report%202016%20V17.pdf>

What Is Shared Value - Driving Corporate Purpose | Shared Value Initiative. (2020). Retrieved 15 October 2020, from <https://www.sharedvalue.org/about/what-is-shared-value/>

Scale Up! Entrepreneurs Guide to Investment in Ghana (2019). Retrieved 15 October 2020 from https://make-it-initiative.org/africa/wp-content/uploads/sites/2/2019/11/Ghana_Investment_Guide.pdf

Sun, S. L., Zhang, Y., Cao, Y., Dong, J., & Cantwell, J. (2019). Enriching innovation ecosystems: The role of government in a university science park. *Global Transitions*, 1, 104-119.

The Five Best Policies to Promote Innovation — And One Policy to Avoid. (2019). Retrieved 15 October 2020, from <https://www.gsb.stanford.edu/insights/five-best-policies-promote-innovation-one-policy-avoid>

Youth empowerment, education, employment key to future development - Office of the Secretary-General's Envoy on Youth. (2015). Retrieved 15 October 2020, from <https://www.un.org/youthenvoy/2015/06/youth-empowerment-education-employment-key-future-development/>

Youth and innovation in Africa: harnessing the possibilities of Africa's youth for the transformation of the continent | United Nations Economic Commission for Africa. (2014). Retrieved 15 October 2020, from <https://www.uneca.org/publications/youth-and-innovation-africa-harnessing-possibilities-africa%E2%80%99s-youth-transformation>