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OACPS R&I PSF

Guidelines for Cooperation and Management of Innovation Hubs in KENYA

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OACPS RESEARCH AND INNOVATION PROGRAMME

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List of Abbreviations

ACIH	Association of Countrywide Innovation Hubs
ACTS	African Centre for Technology Studies
ALN	Africa Legal Network
ASSEK	Association of Start-up and SMEs Enablers of Kenya
AVCA	African Private Equity and Venture Capital Association
CDC	Centres for Disease Control and Prevention
COVID-19	Coronavirus disease of 2019
DEG	German Investment Corporation
DFC	U.S. International Development Finance Corporation
DIH	Digital innovation hub
EASTECO	East African Science and Technology Commission
EAVCA	East Africa Private Equity & Venture Capital Association
EC	European Commission
EoI	Expression of Interest
EU	European Union
EUD	European Union Delegation
FCDO	Foreign, Commonwealth & Development Office (UK)
FDI	Foreign direct investment
FGD	Focus group discussion
FSD	Financial Sector Deepening
GALAI	Global Accelerator Learning Initiative
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GSMA	Global System for Mobile Communications
HEI	Higher education institution
IBM	International Business Machines Corporation
ICT	Information and communications technology
IIEC	Innovation, Incubation and Entrepreneurship Centre
IP	Intellectual property
KEBS	Kenya National Bureau of Statistics
KECOBO	Kenya Copyright Board
KENIA	Kenya National Innovation Agency
KEPHIS	Kenya Plant Health Inspectorate Service
KII	Key informant interviews
KIPI	Kenyan Industrial Property Institute
KIRDI	Kenya Industrial Research and Development Institute
KOTDA	Konza Technopolis Development Authority
KPI	Key performance indicators
MNC	Multinational corporation
MSME	Micro, small and medium-sizes enterprise
MTP	Medium-term plans
NACOSTI	National Commission for Science, Technology and Innovation
NRF	National Research Fund
OACPS	Organisation of African, Caribbean and Pacific States
OFDI	Outward foreign direct investment

PE	Private equity
PKF	Pannell Kerr Forster
PSF	Policy support facility
PWC	Price Waterhouse Coopers
R&D	Research and development
R&I	Research and innovation
SME	Small and medium-sized enterprises
STI	Science, technology and innovation
TAU	Technical Assistance Unit
TTO	Technology transfer offices
TVET	Technical and vocational education and training
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
USIU	United States International University
VC	Venture capital

Glossary of Terms and Definitions

Accelerator hubs

Innovation Hubs that offer cohort-based learning and fixed-term programmes, usually for less than one year.

Business start-ups

New entrepreneurial or innovative small businesses / business units that emphasise growth by pursuing strategic objectives and innovation.

Business start-up development framework

Different stages of development for new innovative business start-ups.

Corporate Innovation Hubs

Usually accelerators or incubator hubs, which are internally managed and funded by corporations or multinational corporations.

Digital Innovation Hubs (DIHs)

Innovation Hubs that help businesses to become more competitive by improving productivity in office activities and production processes through digital technologies. Some DIHs support new digital products and service development.

Enterprise hubs and co-working spaces

Innovation Hubs that provide shared physical workspaces and office facilities for new start-ups, small businesses and independent or freelance workers.

Hackerspaces

Innovation Hubs fitted with production equipment and machinery, product development technology. The focus is on software and computer hardware technologies.

Horizontal-focus hubs

General or non-specialised Innovation Hubs that primarily provide business support services. A mix of industries and sectors are supported.

Incubator hubs

Innovation Hubs that assist early-stage start-ups to transform from a business concept to a business enterprise, by offering advisory services, minimal input resources and training.

Innovation Hubs

Business intermediary service providers that support and nurture new business start-ups through different developmental stages. Innovation Hubs include: accelerators, co-working spaces, Digital Innovation Hubs, hackerspaces, incubators, innovation labs and makerspaces.

Innovation hub services

Provision of physical facilities, technical assistance, business skills training and, occasionally, financing for start-up businesses during different developmental stages.

Makerspaces

Innovation Hubs fitted with production equipment and machinery and product development technology. The focus is on small scale manufacturing (particularly at the jobbing and project process scale) and engineering.

R&D hubs and innovation labs

Innovation Hubs that can support the commercialisation of basic or applied research. These intermediaries are usually attached to or co-located within higher education institutions (HEI), further education institutions (FEI) or government-funded research centres.

Sector or industry-focus hubs

Innovation Hubs that specialise in a specific industry or sector. Sector specialisation can also include social policy issues and support wider inclusion priorities.

Technology-focus hubs

Innovation Hubs that focus on emerging technologies such as software, biotechnology, robotics, or instrumentation.

Executive Summary

The guidelines for coordination and management of Innovation Hubs in Kenya have been prepared under the framework of the OACPS R&I Policy Support Facility (PSF). This support has come about from a request by the Kenya National Innovation Agency (KeNIA), which is the national agency responsible for coordination, promotion, and regulation of the national innovation ecosystem, which includes, among others, skills development, policy formulation, monitoring and evaluation, dissemination, funding, and promotion.

Innovation Hubs in Kenya have mushroomed rapidly across the country over the last five years, from a few hubs to over 200. Although the innovative spirit is encouraging, national coordination is minimal and support could be stronger. According to the stakeholders in the Kenyan innovation ecosystem, Innovation Hubs and hub networks are facing several challenges. Challenges include a lack of clarity on the definition of Innovation Hubs, limited skills, gender disparity, funding, access to information, inadequate linkages, a lack of certification mechanisms, a lack of performance indicators, a lack of measurements of impact, limited capacity, the absence of a registration system for hubs, and limited collaboration and partnerships. There is also no policy on how foreign organisations can establish Innovation Hubs in Kenya.

The Government of Kenya recognises the important role Innovation Hubs play in facilitating business start-ups and innovation and is therefore keen to work with key stakeholders to address a number of significant challenges. The imperative for the government is not to regulate Innovation Hubs or national and country-wide hub networks and associations. The government wants to support and safeguard quality services that are offered to new and emerging businesses.

The purpose of these guidelines is to provide definitions, insights and emerging good practices for innovation hub managers and policy makers to facilitate services and business approaches that can support business start-ups. The guidelines also address the issues of certification and registration of Innovation Hubs for the purpose of coordination, access to funding and provision of government support and services. The guidelines also provide modalities for establishing Innovation Hubs and networks in Kenya.

These recommended guidelines provide the Kenya National Innovation Agency with the necessary modalities to enable it to effectively deliver on its mandate as per the STI Act 2013.

1 Introduction

1.1 OACPS R&I POLICY SUPPORT FACILITY

These recommended Guidelines for Coordination and Management of Innovation Hubs in Kenya have been prepared under the framework of the OACPS Research and Innovation (R&I) Policy Support Facility (PSF). The PSF was launched by the Organisation of African, Caribbean and Pacific States (OACPS), with funding from the European Union (EU), within the framework of the OACPS R&I Programme (oacps-ri.eu). The objective of the PSF is to support OACPS member countries to extend and improve the quality and efficiency of their R&I policies and practices. The PSF is a demand-driven policy support mechanism that responds to requests for national R&I policy reforms and adaptations from OACPS member countries. Through a coherent and systematic approach, the PSF offers tailor-made services that are based on country needs and are impact-oriented and evidence-based. International and local experts with experience in relevant R&I fields from (mainly) OACPS and EU countries are mobilised to carry out the services and formulate concrete advice and recommendations to design, implement or evaluate reforms in the field of R&I at the programme, policy and wider systemic-level.

1.2 THE PSF SERVICE IN KENYA

The Kenya National Innovation Agency (KeNIA) is the national agency that is responsible for the coordination, promotion and regulation of national innovation policies and programmes in Kenya. Long-term economic development can be achieved through locally-driven technological and social innovation and KeNIA is responsible for (among others) skills development, policy formulation, monitoring, evaluation and learning, dissemination, funding and promotion. In order to strengthen the Kenyan innovation ecosystem, KeNIA requested support from the OACPS R&I PSF to assist with two significant challenges, namely the commercialisation of basic research and the coordination of Innovation Hubs. The focus of these guidelines is on the latter priority.

Research and innovation intermediaries are a critical component of the emerging innovation ecosystem, particularly Innovation Hubs, which contribute to supporting innovation through new business development. Innovation Hubs, consisting of co-working spaces, incubators, accelerators, makerspaces/hackerspaces and innovation labs, are contributing to the development of business start-ups across Africa (Giuliani and With, 2019). Innovation Hubs can be private businesses, not-for-profit organisations and programmes implemented by local and national government agencies. Three factors have contributed to the rapid growth of Innovation Hubs in Africa: (i) improved innovation ecosystems and operating environments, (ii) increased availability of venture capital, and (iii) pre-existing hubs adapting and introducing emerging good practices to deliver new and more effective services (Schmitt and Muyoya, 2020). Innovation Hubs are making in-roads in Kenya and are becoming an important enabler of new business development.

The growth of Innovation Hubs in Kenya has increased over the last five years with more than 200 hubs operating in the country in 2022 (UNDP, 2022). The Government of Kenya recognises the enabling role Innovation

Hubs play in facilitating business start-ups and innovation. However, coordination of activities at the national level is minimal and support could be stronger, for example, in setting national definitions and standards. The imperative for the government is not to regulate Innovation Hubs or national and country-wide networks and associations. Nor does the government intend to discourage future hubs from being established. Rather, the government wants to ensure that all the manifestations of Innovation Hubs can offer quality services to nascent business and are responsible agents for positive development.

1.3 ISSUES AND CHALLENGES IN KENYA'S INNOVATION ECOSYSTEM

The onset of 3G internet facilities in 2010 was instrumental in catalysing the ICT sector in Kenya. Internet connectivity and infrastructure coincided with the growth of technology-focus hubs that signified the development of the sector. By 2012, independent Innovation Hubs were established, along with the rise of token-based hackathons supported by larger corporations. This period saw the emergence of notable business start-ups such as m-Tiba and m-Ledger. By 2015, hubs had become the mainstay of the ICT industry, and had begun expanding across the country, including areas outside of the Nairobi metropolis (notably Mombasa, Kiambu, Kisumu, Machakos, and Taita-Taveta). The introduction and support of these early hubs from the Ministry of ICT further bolstered the activity at the grassroots level and positioned these Innovation Hubs as integral enablers. This was accompanied by initiatives to create policy frameworks to govern the space. By 2017, the Government of Kenya launched Konza Technopolis, which has seen increasing interest by investors (by 2022, 70% of Phase 1 has been taken up by investors, led by local investors, while Phase 2 has already attracted significant interest especially from large scale investors). Between 2019 and 2022, the ICT sector has experienced several transitions, including:

- Moving from token-based hackathons to project-based Innovation Hubs;
- The attraction of foreign innovators to the Kenyan innovation space;
- The emergence of fast growth companies led by innovations e.g. Twiga Foods;
- The launch of the Association of Start-up and SMEs Enablers of Kenya (ASSEK) to streamline the operations of enablers in Kenya; and finally
- The introduction of the Data Protection Law 2019.

1.3.1 Business Start-ups in Kenya

The term micro, small and medium enterprises (MSMEs), refers to small businesses in general in Kenya. Under the Micro and Small Enterprise Act of 2012, micro-enterprises have a maximum annual turnover of KES 500,000 and employ fewer than 10 workers. Small enterprises have a turnover between KES 500,000 and 5 million per annum and employ between 10 and 49 workers. While medium enterprises are not covered under the act, these firms comprise enterprises

with a turnover of between KES 5 million and 800 million and employ between 50 and 99 employees. Most small businesses are part of the informal sector, which often refers to self-employed and unregistered small businesses. The informal sector is estimated to constitute 98 per cent of business activity in Kenya, and accounts for 30 per cent of employment and three per cent of Kenya's GDP. The government acknowledges the positive contribution of the informal sector and is keen to integrate these businesses into the formal economy.

The following are some of the challenges facing business start-ups and policy-makers supporting the development of new businesses:[1]

i. **Clarity on definition:** there is generally a poor understanding of how best to define business start-ups. There is also a perception that start-ups are given less attention by the government compared to the wider SMEs constituency;

ii. **Limited business skills:** formal education does not prepare young people for business, let alone starting a new business. The most-in-demand skills required by businesses are marketing, legal and intellectual property, business development, and data base management;

iii. **No system for registration of business start-ups:** currently there is no system for the registration of business start-ups. Registration would make it easier to identify and monitor their growth and develop targeted interventions. However, registration may also bring about new layers of bureaucracy;

iv. **Gender disparity:** the majority of business start-ups are male dominated. Women-led start-ups account for less than 20 per cent;

v. **Protection and certification of innovations:** protection of innovations through intellectual property rights remains a challenge for most business start-ups. Only 40 per cent of business innovators have attempted to formally protect their innovations. The main reasons cited for this low uptake of intellectual property protection are: lack of information on intellectual property, the lengthy and time-consuming patent application process, the high cost of patent applications and maintenance, and infringement due to weak enforcement.

vi. **Funding of innovation development and commercialisation:** access to funding remains problematic:

   a. Few business start-ups have received investment funding. Most start-ups do not have business planning or 'idea pitching' skills.

   b. Most business start-ups do not have in place proper business management systems, which are often required to access funds from banks and other financial institutions.

vii. **Access to information:** most business start-ups do not have easy access to information about the available government and business support services, new business opportunities and policy and legislative requirements. Furthermore, information about funding opportunities is not widely available;

1 Adapted from UNDP (2022).

viii. **Inadequate linkages:** linkages among business start-ups, universities and research organisations are not strong. Collaborative practices require pro-active mechanisms to enable open innovation.

ix. **Start-up Bill:** The government's Start-up Bill lapsed following the end of the last parliament (2022). It will need to be re-activated in this new parliament in order to advance the necessary business priorities.

x. **Limited access to university laboratories and other infrastructure:** business start-ups have difficulties accessing specialised laboratories for product development and prototyping.

1.3.2 Innovation Hubs in Kenya

In 2022, more than 200 hubs in Kenya were identified, of which 148 were registered (UNDP, 2022). Managers and CEOs from Innovation Hubs and senior managers from ASSEK and ACIH identified the following challenges facing hubs and their activities to support new business start-ups[2]:

i. **Lack of clarity on definition:** there is generally confusion and a poor understanding of the definition of the different types of Innovation Hubs;

ii. **Minimum standards:** there is a need for minimum standards for the different types of Innovation Hubs;

iii. **Skills offered:** there is a demand from participants in the Innovation Hubs for short courses on innovation and business skills;

iv. **Measurement of activities:** there is no framework and accompanying set of indicators to measure the performance of hub activities;

v. **Measurement of impact:** there is little evidence to demonstrate the impact of Innovation Hubs on new business development and economic development;

vi. **Limited capacity of hubs:** the objectives of Innovation Hubs to achieve success may not be aligned with government objectives for training and increasing employment opportunities; for example, it is estimated that half of all Kenyan Innovation Hubs have supported no more than 10 innovators/ start-ups;

vii. **Limited use of existing infrastructure:** some county Innovation Hubs and the Ajira centres are either incomplete or underutilised. More effective uses of these facilities should be explored. For example, partnership programmes between the Ajira centres and the private sector could be encouraged;

viii. **Limited collaboration and partnerships:** the level of collaboration between Innovation Hubs and other R&I organisations is inadequate. Networking events are infrequent and collaboration with research institutions and universities are almost non-existent. Furthermore, there is little evidence of collaboration among Innovation Hubs;

ix. **No system for registration of hubs:** currently there is no registration system for Innovation Hubs in the country.

2 Adapted from UNDP (2022).

1.4 METHODOLOGY TO THE DEVELOPMENT OF THE GUIDELINES

This PSF service was requested to address many of the challenges raised in **Section 1.3**. Specifically, these recommended guidelines provide assistance to KeNIA, ASSEK and ACIH in the coordination and management of Innovation Hubs, incubation hubs and accelerators. Further insights are also provided on how the government can support networks and associations.

The expert panel undertook a comprehensive desk review (international, local and academic studies). Primary research consisted of semi-structured interviews and focus group discussions. The expert panel met with 24 key stakeholders including CEOs and managers of Innovation Hubs and business start-ups, and senior managers of the support associations (e.g. ASSEK and AICH). The expert panel also held consultative meetings with senior government officials responsible for higher education, research and STI. The findings from these efforts have been used to prepare this report.

The preparation of these recommended guidelines has also benefited from the findings of various studies undertaken between 2021 and 2022. Specifically, the following two studies were instrumental:

i. Mapping of the Innovation Ecosystem in Kenya - the UNDP, in collaboration with the Konza Technopolis Development Authority (KOTDA), the Association of Countrywide Innovation Hubs (ACIH) and the African Centre for Technology Studies (ACTS), undertook a comprehensive mapping of the actors of the Kenyan innovation ecosystem, to identify opportunities and challenges;

ii. Understanding the Kenyan Start-up Ecosystem - this project was undertaken by Kenyatta University in collaboration with Maitri Capital and the Kenya Industrial Research and Development Institute (KIRDI) and funded by the UK Foreign, Commonwealth & Development Office (FCDO). The objective of the study was to outline the evolution of the Kenyan start-up ecosystem during the last 10 years.

Finally, the expert panel has incorporated the views and comments from the PSF team, the national team, KeNIA, and other national stakeholders. Their input was especially crucial in the early draft versions of the report.

1.5 COVERAGE OF THE RECOMMENDED GUIDELINES

The following recommended guidelines provide definitions, insights and emerging good practices for innovation hub managers and policy-makers to facilitate services and business approaches that can support business start-ups. The recommended guidelines cover the following areas:

- **Section 2** provides definitions of business start-ups, innovation and the various types of Innovation Hubs. The guidelines also propose a set of indicators that can measure process and outcome performances;
- **Section 3** presents a set of standardised services and support that can be offered by Innovation Hubs. Services and support can include the provision of office and infrastructure, training in innovation, business start-up skills and transversal skills, and networking and collaboration to reach the wider research and innovation community;
- **Section 4** sets out the factors to consider when new Innovation Hubs are introduced. Key elements include: the ownership structure, business plans and specialisation, funding, selecting participants, management, collaborations and monitoring, evaluation and learning;
- **Section 5** offers insights into how best to support the network of Innovation Hubs, which can encourage collaboration among the different stakeholders in the research and innovation ecosystem at the local, national and regional level.

The goal of the recommended guidelines is to assist KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs. From a national perspective, there is also an urgency in Kenya to encourage wider participation from women, youth and people with disabilities. Business development should encompass all segments of the country. The challenge is to ensure open participation while ensuring that limited resources can support potential successful businesses.

2 Definitions and Indicators for Business Start-ups and Innovation Hubs

This section provides working definitions for business start-ups and innovations hubs. The section also presents a set of indicators, which can inform policy makers on how performance can be assessed. Performance measures can reveal trends and challenges and can assist in identifying emerging good practices.

2.1 INNOVATIVE BUSINESS START-UPS

Small businesses cover a wide range of business activities and are characterised by the following:

- Legally independent organisations, which means that owners / managers are free from outside control in taking key decisions. In Kenya, micro, small and medium size enterprises (MSMEs) are defined by employment bands with micro enterprises consisting of one to nine employees, small enterprises (10-49 employees) and medium size enterprises (50-99 employees) (Kenya National Bureau of Statistics, 2016);
- Small businesses tend to be owned and managed by the same individual and reflect a highly personalised management style. Formal structures are not always evident;
- Small businesses have a small share of the market and therefore do not influence prices or quantities produced or sold.

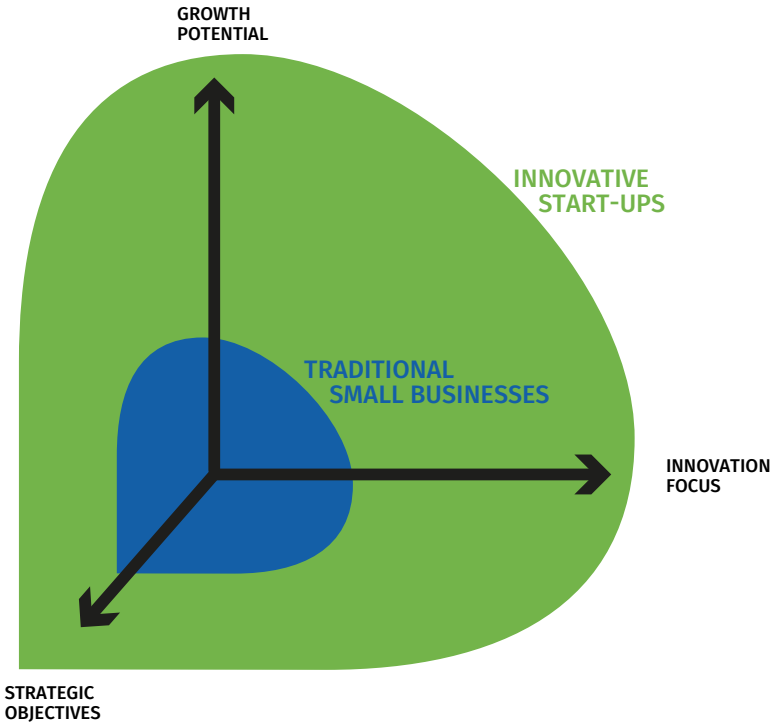
New business start-ups are also (usually) small businesses, or small business units, which are part of a larger organisation. Furthermore, business start-ups demonstrate three other unique attributes:

- The focus of business activities is directed towards innovation, e.g. new products or new services or new processes;
- Strategic objectives are more encompassing and include short- and long-term goals and planning;
- Potential for high levels of growth.

Innovation is critical for businesses start-ups, which sets them apart from other small businesses. Entrepreneurial or innovative small businesses place a priority on innovation and creativity, whether this is in new products and services, or being creative with the use of very limited resources to improve processes or new business models. It is the innovation potential that can create higher rates of growth. Growth is achieved by focusing on the introduction of innovation, and is directed by business strategy and planning. Innovation though is pitted with unknowns and innovative businesses have to accept higher levels of risk and uncertainty than other traditional businesses (Burns, 2016). While some risks can be mitigated by the development of skills and competencies and possibly financial support, uncertain outcomes remain, and failure is never far away.

While innovative start-ups are small businesses (for the most part) by definition, these firms can be distinguished from other small businesses by their activities and intention. **Figure 1** illustrates the weight placed on growth potential, strategic objectives and innovation by innovative start-ups and traditional small businesses.

Figure 1 **The small business space: innovative start-ups and traditional small businesses**



Source: adapted from Burns (2016) and the authors

New business start-ups are fundamental to economic growth. By innovating and seizing new opportunities, start-up businesses contribute to the economy by (i) leading technological progress for both the business and society, (ii) driving higher incomes for workers in value-adding professions and (iii) providing employment opportunities to young people. Traditional new businesses remain important but do not hold innovation as central to their development.

It is recommended that KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs follow a business start-up classification framework. Frameworks can assist and facilitate policy-makers in identifying appropriate actions if required. The Business Start-up Development Framework, presented in **Table 1**, can be used to assess the needs and challenges of business start-ups at different stages of development.

Table 1 – Business Start-up Development Framework	
Stage	**Description**
Early development stage	Businesses are new or have been operating for less than a year. These firms might have an idea for a new product or service and a loose business concept but may not be registered as a company. The focus is to define the product or service concept and design the business model and value propositions.
Seed capital stage	Businesses may be officially registered but most efforts will be devoted to market research. Further development may be required for product testing and prototype development. These businesses may also be soliciting investment or seed capital. However, business may still not be generating revenue.
Early commercialisation stage	Commercialisation commences in full in this stage. Products and services developed in the previous stages will now be generating revenue. Funding and cash flow management can be a challenge.
Growth strategy stage	Growth-oriented small businesses will have a market presence with products or services and will explore possible growth strategies. Strategies can include expanding into new markets (e.g. exporting) or new product development. At this phase of business development, forming strategic partnerships and collaboration is also a priority.
Expansion stage	Small businesses are now growing exponentially. Most small firms will become medium size or large firms and will require new facilities to support a larger work force. Managing economies of scale will be critical and management will be focusing on process innovation to improve efficiency and productivity.

Source: adapted from Kent (2021) and the authors

2.2 WHAT ARE INNOVATION HUBS?

Innovation Hubs are business intermediaries that support new business start-ups through different developmental stages. Business intermediaries are an informal organisational category, which can include technical service firms, consultants, universities, government laboratories, research associations, research and technology organisations and business support service providers. Intermediaries are organisations that provide services that foster innovation in other organisations (Gassmann et al., 2011). As intermediaries, Innovation Hubs support new business enterprises by offering a range of services in a shared physical or virtual space.

There is no one type of innovation hub. In the broadest sense, an innovation hub is a facility that supports new business development. The location and facilities are often important: physical spaces should be flexible and designed to facilitate creativity, encourage collaboration, and generate and develop ideas, concepts and business models and plans. In most cases, Innovation Hubs support new businesses that focus on innovation and technology-driven business strategies. Innovation Hubs facilitate technical and business problem-solving through training and mentoring. Often, peer and cohort learning

are an important feature (Ayatse et al., 2017, Bone et al., 2019, Dempwolf et al., 2014).

Unlike traditional business support centres, Innovation Hubs nurture and encourage innovation through open innovation approaches. Open innovation is the recognition that knowledge is no longer concentrated in a few large organisations such as large multinational corporations (MNCs) or higher educational institutions (HEI). Businesses now look outside narrow organisational boundaries for new ideas (Chesbrough and Crowther, 2006). Collaboration and scanning for complementary and different competences and knowledge bases are explicitly supported (Toivonen and Friederici, 2015). These practices are particularly relevant in the horizontal-oriented Innovation Hubs. For example, horizontal co-working spaces can encourage cross-functional working, in which people with different experiences and specialisations work in a shared space and often on a common project, which can ferment unique combinations of creativity.

There is an emerging perspective that considers the role Innovation Hubs can play in civil society. Such hubs facilitate and engage in intermediary functions, which contribute to national or sectoral research and nurture innovation ecosystems (Cherunya and Ahlborg, 2020, Lantz and Wu, 2017). While this outlook can provide insights into newly formed networks and social systems, this report follows a more pragmatic view in which Innovation Hubs are typically centres that support the development of individual businesses.

The following organisations fall under the 'Innovation Hubs' umbrella and are supported by policy-makers and implementing organisations.[3] These hubs are usually stand-alone organisations, although hubs can have affiliation or be part of a business franchise association. It is recommended that KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs adopt these definitions.

Enterprise Hubs and Co-working Spaces

An enterprise hub or co-working space is a shared physical workspace that provides office facilities for new start-ups, small businesses and independent or freelance workers. The physical office space can facilitate peer learning, networking, capacity development, and collaboration. Enterprise hubs or co-working spaces provide clients with private offices or open space office desks with access to meeting rooms and event spaces. Office space can be rented out at market or subsidised rates. Hubs can host events and facilitate a wider entrepreneurial network. The hubs can be co-located with other facilities such as a Chamber of Commerce or trade associations and will often have a shared management structure. Co-working spaces can be a private business with objectives to generate revenue by renting facilities. Office property investors engage in enterprise hub services for example. Enterprise hubs will occasionally invest in new start-ups.

Incubator Hubs

An incubator is a support structure that helps early-stage start-ups transform from a business concept to a business enterprise, by offering advisory services, resources, workshops and training. There is a strong emphasis on supporting business models

3 Definitions are drawn from the following sources: Atlantic Economic Corridor (2020), Bone et al. (2019), Dempwolf et al. (2014), Giuliani and With (2019), Hathaway (2016) and the authors.

and value propositions in addition to technology development. Incubators focus on the early stage of business start-ups, even at the concept or idea stages. Clients can develop new products and services, which may include scaling-up activities. Start-ups can be supported with seed capital to cover prototype activities, for example. The goal of business incubators is to help businesses survive the difficult early creative and concept development stages.

Accelerator Hubs

An accelerator is an intermediary support structure that offers cohort-based and fixed-term programmes, usually for less than one year. Accelerators usually work with start-ups and existing small firms through the seed stage to reach the early commercialisation stage. Different programmes can include advisory services, mentorship, workshops, networks and limited initial seed investments. Accelerator hubs in Africa typically offer a set programme of less than one year (Giuliani and With, 2019). Services include business advice, networking and investor introductions, one-to-one mentorship and training workshops (Giuliani and With, 2019). Business accelerators support the ramping-up activities required to prepare businesses for commercialisation. Participating businesses may have an existing product or service and some previous commercial experience; the objective of accelerator programmes is to develop a new product, service or market. Many accelerators will facilitate further investment, either by introducing start-ups to external venture capital investors or fund the start-up through internal equity or revenue-sharing arrangements.

Corporate Innovation Hubs

These accelerators or incubators are internally managed and funded by corporations or multinational corporations (MNCs). Successful internal candidates can be spun out as separate business start-ups (with equity owned by the corporation). Alternatively, the breakthrough technologies can be subsumed into the larger corporation, either as a unique business unit or be utilised in the corporation's product lines. Corporate Innovation Hubs usually focus on the sectors relevant to the parent company. Corporate hubs are critical for technological developments but perhaps less important for the development of new and independent businesses.

Hackerspaces and Makerspaces

Hackerspaces and makerspaces are physical facilities fitted with production equipment and machinery, product development technology (e.g., 3D printers, computer-aided design (CAD)) and other technology to assist individuals and business start-ups in exploring concepts and designs, developing prototypes and testing products. There is an emphasis on extending and expanding technical skills and knowledge. Hackerspaces will focus on ICT (software and hardware technologies) while makerspace facilities support small scale manufacturing and engineering particularly at the jobbing and project process scale. One drawback of the makerspace model historically has been the lack of attention given to the development of market plans and business skills.

Research and Development (R&D) Hubs and Innovation Labs

R&D hubs and innovation labs are intermediaries that can support the commercialisation of basic or applied research. These intermediaries are usually attached to or co-located within higher education institutions (HEI) (e.g., universities), further education institu-

tions (FEI) (e.g., TVET colleges) or government-funded research centres. For the science and engineering fields, R&D hubs support activities after the proof-of-concept stage, which can lead to further developments of technologies and prototypes and other development activities. The critical support also should include business relevancy. Science parks and innovation centres are examples of innovation labs. R&D hubs can provide office or desk space and access to meeting rooms, laboratories, etc. University innovation centres, for example, can be either embedded in a university or set up as a separate business unit. Innovation centres traditionally were similar to co-working spaces with office space and administrative support provided free or at a (subsidised) cost. Innovation labs are now introducing incubation and accelerator services, though this may require more autonomy from the university management structure in order to form external alliances and support agile decision making. The advantage of R&D hubs is the access they provide to technical know-how in universities and TVET colleges. A full-time manager and other staff can be employed to support business development. Historically, the weakness of R&D hubs has been the emphasis placed on technology-push innovation, i.e., market orientation and business strategy are not considered until the later development stages. Included in this group are those innovation labs that focus on innovation that supports a wider social agenda; these organisations will often include government and civil society stakeholders.

Digital Innovation Hubs (DIH)

A DIH is a support facility that helps businesses to become more competitive by improving productivity in office functions and production processes through digital technologies. DIHs can also work with start-up businesses in the development of digital products and services. DIHs are often one-stop-shops, working to develop businesses through operations, business planning and accessing technology.

2.3 EMERGING GOOD PRACTICES ACROSS INNOVATION HUBS

Organisational classifications can often be blurred, and many hybrid Innovation Hubs will emerge over time. Organisations learn from one another, and good practices are emerging. For example, co-working spaces and incubators have started to recognise the benefits of cohort learning, which was a feature of accelerators. Furthermore, seed financing, venture capital and other forms of investment can be introduced in any type of innovation hub. The definitions discussed are not fixed and organisations should adapt and change strategies and their service offerings to meet the demands from the business start-up community.

The expertise and interests of individual Innovation Hubs will determine the structure, focus and outreach activities. Each type of hub can benefit business start-ups. Learning can occur, whether it includes structured training or through ad-hoc and informal collaborations or discussions. An open approach is recommended, which recognises the strengths of Innovation Hubs, which include a high degree of independence and limited external interference. This welcoming approach can deliver positive results so long as the learning method and stated objectives are transparent.

2.4 MEASURING PERFORMANCE

It is recommended that KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs collect information pertaining to the performance of new business start-ups and the activities undertaken by Innovation Hubs. Information can be collected annually by a questionnaire (e.g. on-line or by telephone). This information can be used to support network activities and inform government policy-makers. The information should be voluntary and not used for reporting purposes alone. For example, ASSEK and ACIH could use the collected data to provide annual trends and status reports to the wider innovation hub community. This information can be disseminated through newsletters, websites and presentations to members. In addition, customised reports could be offered to those hubs willing to pay for information services. Customised data analysis could include individual benchmarking/comparisons, for instance.

2.4.1 Start-up business performance indicators

Innovation Hubs can have a positive influence on the success of start-up businesses, but the actual contribution is difficult to quantify. Impact can be indirect and often latent or may take some time to be revealed. However, monitoring and evaluations/outcome assessments should be introduced and, to some extent, normalised. At a minimum, assessment or evaluation exercises should take place at least one year after the client start-up business has graduated or departed from an innovation hub programme.

Business metrics tend to focus on business growth and financial performance primarily and will include the following outcomes:

i. Annual revenue generated by the client businesses;

ii. Annual profit generated by the client businesses;

iii. Annual number of new jobs created by the client business.

Obtaining financial data from small business can be challenging. Business owners and managers may not have immediate access or lack real-time data. Also, transparency and trust issues may discourage the sharing of information, even if responses are anonymous. Innovation Hubs can assess the progress of start-ups by using measures that are not intrusive. An ordinal ranking scale can be used to reveal business success. For example, a five-point ranking scale could assess a firm's performance without the use of financial data:

1. The start-up business is very successful:
   a. Expanding into new markets
   b. Growing profitably (optional question)
2. The start-up business is successful:
   a. Growing in the same market
   b. Profitable (optional question)
3. The start-up is surviving:
   a. Not growing but stable turnover
   b. Not profitable/breaking even (option question)
4. The start-up business graduated from the hub, but went out of business in the first year.
5. The start-up business was terminated while in the hub.

Innovation Hubs should also be prepared to adapt to any new challenges that business start-ups may encounter.

Collecting data on start-up performance can inform hubs on possible ways to improve service delivery. Evaluation exercises should include qualitative research approaches such as case studies, focus group discussions and semi-structured interviews. Qualitative methods are more suitable to delve into issues and are particularly attuned to revealing good practices and other management topics.

2.4.2 Innovation hub performance indicators

Innovation Hubs will have different priorities and objectives and success will differ for each hub. The challenge for policy-makers will be to ensure that an agreed set of performance data from different hubs can be collected. Even more importantly, policy-makers should understand why the data are collected. Hubs will often collect data to evaluate performance and, ideally, identify possible learning outcomes. For policy-makers, aggregate data is useful for reporting purposes, but hubs should not be burdened with unnecessary data collection exercises. Data should be used to identify and support the objective of innovation hub activities, preferably by sharing outcomes and associating indicators with an emerging good practice. Innovation Hubs can collect two sets of measures to assess performance:

- Input measures, which measure the support activities for start-up business development. Some data may be outcomes from the hub perspective, e.g. revenue generated. Data can be collected monthly, quarterly and annually (see **Table 2**),
- Output measures, which measure the effects Innovation Hubs may have had towards the client businesses. Some data may be inputs from the hub perspective, e.g. patents. Furthermore, many outcomes may be latent. In most cases, data should be collected after the client businesses have left the hub (see **Table 3**).

Table 2 – Input indicators for Innovation Hubs

Input indicators	Description
Number of training activities provided	i. Count the number of training activities ii. Count the number of participants
Different types of training activities offered	i. Count the different content offered, e.g., business skills, accounting, technical skills, etc. ii. Count the different types of training, e.g., formal training, coaching, mentoring
Technology/product/ industry or sector	Identify the focus of the hubs, e.g., narrow or broad focus
Revenue generated by the hub	i. Revenue from income generating activities, e.g., office space rent, training fees, subscription fees ii. Revenue from grants and subsidies
Venture capital/ investment generated for clients	i. Count the number of clients that received investment ii. Total amount of investment (aggregated)

Source: adapted from Ayatse et al. (2017) and the authors

Table 3 – Outcome indicators for Innovation Hubs	
Outcome indicators	**Description**
Number of patent applications/patents registered	Count the number of patent applications/patents registered by client firms. Firms may sometimes count patents as an input activity but patent activity is typically measured as an innovation output; however patents do not necessarily lead to revenue generation.
Number of businesses that graduated from an innovation hub programme	Number of businesses that graduated can include combinations of the following: i. The number of businesses that started a programme (count) ii. The number of businesses that completed the programme (count) iii. The number of businesses that did not complete (count)
Number of new products/services launched in the marketplace supported by firms supported by an innovation hub	i. Number of new products/services per client firm ii. Total number of new products/services developed
Number of businesses that survived after leaving the innovation hub (survival rate)	One-, three- and five-year assessments. Business survival rate can include a combination of the following: i. Number of start-ups graduating from a hub (count) ii. Number of hub-supported start-ups still operating (count) iii. Number of hub-supported start-ups not operating (count)
Number of jobs created by client businesses	i. Number of new jobs created per client ii. Total number of new jobs created (aggregated)

Source: adapted from Ayatse et al. (2017) and the authors

It is envisioned that the collected data can be used, not only for government reporting, but also to improve performance among the Innovation Hubs. This will require networks and associations (e.g. ASSEK and ACIH) to engage with Innovation Hubs through monitoring, evaluation and learning exercises (see **Section 4.8**).

The potential to engage in international benchmarking exercises is problematic. The heterogeneous nature of hubs, both in terms of the different types and the possible range of activities offered, makes comparisons difficult at the country level. For example, the Global Innovation Hubs Index System provides a three-level analysis of innovation hub performance. Details of the index are available in **Appendix 1**. The limitations of this index are three-fold:

i. The lack of input measures (i.e. hub activities are not measured);

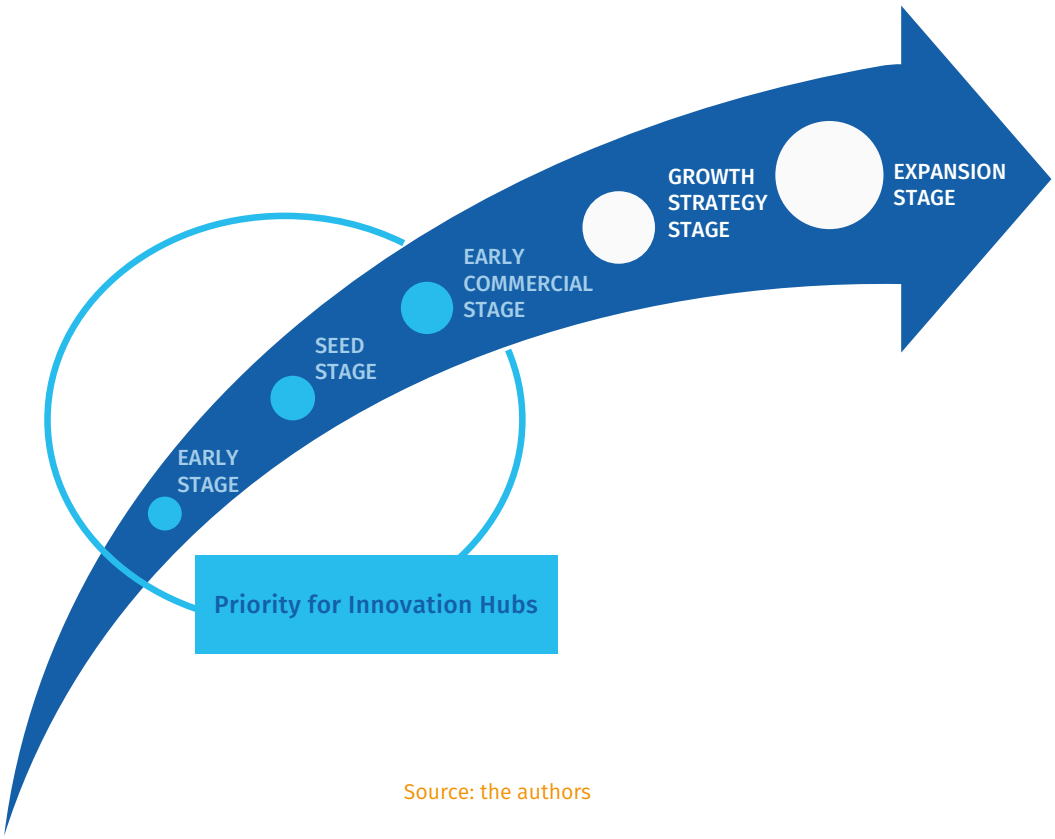
ii. The overemphasis on machine learning innovation;

iii. The under reporting of innovation types other than machine learning.

3 Standard services offered by Innovation Hubs

Potential entrepreneurs and newly formed start-up businesses often require support during the early development stage and the seed stage and, to a lesser extent, the early commercialisation stage. Bureaucratic and inflexible business regulations, access to resources, an inability to absorb and transform emerging research into commercial products and services and a lack of business skills are some of the challenges new businesses encounter. Innovation Hubs are positioned to provide physical facilities, technical assistance, business skills training and, for promising ventures, financing for start-up businesses at the beginning of the development process (**Figure 2**). It is recommended that KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs follow this framework.

Figure 2 **Business development and Innovation Hubs**



Source: the authors

Table 4 presents a list of possible services provided by different Innovation Hub types. This list is not exhaustive and is only indicative as hubs can, and often do, change their service portfolio. It is recommended that KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs follow this framework to assess and support the delivery of services to business start-ups.

Table 4 – Services offered by Innovation Hubs

Type	Infrastructure	Focus	Innovation	Business skills	Learning mode	Investment
Co-working space	Office space Admin services	Freelance Individuals Open (rent)	Limited	-	Events	-
Incubator	Office space Technical facilities	Start-ups Very early stage Fee-based	Concepts and prototypes	Skills training	Training Mentoring	Limited Seed funds
Accelerator	Office space, but not always	Start-ups Very early stage Seed stage Selective	Prototypes and commercialisation	Business models / Value propositions	Mentoring Cohort/Peer	Selective Equity
Hackerspace and makerspace	Technical facilities	Individual Start-ups Seed stage Selective	Prototypes and jobbing processes	Limited	Training Mentoring	-
R&D hub / innovation lab	Office space Technical facilities	Individual Very early stage Selective	Concept to prototypes Limited commercialisation	Skills training	Limited training Mentoring	Limited
DIH	Office space Technical facilities	Open – fee based	Digitalisation processes Digital products	Digital skills	Training Coaching	-

Source: adapted from Bone et al. (2019), Dempwolf et al. (2014), Hathaway (2016) and the authors

3.1 OFFICE AND INFRASTRUCTURE

At a fundamental level, Innovation Hubs can provide business start-ups with office space and infrastructure such as internet connection, personal computers and other physical resources. Providing office facilities is a hold-over from the first generation of enterprise hubs/co-working spaces and incubation hubs. Renting an office or hot-desking was an effective and efficient use of limited resources for start-up businesses. The fees for facilities are usually affordable and the rental contracts are often flexible.

Makerspace hubs complemented the co-working space facilities with equipment, tools and other technologies. This approach supported small scale manufacturing: for example, the cost and training of computer numerical control (CNC) and computer-aided-design (CAD) technologies could reach a wider constituency by being located in one location. However, while important in areas where facilities are dear and not widely available, offering office space and other physical infrastructure services without training and other learning opportunities does not necessarily lead to successful business start-up (Bone et al., 2019).

One important consideration is the impact Innovation Hubs can have on changes to business practices. These changes may lead directly to successful start-ups, but new practices can also have positive effects at a later stage. Those start-ups that were unsuccessful in a hub programme, due to technological failure or lack of market demand for products for example, may be successful in the future. New skills and experiences are not wasted. From the perspective of participating start-ups, the most important set of new practices are strategic planning, marketing, product development and external relationships (Bone et al., 2019).

3.2 INNOVATION TRAINING AND SUPPORT

There are two broad types of business innovation: (i) a new or improved product or service and (ii) a new (breakthrough) or improved process. Critically, the new product should be available to potential users (e.g., available in the market) and the new process should be implemented and in use by the organisation (OECD, 2018). From a business perspective, a new or improved product/service or business process should differ significantly from the firm's previous products or business processes.

3.2.1 Product and service innovation

Product innovations consist of two distinct types, namely goods and services:

i. Goods include tangible objects and some knowledge-capturing products over which ownership rights can be established and whose ownership can be transferred through market transactions. New products are associated with new designs or new technological characteristics. Design features can

include cosmetic, colour, and other visible features. Technological product innovation can include components, modularity, and architectures and platforms (Henderson and Clark 1990);

ii. Services are intangible activities that are produced and consumed simultaneously and that change the conditions (e.g., physical, psychological, etc.) of users. The attributes of a service can depend on the co-production and input of users.

Knowledge-capturing products can have the characteristics of either a good or service and concern the provision, storage, safekeeping, communication and dissemination of digital information. Examples of these products include access to digital music held on the Cloud for a fee.

Product innovations can include significant improvements to the characteristics or performance specifications. This includes the addition of new functions or improvements to existing functions or user utility. Possible product innovations can include one or any combinations of the following (OECD, 2018):

- Quality,
- Technical specifications,
- Reliability,
- Durability,
- Efficiency during use,
- Affordability,
- Convenience,
- Usability,
- New designs,

Product innovations can also include the introduction of new knowledge or technologies or the recombination of existing knowledge or technologies (OECD, 2018).

3.2.2 Process innovation

Business process innovations can include changes to the methods in which products and services are made and delivered. Process innovations tend to occur in core functions and support functions. Core business functions are activities that lead directly to revenue or income and entail the production of goods or services. Support business functions are secondary activities carried out to enable or facilitate the core business functions. Typically, the outputs arising from the support business functions are not intended for the external market.

A business process innovation is a new or improved business process in one or more functions undertaken in the firm. The characteristics of an improved business function are often similar to an improved product. For example, process innovation can include measurable changes to the following (OECD, 2018):

- Effectiveness,
- Resource efficiency,
- Reliability and resilience,
- Affordability,
- Convenience,
- Usability.

Process innovation objectives are usually directed at improving business value chain functions. The core function in most businesses is the production of good and services (i.e., production), which covers direct value-adding activities. In addition to the core function, there are five secondary or supporting functions and activities. Secondary functions include distribution, marketing/sales, ICT, administration and product and service development (Brown, 2008). **Table 5** lists the business functions and examples of process innovation.

Table 5 – The types of business process innovation	
Business function	**Possible innovation**
Production of goods or services	New activities that transform inputs into goods or services, including engineering and related technical testing, analysis and certification activities to support production. Innovation should be measurable and can relate to the following: i. Quality improvements ii. Elimination of waste iii. Acceleration of the process iv. Lowering costs (without deviating from quality)
Distribution and logistics	Improvements can include: i. Transportation and service delivery ii. Warehousing iii. Order processing
Marketing and sales	Improvements can include: i. New marketing methods (i.e. product, promotion and placement, packaging of products) ii. New pricing strategies iii. New sales and after-sales activities
Information and communication systems	Improvements to the provision of ITC could include: i. Hardware and software ii. Data processing and database iii. Maintenance and repair iv. Web-hosting and other computer-related information activities
Administration and management	Improvements can include: i. Strategic and general business management and new organising work responsibilities ii. Corporate governance (legal, planning and public relations) iii. Accounting, bookkeeping, auditing, payments and other financial or insurance activities iv. Human resources management v. Procurement vi. Managing external relationships with suppliers, alliances, etc.
Product and business process development	New methods to improve the innovation process could include: i. Accelerating the process ii. Improving the quality iii. Reducing costs

Source: adapted from Brown (2008) and the authors

3.2.3 Measuring innovation

Measuring innovation performance at the organisational level includes input indicators, process indicators and outcome measures (Adams et al., 2006, Godin, 2004). Science and technology indicators, which focus on technology bases and not specific product and process innovations, include the following:

i. Research and development (R&D) data, which can entail:
   a. R&D expenditure as a share of total expenditures;
   b. The number of scientists and technicians as a share of total employed;

ii. Patent data including applications, grants and patent citations;

iii. Bibliometric data (publications and citations by organisations and scholars).

Sector and industry benchmarking exercises and self-assessment surveys can be used to measure innovation performance. Respondents from business are asked to evaluate their product and process innovation activities from a sector or industry perspective. For example, the EU Community Innovation Survey measures business innovation using an innovativeness (ordinal) scale. An innovation can be assessed using a three-point scale:

i. New to the world / radical innovation;

ii. New to the industry / sector;

iii. New to the firm.

Self-assessing innovation can be cost effective, especially if the questionnaires are administered electronically or by post. However, there are challenges to ensure that the respondents have a shared understanding of the terminology and their (self) analysis does not over or under assess the innovation.

3.3 MANAGING INNOVATION PROJECTS

It is recommended that start-up businesses should be equipped with the necessary skills to manage and implement all the activities that contribute to product or process innovation outcomes. Innovation activities include the developmental, financial and commercial activities undertaken by a firm that are intended to result in an innovation:

- Research and experimental Development (R&D) activities;
- Engineering, design and other creative work activities;
- Marketing and brand equity activities;
- IP-related activities;
- Employee training activities;
- Software development and database activities;
- Activities related to the acquisition or lease of tangible assets;
- Innovation management activities.

Innovation management entails the procedures and routines and skills necessary to transform an idea or concept through implementation and take it to the market place. Innovation management activities usually include the following:

i. Scanning competences in order to search for new ideas, concepts or technological developments. Searching entails internal and external exploration;

ii. The selection stage includes prioritisation of the different ideas and possible scenarios. This step includes an opportunity and cost analysis of other uses of the resources (e.g. different applications of staff, financial investments, and plant and equipment);

iii. The implementation stage is critical to the whole exercise: on-going learning and technical improvements occur during the transformation from concept to prototype to design and ready for commercialisation. Good practices include stage-gate project management and cross-functional team working;

iv. The market launch stage includes the realisation of the financial benefits of a new product and service or the performance improvements derived from new and improved processes (e.g. cost savings, improved quality, and faster production);

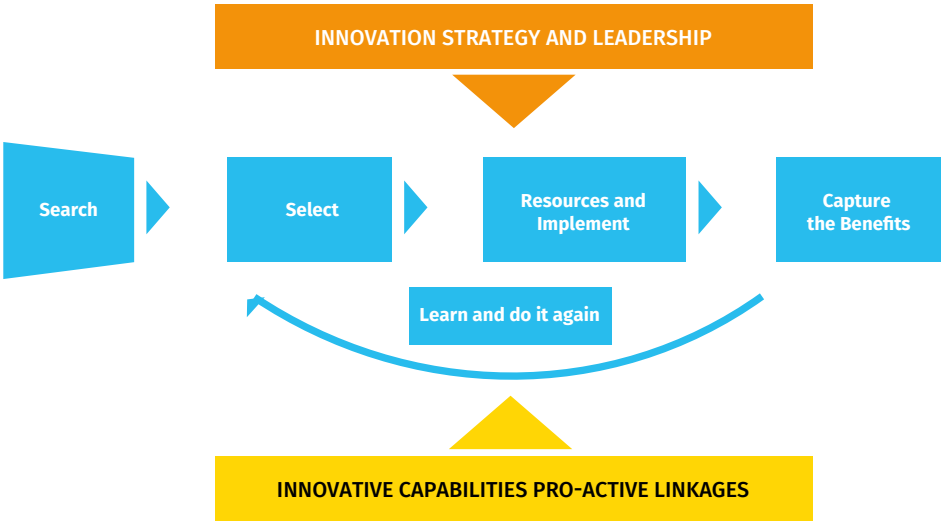
v. Effective innovators recognise that innovation is a process that can be improved. Learning mechanisms such as post project reviews are mechanisms to ensure technical and organisational experiences can be emulated in future endeavours;

vi. Driving this process is an innovation strategy and leadership, which complements the overall business objective;

vii. Underpinning innovation are the necessary capabilities of the business. These will include the technical skills, open collaborations and competences to manage and implement innovation.

The innovation management model in **Figure 3** suggests innovation is an input-output process. However, the innovation process is not linear. Several reiterations, stop-gap steps and failed attempts occur during the different stages of a new product or service innovation or the improvement of a process. The development of new technologies, particularly, is often a chaotic endeavour. The use of stage-gate project management practices is advisable to manage innovation projects. Stage-gate milestones will systemically evaluate the technical viability, financial prudence and market potential of the project.

Figure 3 **Business development and Innovation Hubs**



Source: adapted from Tidd et al. (2005) and the authors

3.4 BUSINESS SKILLS

Business models and business plans

Equipping start-ups to formulate business models / value propositions and business planning is critical for long-term business development. Training and mentoring should focus on identifying business concepts and the core ideas that can be applied to their actual activities. The business plan sets out:

- The business value proposition – what is the value of the product or service to potential customers;
- Estimated costs that the business is likely to incur;
- Marketing plans;
- Revenue streams;
- How the business will be financed;
- Estimation of expected earnings.

One technique which businesses can use to capture the necessary information is the Business Model Canvas. This visual approach can illustrate details about the value proposition, infrastructure, customers, and finances on one or two pages.

Management skills

Managing people and other resources is important for any business to succeed. The following set of management and business skills are useful for on-going and future business activities:

- Financial and accounting skills including cash flow management and how to assess profitability;
- Project planning and strategy;
- Communication, including how to lead meetings and write reports;
- Negotiation skills, which are useful for supplier contracts and customer relations.

Marketing skills

Marketing entails the long-term strategy for selling products and services. Marketing skills include:

- Brand-name development;
- Positioning products and services and location;
- New market development and pricing;
- Creative advertising skills;
- Customer relationship management;
- Web development for social media advertising and marketing.

Increasingly important are data analytics skills, which can segment customers according to a range of purchasing behaviour and demographics and are used to support marketing strategies.

Transversal competences

Critical thinking is highly regarded by business across sectors and industries. These transferable skills and competences underpin continuous improvement and learning and include behaviour and routines to collaborate. Examples of transversal skills and competences include:

- Problem-finding and solving in technical and business applications;
- Creativity and design thinking;
- Collaborative work practices;
- Project management skills and techniques.

3.5 COMPETENCY AND SKILLS DEVELOPMENT APPROACHES

The delivery of new competences and skills or the upgrading of the existing skill base can be undertaken using different approaches. Common approaches include: training, mentoring, coaching, peer-to-peer learning and e-learning (Table 6). The type of training and the delivery approach are an important consideration. Hubs can be agile and responsive to the changing demands of the clients and marketplace by adding and modifying their offerings. While hubs can use a mix of these approaches to develop start-up businesses, an emerging good practice is the use of cohort and peer learning approaches (Bone et al., 2019). Cohort learning practices are used by accelerator hubs and are essential for fostering creativity and problem solving while also being cost-effective.

E-learning

E-learning is an emerging critical learning platform. This learning approach makes use of multimedia technologies and the internet to structure the delivery, and improve the quality, of learning and training. E-learning can be text-oriented, in which the training material includes text, graphics, audio, and simple questions and answers. More advanced e-learning programmes can include interactive and simulation activities, which may also entail graphics, video and audio. Blended courses (a mix of e- and in-person learning) are a favourable training approach and can promote flexibility, improve communication and interpersonal relationships, and reduce costs (Callan et al., 2015).

Table 6 – Business Start-up Development Framework

Delivery approach	Description
Training	Development of new skills and refreshing old skills through a structured learning programme. Trainer is usually an expert in activities, discussions, role play, exercises, etc. Goals are identified at the start of the sessions. Participants can be assessed if the training includes certifications, etc.
Mentoring	Mentor will share his/her experience with participants and engage with longer term focus. Mentor is an expert and will draw on his/her experience. The importance of sharing tacit knowledge is critical. Best approach to use to increase competencies (knowledge and behaviour).
Coaching	Coaching can develop existing skills and confidence. There is a deep focus on 'how' to achieve something. Coaching focuses on a complexity of competences, including behaviour, rather than one specific skill. Hub participants are seen as peers and experts and engage with the coach to share and complement his/her knowledge. Motivation and understanding of the process is often emphasised.

Table 6 – Business Start-up Development Framework	
Delivery approach	**Description**
Peer-to-peer / Cohort Learning	Sharing work practices and experiences can encourage connectivity, collaboration and learning. Hubs can demonstrate brainstorming and problem-solving techniques and encourage cohorts to meet and discuss real work challenges. Sometimes informal learning sets can also emerge and should be encouraged.
E-learning	E-learning makes use of web connectivity and can be more efficient and effective than traditional training. Online training allows individuals to learn at their own pace and when it is convenient.

Source: adapted from Clutterbuck (2008), Hampton et al. (2004) and authors

3.6 COLLABORATIONS

The training and mentoring programmes offered by the Innovation Hubs impart critical business and innovation skills. However, it is also important to facilitate networking opportunities. Collaborations with external business is one outlet that could lead to a number of positive outcomes. Firstly, hubs can establish strategic affiliations with corporate businesses, which can bring potential access to physical facilities such as ICT (e.g., cloud and servers) (Giuliani and With, 2019). Secondly, this association can provide possible learning opportunities with access to experienced technical and business personnel for training and mentoring of young entrepreneurs. Finally, possible business contracts could arise between the start-ups and the larger businesses. These contracts could be transactions for products and services. Alternatively, some start-ups may be subsumed into the larger business, with the employees of the start-up finding paid employment.

KeNIA can support collaboration among business start-ups, Innovation Hubs and other R&I organisations by introducing the following:

- Tenders requiring endorsement from KeNIA could require collaborative bids, which would include businesses, HEI and Innovation Hubs;
- Partnerships among the Innovation Hubs could support other social and economic priorities, e.g., training of women-run businesses;
- Collaborations can also have a revenue and service delivery element. For example, hubs could provide training services to other hubs, universities or government.

3.7 SEED CAPITAL AND VENTURE CAPITAL

The provision of financial support varies among hubs. Co-working spaces tend not to provide any financial assistance, although office space may be subsidised. Incubators may provide seed capital at the early development stages e.g. Vilgro Africa. Accelerators will offer financial support for new businesses during the seed stage and early commercialisation stage e.g. Kenya Climate Innovation Centre. Accelerators introduce venture capital opportunities when start-ups have been selected after an intensive training and development programme (Pauwels et al., 2016).

Seed capital

Seed capital is the initial financial support intended to help business start-ups. This financial support is usually directed at start-ups during the early development stage (Hayes, 2022). The amount of seed capital required at this early stage can fund development activities (rather than scaling-up activities). The amount of funds is not necessarily large. Funding can be provided by private or outside investors. Seed capital can also be in the form of a loan, or investors can also receive an equity stake in the business. In some cases, investors can also establish profit sharing or revenue sharing structures related to the specific funded new product or service.

Venture capital

Venture capital investments are financing start-up businesses that are perceived to have long-term growth potential. In return, venture capital investors will usually take an equity stake in the new business. Large investors that provide venture capital can also offer technical or managerial expertise. Venture capital tends to focus on new business start-ups, while traditional private equity funds larger, more established businesses (Hayes, 2022).

4 The introduction of new Innovation Hubs

The introduction of Innovation Hubs should be encouraged, especially in centres and counties outside of Nairobi. Although there are many types of hubs, and hub founders will have their preference, the government may want to prioritise locations.

4.1 REGISTRATION OF INNOVATION HUBS

It is recommended that Innovation Hubs should be encouraged to register with ASSEK, ACIH or other networks and associations responsible for the coordination and management of Innovation Hubs. Registration should be voluntary and should be recognised as a positive exercise, i.e., not an expense or regulatory burden. In addition to association membership, registered Innovation Hubs could receive the following benefits:

i. Official government recognition as a Kenyan Innovation Hub;

ii. Inclusion in funding tenders and projects for national and international bids;

iii. Possible advisory roles related to local small business development.

Innovation Hubs should provide the following details for registration purposes:

i. Ownership structure;

ii. Business model and strategy;

iii. Priority focus of the hub;

iv. How hubs select or register start-ups;

v. Management structure;

vi. Monitoring, evaluation and learning.

Table 7 offers a possible registry/information form, which can be used to record new (and existing) hubs. The information should not be too intrusive and the details can be adapted and modified. ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs could administer the registration process and manage the data requests from KeNIA. This process would make additional registration with KeNIA unnecessary.

Table 7 – Registration profile of Innovation Hubs

Category	Details
Name of Innovation hub	
Contact details	
Founder/manager name:	
Year founded/registered	

Table 7 – Registration profile of Innovation Hubs	
Category	**Details**
Type	• Co-working space • Incubator • Accelerator • Makerspace • Hackerspace • Innovation lab • DIH • Other
Ownership	• Private • Not-for-profit • Government programme • Other
Hub model	• Horizontal • Technology focus • Sector focus • Other
Infrastructure	• Office • Internet • Operation equipment e.g. CNC • Product design tech. e.g. 3-D printers • Other
Start-up selection	• Open - fee paying for space • Selective screening • Sponsorship • Other
Start-up graduation	• Completion of training • Selected for investment • Time limits • No graduation • Other
Innovation training	• Product • Service • Innovation management • Other
Business training	• Business plans • Marketing • Accountancy • Transversal • IP (patents and copyrights) • Other

Table 7 – Registration profile of Innovation Hubs	
Category	**Details**
Learning approach	• Training • Mentoring • Coaching • Peer-to-peer/cohort • E-learning • Other
Investment services	• Seed financing • Venture capital/equity • Revenue sharing • No financing • Other

In addition to the registration of new hubs, KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs could undertake an annual assessment of innovation hub performance. Indicators can be drawn from **Section 2.3** (Measuring Performance). The findings could support the development of emerging good practices and other learning outcomes at the national level. For example, findings could be shared at co-hosting events such as the Kenya Innovation Week (KIW) that involve different actors discussing different thematic areas relevant to the innovation system.

4.2 OWNERSHIP

Innovation Hubs can have different ownership structures and will tend to be one of the following types:

i. **Privately-owned Innovation Hubs:** these hubs can often be established by venture and seed capital investment groups, or by corporations and real estate development partnerships. The business model for private hubs is to derive revenue from clients/business start-ups, either through fee paying activities or equity sharing. Revenue can be generated from renting out office space or from training and consultancy fees. Some private hubs will also take equity in a select number of start-ups. Alternatively, private hubs can also be linked to large corporate businesses. Corporate hubs tend to focus on new technologies and innovations to support their business product lines or improve processes. Outcomes arising from corporate hubs can also be assigned directly to specific customer priorities. Privately-run hubs should be registered as businesses and follow Kenyan taxation and employment law;

ii. **Public or not-for-profit Innovation Hubs:** government and non-profit organisations can fund and manage Innovation Hubs. These Innovation Hubs can include social and economic objectives such as the wider inclusion of young women and people with disabilities in business development. Not-for profit organisations will often manage the hubs that have received government funding. Many public hubs emphasise the business and innovation ecosystem and prioritise local entrepreneurial activity. Public and not-for-profit hubs should also be registered according to Kenyan law;

iii. **Public-private partnerships:** these hybrid organisational structures are joint efforts between government and the private sector. These Innovation Hubs have the advantage of government-guaranteed initial funds that can be secured to garner support from the private sector, including technical expertise and secondary financing. Hubs can be registered as a private businesses or not-for-profit organisation;

iv. **R&D hubs / innovation labs** such as innovation centres and university-based enterprise centres, can have different ownership and management structures. R&D hubs can be fully integrated into the existing university management structure or can be established as semi or fully autonomous business units (Cherunya and Ahlborg, 2020). Fully integrated hubs can benefit from access to university funding. University governance can provide transparent selection procedures for students and staff to participate (Cherunya and Ahlborg, 2020). Examples exist of university department-specific hubs, which fall under the responsibility of the Head of School. These department hubs tend to be aligned with the expertise of the department, i.e. technology focus. There are also university-wide access hubs, which are accessible to all departments. The autonomous R&D hubs can be private or not-for-profit enterprises. One advantage of autonomous R&D hubs is that they reduce the bureaucratic management structure often found in larger institutions. A lean management structure can support the agile decision making required to support innovation.

4.3 INNOVATION HUB BUSINESS PLAN

A concise business strategy should include:

i. Value propositions, i.e. what does the hub offer new start-ups and individuals?

ii. Possible income sources;

iii. Projected and expected demand;

iv. Possible competitors.

The formulation of business strategies and plans is an important foundation step for privately-funded hubs, which are expected to be managed to generate revenue streams. Private funders will expect a plan to accompany any proposal before considering funding requests. Not-for-profit hubs should also put together a strategic plan before commencing operations. Business plans provide a link between strategy and operations. Furthermore, donors and other external funding agencies expect proposals and justifications for financial requests, which increasingly follow a business plan format. The allocation of costing is an important consideration. In some instances, incubator hubs that allocated more funds towards staffing and programme delivery, rather than to building maintenance or debt servicing, have demonstrated more sustained and positive outcomes for business start-ups (Lewis et al., 2011).

Innovation Hubs will usually focus on the performance of business start-ups, and are associated with one or more of the following business goals:

i. Business survival, i.e. start-ups are operating after leaving the hub programme;

ii. Wealth creation, i.e. revenue or profit generated by start-ups;

iii. Job creation, i.e. number of jobs generated by the start-ups.

For example, a survey of hub activities across Africa reported that generating revenue is a priority for incubator and accelerator hubs primarily (Giuliani and With, 2019). Many Innovation Hubs will have more than one objective and many of these objectives can overlap. However, each objective may require different training programmes and accompanying service activities (Bone et al., 2019). The alignment of expected outcomes with strategies and operations is essential for the success of Innovation Hubs – and business in general.

Innovation Hubs in Kenya can have goals other than financial performance. For example, government and not-for-profit hubs often have wider developmental objectives e.g. inclusion of historically disadvantaged social and economic groups. These important objectives should be supported, but careful attention should ensure that the different objectives and activities do not diminish the impact of the business development and innovation goals.

4.4 SPECIALISATION

The focus or target areas will usually be part of the hub strategy, but it is important to highlight the available options.

Horizontal focus

Co-working spaces and enterprise hubs have often provided office space for new start-ups, usually regardless of the industry or sector. In many cases, business administration and other secondary functions are also provided. This lack of a technology or sector focus was not necessarily by design, as co-working spaces were often established to rent out office space and selection was not a concern. General or non- specialised Innovation Hubs would primarily provide business support services. However, this heterogeneous mix of business interests, knowledge and technology bases has led to some interesting outcomes. Through cross-functional cohort/teams offering blended and complementary skills, creative approaches have emerged that can tackle problems from different perspectives. This horizontal strategy comes close to reflecting the IDEO mode of design thinking and deep dive approach to innovation (Hargadon and Sutton, 1997). However, this cross-functional approach will still have to build in milestones and time-bound strategies to align with the selection priorities often found in accelerator hubs (for example).

Sector or industry focus

Customising support can, alternatively, be very effective and allow for a deep understanding of the technical and business issues in specific industries and sectors. For example, service development programmes can support business start-ups in the service sector, e.g. graphic designers and accountants. Makerspace hubs have specialised in small-scale manufacturing and draw upon technical expertise in metalwork and machine supported prototyping. Sector/industry focus hubs often emphasise the development of technical skills embedded in an industry, but there is an opportunity to introduce business fundamentals. Customer relationship marketing and distribution channels can be industry- and product-specific and combining technical training with business awareness can be beneficial.

Sector specialisation can also be directed towards the social impact agenda, such as education and agriculture (Giuliani and With, 2019). The importance of impact frameworks can widen the scope of the hubs. Inclusivity can include important goals such as start-ups owned by women and people with disabilities. However, additional objectives may require additional programmes and funding.

Technology focus

Technology focus hubs are specifically focused on emerging technologies such as software, biotechnology, robotics, or instrumentation. Hub activities can be directed to knowledge-intensive activities among collaborators and directed to an open innovation model. This will require the inclusion of universities and other R&D institutions active in basic and applied research. Software development (for example, machine learning) is a particularly viable technology for Innovation Hubs to engage with. The capital investment required is not significant compared to other technologies and the use of agile and scrum project management practices among cohorts can generate quick development time from concept to commercialisation.

4.5 FUNDING

Innovation Hubs require a significant financial commitment. In Kenya, 30 per cent of registered hubs are privately owned with the remaining 70 per cent funded by the government, donors or NGOs (UNDP, 2022). Funding operations and programme delivery is critical – and this does not include possible seed capital investment services.

All new hubs will require initial funding, which should cover wages, operating costs, rent, and in some situations, training programmes. Wages and facilities tend to be the highest costs on average (Giuliani and With, 2019). A sustainable financing model should be reported, which will include the initial capital investment and, possibly, funding sources (including equity, debt, and grants). Further funds will be also necessary, and a business plan should indicate future income streams, e.g. office space rental fees, charging for training or some other mechanism. While this may be intrusive, the purpose of obtaining this information is to ensure some duty of care is afforded to the individuals and business start-ups participating in the development programmes provided by the hubs.

It is recommended that hubs should establish revenue generating activities to offset an over reliance on external funders (including the government). Hubs can charge fees for office space, training or consultancy services, and charging for services does not necessarily have a negative impact. A study in the USA on incubator hubs revealed that those hubs that received a greater share of revenues from clients, either from rent or fees from training, achieved higher results than hubs that did not charge as much (or at all) (Lewis et al., 2011).

4.6 PARTICIPANTS

As noted previously, Innovation Hubs have different objectives and priorities. Attracting the appropriate clients, tenants or new business start-ups is an important consideration. **Table 8** presents the type of participants that tend to be supported by the different Innovation Hubs. These participant types are generalisations, which are based on business development stages. Other considerations could also be included.

Table 8 – Start-ups associated with different Innovation Hubs	
Start-ups and Development Stage	**Innovation Hub**
Anchor tenants are typically mature businesses. They do not require significant input but may be interested in skills upgrading and other training. These start-ups may be able to pay for services and rental space.	Co-working spaces
Early-stage start-ups that require a nurturing environment from the hub. These entrepreneurs are aware that they lack resources and require co-production efforts from their host to reach their potential.	Incubators Makerspaces Innovation Labs
Seed stage and up-and-comers also have the significant resource and skills gaps that can be addressed by participating in a hub programme. Businesses are operated by entrepreneurs who are aware of the gaps. Seed capital is also required.	Incubators Accelerators
Early commercialisation start-ups are ready to engage with minimal co-production efforts from the hub. They have resolved problems, can withstand crises, and expect to imminently graduate. These companies can play a mentoring role to early stage and seed stage firms.	Accelerators

Source: adapted from Tavoletti (2013) and the authors

For many Innovation Hubs, the initial selection of clients or business start-ups is a critical stage. Selection decisions tend to be based on two factors: (i) the maturity or the level of business development and (ii) potential for scaling-up the new product or business plan. Some Innovation Hubs offer a very early or pre-incubation stage. This can be part of first entry criterion and fall under a 'boot camp' set of activities. These programmes focus on the selection of promising ideas in order to filter out participants for the more intensive programmes (Cherunya and Ahlborg, 2020).

There may be several reiterations of the selection process, with unsuccessful start-ups leaving the programme. This selection process is stressed especially in accelerator hubs. Selection elements could include[4]:

i. The potential of the business idea;
ii. The feasibility of the technology, product or service innovation;
iii. Market potential;
iv. Progress to date and trajectory to continue.

4 Adapted from Roberts and Lall (2019)

4.7 MANAGEMENT STRUCTURE

The current profile of the management of hubs is Kenya is well placed to lead this dynamic sector. Most manager are well-educated with 78 per cent of reported managers indicating that they have at least an undergraduate degree with 21 per cent holding a post graduate qualification (UNDP, 2022). However, supporting business start-ups is not an academic exercise and business and management experience and competence may be more important than education level.

It is important to employ a competent management structure. This will include a viable senior manager who can also be the spokesperson and focal point of the organisation. A study by Monsson and Berg (2016) found that innovation hub managers can have a positive influence on facilitating access to external training, assisting with practical advice and the daily management of the programme. At times, managers have to balance operational tasks with creating external partnerships. It may be wise to not assign all the tasks and roles of the hub to one person.

4.8 MONITORING, EVALUATION AND LEARNING

Whenever possible, performance should be evaluated at the individual hub level. The indicators discussed in **Section 2.4** (Measuring Performance) could be introduced at the individual hub level. However, aggregating results may not be particularly useful given the different objectives, training approaches and focus addressed by each hub. For example, on average, start-up businesses that have graduated from accelerator hub programmes may have achieved higher levels of turnover, a greater number of employees, and attract higher levels of investment than businesses or individuals that did not continue with the accelerator programme (Dempwolf et al., 2014). This result can be partly explained by the fact that accelerator hubs are, typically, highly selective and will only take on very high-quality start-ups. Business start-ups that have gone through highly selective programmes will be more successful because of the weeding out process. Comparing accelerator hubs with other, non-selective Innovation Hubs may not be a useful exercise.

Another issue to consider is the time period and lag required to evaluate. In the USA, on average, it can take slightly more than three years to successfully incubate a start-up business. And up to six years or more for that firm to realise significant growth (Lewis et al., 2011). Innovation Hubs that rush or speed up the incubation process may disservice young businesses. Furthermore, the selective nature of some programmes, i.e., accelerator hubs, may also cut-off potential businesses just by the nature of the selection process. Software-focus hubs can expect shorter development periods given the nature of the technology while start-ups in other technologies or sectors may require a longer gestation period. Finally, programmes funded by donors

and governments are often managed using logical framework and funding deadlines. Many positive outcomes could be overlooked by undertaking an evaluation too early. Evaluations are important for all stakeholders, but for policy-makers there should be a space and opportunity to address learning potential. Ideally, performance outcomes should be linked to organisational and management practices, which can be shared.

Nonetheless, should KeNIA intend to make use of Innovation Hubs as a strategic policy instrument to facilitate new business development and innovation, data collection is paramount. The data will have to be normalised to some extent, which will mean that some of the nuances and details will be lost. A pilot exercise should be undertaken using the indicators proposed in **Table 7**. The usability of the collected data should be evaluated, based on which modifications should be forthcoming. The benefits of the data collection exercise may take years to be realised, especially if trends are to be captured over time.

5 Innovation Hub Networks

Despite their different approaches and service provisions, Innovation Hubs have a common objective to support the development of new businesses. Having one shared goal suggests that other interests may be found. One route for private and not-for-profit organisations to promote their common interests is through a professional association. These organisations are charged with representing the shared interests of members and to advance the profession nationally and internationally (Harvey et al., 1995).

The Kenya National Innovation Agency (KeNIA) core mandate is to develop and manage the national innovation system. The Agency is therefore responsible for coordination, promotion and regulation of the Kenyan national innovation system. Working with partners, KeNIA strengthens interrelationships between actors to promote innovation and enterprise development from research and ideas: from supporting the identification, recording and protection of innovative ideas to coordinating the establishment and implementation of appropriate policies, standards, processes, infrastructure, and partnerships to nurture innovative ideas. The agency also works with partners to ensure appropriate prioritisation, relevant capacity development, innovation recognition and publication of the same.

Professional associations are often characterised by the activities and roles they perform. At the minimum, most associations represent the self-interest of their members, which can be individuals or organisations. At another level, professional associations have been giving or have taken on the responsibility of governing the practices of a recognised occupation, industry or sector. This governance can include control and oversight. Unlike government regulatory agencies, whose mandates are enforceable by law, professional bodies do not have legal backing. Certification from an association can be a gateway into the profession. The recognition offered by the association through registration or certification can make this an attractive proposition to members.

5.1 PROFESSIONAL ASSOCIATIONS

What type of professional association is appropriate to support Innovation Hubs? This decision, ultimately, is for ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs to make. Innovation Hubs in other countries tend not to belong to an association. Hubs are independent entities and can attract and support business start-ups by relying on a functioning market. Hubs in a market environment perceive other hubs as (friendly) competitors. Hubs also can work directly with local and national government without another layer or secondary intermediary. However, if there is a strong interest in supporting hubs through an association or network, then the following types of professional association can be considered:

i. Member-Benefit Professional Associations

Member-based associations focused on the community of practitioners, i.e., their members. These associations may offer shared offices and other resources, organise conferences and provide peer support to individual members. The

aims and objectives of member-benefit professional associations are to create value for members (Balthazard, 2017, Forsyth and Danisiewicz, 1985);

ii. **Designation-Granting Associations**
Members that join these associations display a greater dedication to their field. The fact that members can obtain membership certification is an important distinction and marks an important recognition among professional peers (Balthazard, 2017). The designation associations can accredit and renew certificates through exams, displaying their professional expertise, or completing a certain number of professional learning hours. The designation awards are assessed by the association although there may be some quality control and accreditation with third parties. For example, university business schools often provide teaching and other inputs for professional management exams for project management and supply chain management associations;

iii. **Professional Certifying Bodies**
Members that join a certifying association are aspiring to obtain professional recognition from the industry, government or peers. The main purpose of these associations is to issue and track certifications (Balthazard, 2017). Often, applicants can only join if they have a certain level of professional or educational experience. Membership of a professional certifying body can be a legal requirement: for example, to practice professional engineering in many countries will require additional certification from a professional association;

iv. **Professional Regulatory Bodies**
These associations are designed to establish and uphold the professional expectations of an industry or profession. The associations will have established definitions, guidelines and best practices for professionals in their field to ensure quality control. The regulations also signal a level of trust to other agencies and the wider public. These associations can also establish licensing and certification requirements. Unlike government regulatory bodies, professional regulatory bodies are self-regulating and represent the interests of their memberships (Harvey et al., 1995). However, the government can delegate some regulatory authority to regulatory bodies, e.g., licensing of individual professions and organisations.

5.2 MEASURING PERFORMANCE FOR PROFESSIONAL ASSOCIATIONS

Table 9 provides a list of performance indicators, which can be applicable to the different types of professional associations. Real-time feedback may be useful, especially with the use of email and on-line services. Membership renewals could be linked to a short performance survey in some situations. Voluntary feedback remains the best approach, however.

Table 9 – Measuring performance for the different association types

Type of professional organisation	Performance Measures
Member-benefit associations	i. Member satisfaction ii. Membership growth iii. Membership retention
Designation-granting associations	i. Member satisfaction ii. Membership growth iii. Membership retention iv. Desirableness of designation: a. Perspective of hub members b. Perspective of start-ups
Certifying bodies	i. Number of certifications ii. Growth in certification base iii. Desirableness of designation a. Perspective of hub members b. Perspective of start-ups
Professional regulatory bodies	Protection of the public Public confidence in professional regulation (e.g., satisfaction surveys)

Source: adapted from Balthazard (2017)

5.3 SUPPORT FROM THE GOVERNMENT

Innovation Hubs can be an effective mechanism to support innovative business start-ups. New enterprises that participate in a hub programme will succeed, on average, to a greater extent than ventures that do not receive such support. Occasionally, a start-up may become a high growth business. In many countries, Innovation Hubs operate outside of the sphere of government policy. Hubs support local entrepreneurs through their own network and outreach activities. Hubs will also often attract funding and technical assistance from international donors and the private sector directly. Government procedures and regulations are not always viewed to be accommodating of new business development (Sambuli and Whitt, 2017).

Lessons from other programmes may be insightful on how the Government of Kenya can support associations and networks of Innovation Hubs. For example, the Global Accelerator Learning Initiative (GALAI) reviewed over 300 accelerator/innovation hub programmes (Guttentag et al., 2021). The UK Government also evaluated incubator and accelerator programmes in the UK (Bone et al., 2019). The following policy measures could be considered to support the network of Innovation Hubs.

1. **Funding support to new Innovation Hubs** - unlike privately-funded or corporate Innovation Hubs, most not-for-profit Innovation Hubs will require donor or government financial support, particularly in the early stages of the programme. Operational costs could be covered for a fixed term. Financial support should be flexible and not tied to unnecessary constraints or bureaucracy;

2. **Funding support for seed capital** – in addition to the funding support offered to new Innovation Hubs (1 above), the government could also create a fund to support early-stage seed capital requirements. This fund would be separate from the operational fund allocated to hubs. This 'seed capital fund' could be offered through a competitive bidding process. Innovation Hubs would have to demonstrate a period of stability (e.g. operating for more than three years) and reach performance thresholds (i.e. introduce and follow the performance measures suggested in **Section 2.4**) before they can qualify;

3. **Registration** - ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs could introduce a registration programme for innovations hubs. Registration should be voluntary but would provide hubs with a 'seal of approval' from the government. Registration would also benefit hubs seeking donor or external funding. In return, hubs could provide organisational details (see **Section 4.1** for details);

4. **Annual performance survey** - ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs could collect information from the registered Innovation Hubs annually. The information could be drawn from an agreed set of performance indicators (see **Section 2.4** for details);

5. **Other business support programmes and services** - Innovation Hubs can succeed in supporting high growth businesses but usually this occurs by instituting a selection programme. Selection prioritises a limited number of ventures during any one period. The majority of small businesses and start-ups will not reach this threshold and will therefore not be supported. To offset this specialisation set of activities, KeNIA and other government agencies should offer other business support programmes and services which will complement Innovation Hubs;

6. **Focus on other social and economic priorities** - wider social and economic objectives may not always fit with the priority and selection programmes offered by Innovation Hubs. The government should explicitly establish programmes for young women entrepreneurs and people with disabilities and not assume that Innovation Hubs will provide services to support these important but often overlooked groups;

7. **Registering new businesses** - registration of new business start-ups can occur once firms engage in commercial activities. Hubs can register individuals and cohorts as trainees or clients while they are engaged in training or mentoring programmes;

8. **Demonstration role** - Innovation Hubs can play an instrumental role by demonstrating and accessing new technologies, e.g., digital tools, to the wider business community. The government could collaborate with local hubs, particularly hubs located in smaller centres, to introduce digital technology awareness services;

9. **Specialised Innovation Hubs** can support government priority areas. For example, specialised Innovation Hubs can support digital technologies such as agritech, fintech and cybersecurity (Bone et al., 2019);

10. **Cohort and peer learning** - e-business skills training, especially using mentoring and cohort approaches is an emerging good practice regardless of the type of innovation hub. ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs could support individual hubs in developing in-house competences or establish a roster of external consultants that can provide these services;

11. **Government should not fund business start-ups directly** - incubators and accelerators, in particular, provide a forum for business and technical development in preparation for commercialisation. Identifying those potential start-ups that are ready for funds (more advanced seed capital or venture capital) to further this process is best left to hubs. While an argument can be made that the unavailability of seed financing or venture capital is a market or systemic failure in the innovation ecosystem, it is not the role of government to be a lender to or take on equity positions in small business start-ups. The uncertainty associated with innovation and new business development requires unique expertise and a capacity for risk taking, for which governments or government agencies are not well-suited. Nonetheless, the government can alleviate information asymmetry by introducing and setting up platforms for hubs, start-ups

and potential investors to meet and collaborate;

12. **Networking roles to attract investors** – a critical role for KeNIA, ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs would be to connect Innovation Hubs and start-ups with external sources of seed capital and venture capital financing (Giuliani and With, 2019). For example, demonstration events can be organised to introduce investors to new business start-ups. It is important for business start-ups to understand the expectations of investors (Guttentag et al., 2021);

13. **Early-stage introduction** - it is prudent to introduce investors to innovations Hubs during the initial commencement of a programme or intake of a new cohort (Guttentag et al., 2021). This may require training programmes to be aligned to the interests of investors at the programme design stage of business development programmes;

14. **Awareness raising for local investors** – KeNIA could support ASSEK, ACIH and other networks and associations responsible for the coordination and management of Innovation Hubs, by introducing investors at the local level to the Innovation Hubs and business start-ups. These networking activities would include reaching out to the Kenyan diaspora. Furthermore, local business people should be provided with information and skills on how to invest in Kenyan business start-ups, i.e. local Kenyan angel investors.

APPENDIX 1 - INDICATORS FOR THE GLOBAL INNOVATION HUBS INDEX SYSTEM

Level 1 indicators	Level 2 indicators	Level 3 indicators
(A) Research innovation	A1. Science and technology human resources	01. Number of active researchers (per million people)
		02. Percentage of highly cited scientists
		03. Number of winners of top scientific awards
	A2. Research institutions	04. Number of top 200 world-class universities
		05. Number of top 200 world-class research institutions
	A3. Scientific infrastructure	06. Number of large scientific facilities
		07. Number of top 500 supercomputers
	A4. Knowledge creation	08. Percentage of highly cited papers
		09. Proportion of papers cited in patents, policy reports and clinical trials
(B) Innovation economy	B1. Technological innovation capacity	10. Total number of valid patents (per million people)
		11. Number of patent cooperation treaty (PCT) patents
	B2. Innovative enterprises	12. Number of top 2,500 companies in R&D investment
		13. Number of unicorn companies
	B3. Emerging industries	14. Market value of high-tech manufacturing companies
		15. Revenue of listed companies in new economy industries
	B4. Economic growth	16. GDP growth rate
		17. Labour productivity
(C) Innovation ecosystem	C1. Openness and collaboration	18. Paper co-authorship network centrality
		19. Patent collaboration network centrality
		20. Foreign direct investment (FDI)
		21. Outward foreign direct investment (OFDI)
	C2. Support for start-ups	22. Venture capital (VC) investment
		23. Private equity (PE)
		24. Number of registered lawyers (per million people)

Level 1 indicators	Level 2 indicators	Level 3 indicators
(C) Innovation ecosystem	C3. Public services	25. Number of data centres (public clouds)
		26. Broadband connection speed
		27. Number of international flights (per million people)
		28. E-governance level
	C4. Innovation culture	29. Professional talent inflow
		30. Residents' average years of schooling
		31. Number of international conferences
		32. Number of public libraries and museums (per million people)

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