THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL GUIDELINES FOR ESTABLISHMENT AND DEVELOPMENT OF TECHNOLOGY AND INNOVATION CENTRES

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FOREWORD

Science, Technology and Innovation (STI) are continuously evolving consequent to structural shifts in the world economy, steady globalization of innovative activities as well as the rise in new actors and new ways of innovating. Every passing day, new innovations, technologies and services are emerging over the horizon. As STI become the cornerstone of our daily activities; Governments, businesses and individuals must keep on innovating and adapting to this new reality. Despite notable importance of STI as enablers of socioeconomic development, Tanzania's economic growth shows over-dependence on imported high costs technologies and innovations; and lagging high-tech and modern service industry as a result of weak indigenous innovation capability. This trend needs to be reversed. The guiding principles for our STI undertakings over the next five years are: indigenous innovation, leapfrogging in priority fields, enabling development, and incubation of both locally developed and imported technologies and innovations.

In view of this, the government intends to promote original innovations, integrated innovations, and re-innovation based on assimilation and absorption of imported technologies, in order to improve our national innovation and technology capability. Special emphasis will be on leapfrogging priority fields that are linked with the national economy and peoples' livelihood, to strive for breakthroughs and realize leaping developments.

This calls for strengthening of indigenous innovation capability at the core of STI undertakings. In the same token the Ministry has developed the National Guidelines for Establishment of Technology Stations and Innovation Spaces as an attempt to promote local technologies and innovations. Certainly, both public and private stakeholders have fundamental roles to play in promoting locally developed technologies and innovations. It is my convictions that in turn this will result into improved and efficient business environments, productivity and better standards of living. I therefore call upon all stakeholders to make use of these guidelines in establishing and operating technology and innovation centres. The government will continue to provide the necessary support in view of enhancing the contribution of innovation and technology centres to the country's socio-economic development.

The Ministry of Education, Science and Technology (MoEST) would like to extend its profound gratitude and acknowledgement to all institutions, teams and individuals who contributed in the development of these guidelines. The Ministry is grateful to the Small Industries Development Organization (SIDO), Sokoine University of Agriculture (SUA), Dar es Salaam Institute of Technology (DIT), Vocational Education and Training Authority

(VETA), National Institute for Medical Research (NIMR), Mbeya University of Science and Technology (MUST), Nelson Mandela African Institution of Science and Technology (NM-AIST), University of Dar es Salaam (UDSM) and Business Registrations and Licensing Agency (BRELA). Special thanks also go to all MoEST staff who crafted the initial draft of these guidelines, which provided an excellent framework that was improved further by the task team. The task team is therefore applauded for improving and finalizing this important document.

Last but not least, we sincerely extend our gratitude to all individuals who participated in the stakeholders' workshops and took part in reviewing this important document.

Prof. Carolyne I. Nombo

PERMANENT SECRETARY

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LIST OF ABBREVIATIONS

BIC	Business Incubation Centre
BPRA	Business and Property Registration Agency
BRELA	Business Registrations and Licensing Agency
CDTT	Centre for the Development and Transfer of Technology
COSOTA	Copyright Society of Tanzania
COSOZA	Copyright Society of Zanzibar
COSTECH	Commission for Science and Technology
CTCN	Climate Technology Centre and Network
DIT	Dar es Salaam Institute of Technology
DSTI	Department of Science Technology and Innovation
DTIS	Diagnostic Trade Integration Study
FDI	Foreign Direct Investment
FYDP III	Third National Five Years Development Plan
GCF	Global Climate Fund
GEF	Green Environment Facility
HEIs	Higher Education Institutions
ICT	Information and Communication Technology
IIDS	Integrated Industrial Development Strategy

IP	Intellectual Property
IPMO	Intellectual Property Management Office
IPR	Intellectual Property Rights
LGA	Local Government Authority
LTPP	Long Term Perspective Plan
M&E	Monitoring and Evaluation
MDAs	Ministries, Departments and Agencies
MoEST	Ministry of Education, Science and Technology
MoU	Memorandum of Understanding
MSME	Micro, Small and Medium Enterprises
MUST	Mbeya University of Science and Technology
NFAST	National Funds for Advancement of Science and Technology
NGOs	Non-Governmental Organizations
NIMR	National Institute for Medical Research
NM-AIST	Nelson Mandela African Institution of Science and Technology
PPP	Public Private Partnership
R&D	Research and Development
S&T	Science and Technology
SIDO	Small Industries Development Organization
SME	Small and Medium Enterprise
SOP	Standard Operating Procedure
SPV	Special Purpose Vehicle
SSC	South-South Cooperation
STI	Science, Technology and Innovation
SUA	Sokoine University of Agriculture

TBS	Tanzania Bureau of Standards
TCU	Tanzania Commission for Universities
TLO	Technology Licensing Office
ToR	Terms of Reference
TOT	Transfer of Technology
TS	Technology Stations
TTO	Technology Transfer Office
TVET	Technical and Vocational Education and Training
UDSM	University of Dar es salaam
VETA	Vocational Education and Training Authority

DEFINITIONS

For the purpose of the guidelines, the following definitions shall apply.

Copyright means a legal right given to a creator for his/her literary and artistic works (including computer software). Related rights are granted to performing artists, producers of sound recordings and broadcasting organizations for their radios and television programme. The period of protection is the lifetime of the creator and 50 years after his/her death.

Grassroots Innovation means an innovation from unaided, unqualified, untrained individual innovator from informal sector, who has developed a solution to technical, environmental and socio-economic problem.

Incubation centre means a centre owned and/or managed by public or private entity that provides service like management, mentoring, training and office space for start-up and individual innovation projects.

Innovative cluster means structures or organised groups of independent parties (such as innovative start-ups, small, medium and large enterprises, as well as research and knowledge dissemination organisations, not-for- profit organisations and other related economic actors) designed to stimulate innovative activity through promotion, sharing of facilities and exchange of knowledge and expertise and by contributing effectively to knowledge transfer, networking, information dissemination and collaboration among the undertakings and other organisations within the network.

Innovation space means a collaboration platform for positive change providing a shared working space for the community to bring about innovation. It is the main platform for managing activities and knowledge flow; it brings together people and teams from across the knowledge triangle for ideation, projects and other initiatives. It enhances thoughtful integration of teams across distances that require planning, insight and commitment to minimize disparities. Innovation spaces are not creators or implementers but enablers of innovation.

Innovation means the process of translating an idea or invention into a good or service that creates value for which customers will pay. It may be in the form of new or improved products, new or improved services, or new organizational and managerial measures.

Innovation hub is a physical space that brings together researchers, creators and innovators to nurture ideas into industry-changing products and services.

Intellectual property means intangible possessions or asset, which encompasses creative works, inventions, signs and information. Intellectual property is distinct from the tangible objects in which it is embedded.

Invention means a product or process that provides a new way of doing something or offers a new solution to a technical problem.

Makerspace means an open access workshop, dedicated room or a multipurpose space inside a college, school or a separate public or private facility hosting a variety of tools and equipment where people come together to share materials, learn new skills, design, build and create all sorts of different things.

Patent means an exclusive right granted for an invention in a given territory for a limited period, generally 20 years, after which the invention enters into the public domain. For an invention to be patented it must be industrially applicable (useful), new (novel), and of a sufficient inventive step.

Prototype means an original model constructed to include all the technical characteristics and performances of a new product or process. In innovation process this can be in a number of stages depending on the type of technology: A model of something that exhibits the essential features of a later type; a standard or typical example; and a first full-scale and usually functional form of a new type or design of something.

Spin-off company is a company that is created using resources of the institution or company from which the technology originated. The host institution or company usually incubates the spin-off company at least until the end of the first round of venture capital investment. The staff members from the institution or company are often transferred to the new company either on a permanent or secondment basis.

Start-up Company is a company created by people outside an institution or another company. It is usually built on a license to one or more technologies that may originate from an institution or company, however, its other resources such as management are drawn from elsewhere.**Technology and Innovation Centre** means a facility including but not limited to innovation spaces; hubs/Makerspaces; Technology station; Technology Transfer Offices; Technology Parks; Incubation centres; and Innovative Clusters.

Technology and Innovation parks means property or facility designed to facilitate the production and commercialization of technologies and innovations by forging synergies among research centres, education institutions, and technology-based companies.

Technology station means a centre with technology equipment, facilities, infrastructure and expertise, which provides space for individuals to engage in development of innovative products, processes and services.

Technology Transfer Office (TTO) means an organizational or institutional structure whose core role is to, manage and protect the intellectual property of a scientific organization such as a university or research organization. The TTOs facilitate commercialization of intellectual property obtained research-based results through licensing, patenting or management of spin-off creations.

CHAPTER ONE

1. INTRODUCTION

1.1 Background

The United Republic of Tanzania (URT) developed her National Development Vision 2025 which prompts the desire of becoming an upper middle-income economy country. Based on this vision, the government envisions the attainment of high-quality livelihood, good governance as well as building a competitive economy that is knowledge based, innovation driven and responsive to the needs and aspirations of its people. As such, building a productive and efficient innovation system is critical.

Various plans and strategies have also been developed and are at different stages of implementation, and these include among others: The Tanzania Long Term Perspective Plan (LTPP), 2011/12-2025/26; the Third Five-Year National Development Plan (FYDP III) 2020/2021–2025/2026; the Blueprint for Regulatory Reforms to Improve Business Environment (2018); the Strategy for fast-tracking Industrialization in Tanzania: 2016-2020; The Integrated Industrial Development Strategy 2025 (IIDS 2025) and the Tanzania Diagnostic Trade Integration Study (DTIS) 2017; Boosting Growth and Prosperity Through Agribusiness, Extractives, and Tourism. In order to achieve the underlined goals of these plans and strategies, the availability of a responsive national STI policy, state-of-the-art infrastructures and adequate skilled human resource are extremely necessary. To date, STI in the country is guided by four policies which are the Science and Technology policy of 1996, R&D policy of 2010, Biotechnology policy of 2013, and Nuclear Technology of 2013.

Despite the efforts that the government and many stakeholders have made in promoting STI, the country is still far from realizing the desired benefits of such endeavor in terms of enhancing the country's economic growth and human development. The reasons being that the STI system is constrained with several challenges including, among others, weak coordination and governance; inadequate

investment on research and innovation; inadequate supportive infrastructures and facilities; low transfer and diffusion of existing and upcoming technologies; low quality of research results thus limiting the private sector from up taking them; and lack of national criteria for the establishment and operationalization of quality innovation and technology centres. These infrastructures constitute one of the major drivers of pre-requisite skills development and commercialization of locally developed innovations and technologies worldwide. Interestingly, there is a growing interest on establishment of technology and innovation centres both in the public and private sectors. Hence, developing standard guidelines for their establishment and operationalization is imperative. These guidelines will set forth the steps, procedures, criteria and modalities for benchmarking and aiding the quality of such centres, and thus enhance the rate of accreditation and development of transferrable technologies and innovations.

The guidelines will also help the frontline governance and regulatory authorities to exercise their mandates accordingly in terms of coordinating, promoting and facilitating innovation matters. The Ministry of Education, Science and Technology, Commission for Science and Technology (COSTECH) through the Centre for Development and Transfer of Technology (CDTT) will assume the central role in ensuring compliance and that the guidelines are reviewed from time to time.

1.2 Main objective

These guidelines are broadly meant to set forth criteria and procedures for governing the establishment, operationalization and development of robust technology and innovation centres in the Tanzania.

1.3 Specific objectives

Precisely, these guidelines are meant to:

a) Set criteria and standard procedures for establishment, operationalization and benchmarking of technology and innovation centres in the country;

b) Set criteria for enhancing the transfer and diffusion of technologies and innovations for human use;
c) Ensure ethical and quality research outputs;
d) Set criteria for identification and classification of technology and innovation centres; and
e) Ensure objective and efficient monitoring and evaluation of the technology and innovation centres.

1.4 Scope of the Guidelines

The guidelines shall apply to all forms of technology and innovation centres established by institutions, companies and individuals across the country both physical and virtual. The guidelines will serve in developing, drafting or revising legislative, administrative or policy measures relating to the development as well as promotion and commercialization of inventions, innovations and traditional knowledge practices in the country.

1.5 Rationale

The mechanisms to promote technology development have undergone various changes for improvement purposes. Some policies and guidelines have been developed or are in different stages of development. The newly launched guidelines for Identifying and Promoting Inventions, Innovations and Traditional Knowledge Practices of 2018 provides a framework on how the government and other key players should deal with the identification and promotion of inventions, innovations as well as traditional knowledge and practices from academia, public and private institutions and innovators/industrialists throughout all levels in Tanzania. These include grassroots innovations, non-grassroots innovations and traditional knowledge practices.

Moreover, the country has witnessed mushrooming of initiatives for establishing technology and innovation centres in the public and private sector. However, the establishment and operationalization of such centres are governed by own set of

criteria and procedures which pose the risk of compromising quality of innovation intermediation role performed by technology and innovation centres programmes and outputs thereof. Thus, underpinning the need for harmonized and standard guidelines and procedures. The better these guidelines and procedures are, the better the quality of training, innovators/industrialists as well as the generated technologies and innovations. The registered technology and innovation centres will be recognized as credible and reputable entities locally and internationally, which will in turn enhance access for funding and technical support from the government and other national and international organizations.

By being registered, monitored and supported, the centres will have access to different opportunities that are necessary for their sustainability. As such, we envision swift technology transfer; enhanced access to support systems; enhanced access to training and other capacity building programs; heighted linkage with public and private investors and customers; provision of guarantees when needed; strong linkage to higher learning and research and development institutions that are responsible for prototyping and valorization of technologies. Also, the guidelines will in the medium- and long-run positively affect the rate of commercialization, establishment of spin-offs/start-ups, and eventually the increase of revenue as well as job creation and entrepreneurship opportunities.

CHAPTER TWO

2 KEY FEATURES OF TECHNOLOGY AND INNOVATION CENTRES

Technology and innovation centres have common features of innovation intermediation role between different stakeholders. But still individual categories have extra and unique features which are more relevant and effective to different types of technologies and innovation ecosystem as described below. The centres comprise of innovation spaces, incubation centres, innovative clusters, technology transfer offices, technology stations, and technology parks.

2.1 Innovation Space

An innovation space is an appropriate physical setting that provides the required resources to foster users' creativity when working on innovations in a fast-paced environment. Universities and private organizations both create innovation spaces in a variety of styles, including fabrication laboratories, maker spaces, co-working spaces, accelerators and living laboratories. Such areas provide opportunities to develop innovative ideas by including users early in the innovation development process and in the design of new products. For academic institutions, innovations spaces offer a chance to connect with the business world, as well as a place to promote learning and research. Furthermore, the spaces enable completion of more extensive and complex projects by serving as gathering places for mentors and upcoming innovators to meet and work collaboratively.

Innovation space activities include but not limited to:

a) Products development;
b) Coding/software developments;
c) Gadget making;
d) Computer hardware /system design and fabrication;
e) Reverse engineering;
f) Art and Designs; and
g) System integration and adaptation.

2.1.1 Innovation Hub

Innovation hub is the main instrument for managing activities and knowledge flow; and brings together people and teams from across the knowledge triangle for ideation, projects and other initiatives. Also, it enhances thoughtful integration of teams across distances that require planning, insight and commitment to minimize disparities. Hubs are not creators or implementers but enablers of innovation.

The main features of hubs include:

a) Pre-occupation with large innovation challenges;
b) Expectation of break through solutions;
c) Targeted collaborations;
d) Rich innovation toolbox;
e) Focus on experimentations; and
f) Systematic thinking.

2.1.2 Makerspace

A makerspace provides manufacturing equipment, technology and also educational opportunities depending on where it is located. It is a flexible, community space, particularly well-suited to libraries, where groups and individuals can gather to hypothesize, explore, and experiment to further and deepen their own learning. Overall, it is a place that can be used for a range of activities with changing and flexible educational goals and creative purposes.

2.1.3 Identification of Innovation Space

The innovation space may be identified based on the following features:

a) Considered a haven for new ideas where teams are facilitated to test and develop ideas, accelerating iteration and innovation;
b) Encourages curiosity, experimentation and collaboration;
c) Inspires new thinking and communicates key aspects of brand and culture;

d) Local or global connectedness: co-located and distributed teams have distinct needs;
e) Promotes relationship between technology or innovation and entrepreneurship.

2.1.4 Establishment of innovation space

Innovation space can be established in both the public and private entities; and may serve a specified or multiple sectors depending on the targeted end-users.

2.1.5 Administrative structure of innovation space

An innovation space requires a full-time executive leader and support staff who will ensure that the core functions and/or responsibilities are carried out efficiently. The executive leader and support staff shall, inter alia, be responsible for:

a) Directing, managing as well as recruiting and training team leaders and members;
b) Documenting the innovation space processes and proceedings;
c) Assessing outcomes and ensuring accurate and timely communication of the same within the innovation space.

2.1.6 Functions of Innovation Space

Functions of an innovation space include but not limited to:

a) Providing physical space for interaction within local innovation ecosystem;
b) Ensuring knowledge exchange within, between and across the innovation spaces and the rest of the ecosystem;
c) Providing a platform for undertaking activities and services that aim to promote innovation such as boot-camps, seminars, trainings and showcasing; and
d) Helping start-ups to get through the initial hurdles during establishment of a business by providing guidance on different aspects including business basics, networking activities, marketing assistance and research.

2.1.7 Operation of Innovation Space

Innovation space can be established in the form of one or a cluster of the following forms:

a) Interactive platform with a virtual and/or physical presence;
b) Workspace, an incubation space, a formation zone, or an R&D Centre;
c) Social network or knowledge network; and
d) Branded engagement mechanism.

An innovation space may be funded through membership fees or affiliations with host organizations, such as universities, for-profit organizations, non-profit organizations and other forms of non-state actors. Members of a respective space may spend a prescribed period of time and then graduate to subsequent stages of innovation as specified in the operational manual.

2.2 Incubation Centre

Comprises of incubation facilities which offer start-ups the necessary advice, technical assistance, infrastructure, access to investors, networking opportunities, and a variety of other resources that may be needed for the start-up or individual inventor to survive and scale up.

2.2.1 Identification of incubation centre

There are two main types of incubation centres that are widely accepted: Technology Incubation Centres and Business Incubation Centres. While the former focuses on offering technology development services, the Business Incubation Centre focuses on offering business support services. Nevertheless, the incubation centre may offer both the technology development and business support services depending on the competence and skills set of its staff.

The incubation program comprises of three stages that are widely accepted:

a) Pre- incubation stage

Includes activities that bring together the members of academia and public sector and businesses, or aspiring business people to develop and test innovative ideas for solving common problems or to develop business ideas and entrepreneurial skills. This stage involves ideas that still require

nurturing and proper formulation. It is applicable to incubators attached to universities or research institutions that are dealing with high-tech industries. Beneficiaries of pre-incubation activities are young entrepreneurs, entrepreneurs that have not yet registered their companies (i.e. informal businesses), women that are working in informal sector or at home.

b) Incubation stage

This is also referred as acceleration stage and is regarded as such where clear plans are available, teams have been formed and operations have started. The main role at this stage is to refine the plan, strengthen the team, connect the team to resources and help/guide the team to invest and form start-ups. The start-up(s) at this stage still requires support for financial and other resources. Beneficiaries of incubation activities also include research organizations through interaction between the research organizations, the private sector and the public sector.

c) Post-incubation stage

This stage is referred where a start-up is becoming profitable but still requires limited and/or specialised support from the incubation centre. The support will also link the small companies and entrepreneurs to new and larger markets and support them in lifting the quality of their products to meet the requirements of the new markets. Thus, there will be a possibility of scaling up and expanding their businesses. Therefore, the incubator may continue to host the start-up for limited period of time to allow it to mature before being released to the free world.

An incubation centre may choose to offer pre-incubation, incubation and post-incubation services only or altogether depending on its level of resources and expertise.

2.2.2 Establishment of Incubation Centre

A legally registered entity such as a research institution, educational institution, non-governmental organization and company, among others, are eligible for establishing

incubation centres provided that their mandate and/or core functions embrace a component of incubation services.

2.2.3 Administrative structure of incubation centre

The team should consist of qualified personnel who are capable of running the incubation centre. The incubatees are responsible for managing their individual businesses. Furthermore, it is good to identify a set of advisors, preferably a mix of industry veterans, faculty and investors, who will provide guidance on managerial and strategic issues. The administrative structure should consist of management board, manager, and other experts. The manager of the incubation centre must deploy all relevant policies and governance guidelines.

2.2.4 Functions of incubation centre

The incubation centre must be able to prove that it has the capacity, in terms of personnel, facility, networks, and partnerships, to offer the desired services. Services that can be offered through the incubation centres include but are not limited to:

a) Technical support services;
b) Legal support services;
c) Business Development Services;
d) Networking capacity;
e) Mentorship services;
f) Training services;
g) Boot camps; and
h) Exhibitions, advertisement, publicity, promotion and financial services.

2.2.5 Operations of incubation centre

The operation of incubation centres involves planning, marketing and management of stakeholders, financing, monitoring & evaluation and benchmarking.

2.2.5.1 Recruitment of incubatees

An incubation centre must comprehensively define its criteria and standard procedures for recruiting incubatees. The recruitment positions for incubatees must be advertised with clear statement of the required minimum requirements. The admission requirements and/or conditions should be flexible and may vary

depending on whether the applicant intends to join for pre-incubation, incubation and post-incubation. Incubation centres use a set of criteria for recruitment of incubatees, which include but not limited to:

a) Innovativeness of the idea(s) sought for incubation;
b) Level of technology readiness;
c) Feasibility of the business and plan;
d) Appropriateness to Government/development priorities;
e) Support of local authority;
f) Environmental compliance and soundness;
g) Gender consideration;
h) Potential for use of locally available raw materials;
i) Availability of similar proven technologies;
j) Commercial viability;
k) Favourable business environment;
l) Risk exposure and likelihood of success; and
m) Envisioned benefits to local communities.

2.2.5.2 Exit/graduate of incubatees

The incubation program must have defined duration for entry and exit level of incubatees. The minimum conditions and qualifications required for the incubatees to graduate must be clear right from the onset of the program. Examples of the necessary conditions include:

a) Defining the time limit for graduation (up to six months), however, this can be revised and/or extended on case-by-case basis;
b) Incubatee is often suspended consequent for failing to achieve the agreed business objective(s) and/or targets;
c) Incubatee leaves the centre as soon as the agreed business objective(s) and/or targets are achieved; and
d) Adequate preparations have been made for an incubatee who is ready to exit (such as a relocation plan; obtaining suitable premises).

Other conditions and/or criteria may be added and employed by individual technology and innovation centres when need be.

2.3 Innovative Cluster

Clusters are group of firms engaged in similar or related economic activities in a national economy. In most cases they have been defined by two important attributes, namely spatial agglomeration and sectoral dimension.

2.3.1 Identification of innovative cluster

Innovative cluster is a structure or organized group of independent parties and/or undertakings designed to stimulate innovative activity through promotion, sharing of facilities and exchange of knowledge and expertise; and by contributing effectively to knowledge transfer, networking, information dissemination and collaboration among the undertakings and other organizations that are operating in a particular sector and region. A cluster normally is recognized as a co-location of partners, services providers, educational and research institution related through linkages of different types

2.3.2 Establishment of innovative cluster

Innovative cluster is established from members having a common interest and can be anchored at a public or private institution/entity. It is normally registered based on nature of the focus area of the program. Currently, there is no formal registration of cluster but the registration can follow the path of an association or non-governmental organization. Cluster members choose leaders and secretariat subject to written constitutions, charters or procedures. Most clusters establish formal collaborations with relevant institutions to enhance technical and other forms of support.

2.3.3 Administrative structure of innovation cluster

A cluster is headed by a chairperson and a secretary but often has a facilitator who should focus on cluster development; solution of related problems; improvement of the situation in the country; global/regional labour market; implementation of cluster management policy; and development of social infrastructure. The facilitator plays a leading role or may be presented as a coordinating body at the individual level of employees of enterprises in the realization of activities and tasks. The facilitator must be an expert in the field of strategic management and area of specialization of the respective cluster. Furthermore, the facilitator makes propriety advices related to the development of innovation clusters and the involvement in different initiatives

including, among others, the participation in roundtable discussions, seminars, workshops and conferences.

2.3.4 Functions of innovation cluster

The functions of an innovative cluster include but not limited to:

a) Fostering relationships within and between clusters that eventually lead to new methods of competition that heighten the creation of innovation;
b) Creating conditions and/or requirements for the formation of regional innovation systems and development of businesses;
c) Serving as growth points of domestic markets and international development;
d) Helping in introducing new products and services to new markets;
e) Conducting marketing research on lighting markets;
f) Organizing exhibitions, trade fairs and communication activities;
g) Organizing vocational training and re-training programs;
h) Providing consultations regarding the protection of intellectual property rights, research and development, registration, including patent search and the use of patent information;
i) Promoting information campaigns on activities of the cluster and its development prospects using mass media; and
j) Creating conditions and/or requirements for the establishing a formal relationship between its members (SMEs) with a source of knowledge such as Universities or R&D institutions

2.3.5 Operations of innovation cluster

The sustainable operation of clusters significantly depends on access to the current sources of scientific knowledge and state-of-the-art technologies. It also depends on the concentration and probability of significant amount of financial resources. The decisive role in the innovation orientation process of a cluster is dictated by the existence of civilized infrastructure of intellectual and financial capital. The interaction within an innovative cluster is performed through vertical and horizontal connections. It is the cooperation within a cluster and the ability of its participants to effectively use

internal and external resources which determine the competitiveness of the products from cluster members.

2.4 Technology Transfer Office/Centre (TTO /TTC)

Technology Transfer Offices (TTOs) participate in a variety of for-profit endeavours designed to speed up the commercialization of scientific advancements. It engages in a variety of commercial activities that are meant to facilitate the process of bringing research developments to market, often acting as a channel between academia and industry.

2.4.1 Identification of TTO

The TTO encompasses different kinds of organizational structures whose common role is to assist individuals from higher education and R&D institutions in managing intellectual assets in ways that facilitate their transformation to beneficial products and/or services.

2.4.2 Establishment of TTO

The establishment of TTO must consider the following:

a) Each institution must develop and implement an Institutional Intellectual Property Rights Policy. The policy must provide guidance on entrepreneurial staffing and environment, roles, strong links to commercial/manufacturing partners, access to risk or venture capital, operations and management of the respective TTO. The Policy should not be made in isolation from existing policies and frameworks of the institution and units. TTOs are mainly established either in research or in postgraduate directorates for higher education or R&D Institutions.
b) Each institution must have a furnished office and appropriate electronic databases for technologies and innovations.

2.4.3 Administrative structure of TTO

Classical TTOs are entities within the higher learning and R&D institutions. In this regard:

a) The TTO should preferentially be headed by someone with experience from both the academia and private/industrial sector. The best profile for TTO heads is one with expertise on either IP Law, science, engineering and/or experience in business;
b) TTO structure should consist a head, licensing associates, licensing liaisons, administrative staff and industrial liaison officers;
c) TTO staff can be recruited or designated from public or private/industrial sector;
d) TTO should have a technical Board/Committee including external representatives from business and senior technology transfer experts.

2.4.4 Functions of TTO

The main function of TTO revolves around working with innovators, inventors, industrialists and prospective licensees to bridge the gap between research and innovation. This endeavour is achieved through:

a) Establishing relationships with firms and community actors;
b) Providing assistance in all areas related to entrepreneurship and intellectual property rights;
c) Creating awareness and encouraging researchers to disclose their inventions;
d) Building a strong IP portfolio;
e) Establishing an organizational culture that fosters technology transfer;
f) Mediating between parties involved in the commercialization process like the inventors and industries;
g) Facilitating the formation of spin-off companies and start-ups utilizing generated technologies and staff to enhance prospects of further development; and
h) Generating net royalties for the higher education/R&D institutions and collaborating partners.

2.4.5 Operations of TTO

The TTOs should prepare and make available all operational manuals or plans defining office protocol for various issues including patents, trademarks, copyrights,

and trade secrets; plant variety protection; contracts, agreements, and licenses; policy development; technology evaluation; invention marketing; conflict analysis; negotiation support; and strategy inputs.

Each TTO requires a clear policy of ownership that ensures that everyone involved in the process knows who bears ultimate responsibility for a given technology. The policy should define the distribution of income from the commercialized technology and innovation. In addition, the TTO should have a policy with regard to prevention and resolution of conflicts of interest, to maintain the integrity of the R&D and high learning institution's main educational and research functions amid the increased commercial opportunities. The TTOs shall build networks in the technology transfer and licensing community. This could be a multilevel approach allowing organizations to address different aspects of their respective missions.

2.5 Technology Station

This is a world class service provider of Engineering services to Technology based Micro, Small and Medium Enterprises (MSMEs) and start-ups through interaction with experts at universities R&D and vocational training centres. The main objective of establishing technology stations is to promote the competitiveness of industry and technology enterprises through the use of specialized knowledge and technology. While higher learning institutions and R&D institutions strives to be more responsive to industry needs, the industry anticipates gaining access to the institutions' specialized knowledge and resources.

2.5.1 Identification of Technology Station

The primary feature of a technology station is the availability of supportive infrastructure, facilities and services for technology development into start-ups, micro, small and medium-sized enterprises. This establishment plays a critical role for transfer of improved products, processes and services. Technology stations support industries through activities that bridge the gap between local suppliers and industry.

2.5.2 Establishment of Technology Station

A technology station is established in partnership between national STI coordinating body and higher education or R&D institution through government or private funding

mechanisms. The requirements for its establishment include: technical experts in selected disciplines, high-tech laboratory, manufacturing equipment (accredited) and physical infrastructure for instance workshops and offices. The TTO is also considered as important to facilitate smooth flow of knowledge from research to the station. The facility is established to serve specialized sectors such as: agro-processing, materials and processing, chemicals, energy and environment, clothing and textile, automotive industry and tools and equipment fabrication. Within the Technology Stations are the high-Tech equipment forming part of infrastructure and experts from HEIs, R&D institutions and industry who have requisite skills and expertise for using any available such high-tech equipment.

2.5.3 Administrative structure of Technology Station

The administrative structure of a technology station is composed of:

a) The station's manager with experience in administration, technology and innovation as well as marketing in the legal streams;
b) The project administrator(s), the lawyer, licensing officer(s), administrative staff, and industrial liaison officers;
c) The working force can be recruited or designated from public or private/industrial sector; and
d) Technical Board/Committee including external representatives from business and senior technology transfer experts.

2.5.4 Functions of Technology Station

Technology station performs the following functions:

a) Testing, behaviour analysis and quality of various materials using available equipment according to the standards or required specifications;
b) Producing a working model (prototype) according to the expected functions of the product and manufacturing of models or equipment depending on client requirements;
c) Identifying potential for improvement and required interventions, searching and sourcing of required technology and managing technology transfers for small and medium enterprises (SMEs);

d) Improving productivity, workflow and quality of products through application of standard procedures and methods, and testing to improve product in view of meeting required market and regulatory;
e) Providing professional engineering and design, identify and source technology or equipment to improve SMEs products;
f) Investigating new products or processes and apply scientific methods to improve competitiveness and compliance to standards; and
g) Offering tailor-made training and demonstration of new or existing technologies to SMEs and individuals (if possible accredited).

2.5.5 Operations of Technology Station

Technology station must operate legally in order to reach the goals intended as per the national targets. In technology station, the senior-level administration has to be recruited first to ensure commitment, entice career-minded individuals to participate, and develop the support structure for partnership in all facets of the technology station. Strong relationship between the centre and administration of HEIs is equally important to ensure the establishment of similar support structures in partner institutions. It is important to aggregate administration supporters under a common governing or advisory organization so that the support is nurtured and maintained throughout the life of the station. This governing body should also be actively engaged in responding to issues and challenges raised by industry through monthly review process. The station, throughout its lifetime, should be envisioned as a permanent part of the participating HEIs and their respective strategic plans.

2.6 Technology Park

Technology parks are designed to facilitate the production and commercialization of advanced technologies by forging synergies among research centers, education institutions, and technology-based companies. Tenants of technology parks are usually small companies at an early development stage pursuing an ambitious growth strategy based on the incubation of new ideas. To facilitate the successful adaptation and take-up of these ideas in the market place, the technology park provides:

a) cooperation in R&D with scientific research institutes and laboratories;

b) financial consulting and assistance in obtaining venture capital;
c) professional, technical, administrative and legal assistance;
d) technology information services; and
e) supportive business infrastructure.

2.6.1 Identification of Technology Park

Technology Park should be established in a controlled premise in both public and private entity. Such entities may include higher learning and R&D institutions; Local Government Authorities; Grassroots innovators; Community (Citizens); Ministries, Department and Agencies; Industries; SMEs; Large companies and corporations; Local and Foreign Investors; Policy makers and higher decision makers; Non-Governmental Organizations; and Development Partners. Technology Park stimulates and manages the flow of knowledge and technology amongst HEIs, R&D institutions, companies and markets. It facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities.

2.6.2 Establishment of Technology Park

Technology parks vary in the way are established and managed. They can be founded as independent by higher learning institutions and R&D, private corporations or any combination of those. Depending on the institutional character of their founders, parks can be public or not-for-profit, private, academic-related, hybrid, and other. A decision on establishment of a technology park should be assessed in a broad national or local economic context. It is important to note that to establish such a facility is never an end in itself; it is a means to an end. Therefore, it is important to understand: (a) what can be achieved by establishing the park (e.g., to enhancing national R&D or promote economic development in a particular city or region of a country); and (b) whether there are better alternative solutions to achieving that goal. Furthermore, establishment of the technology park should be in line with the national plans or strategies for boosting the development of science, technology and innovation, and/or moving products from laboratory to market. In view of that the following precursory conditions among other should be observed:

a) Key tenants or the anchor tenants such as higher learning institutions and R&D institutions are committed to staying in the technology park. Such anchor tenants are crucial to ensuring that the facility is not empty and useful in attracting other firms to locate in the park;
b) Availability of a management team responsible for managing multiple tasks such as coordination and communication among various stakeholders, R&D, talent, capital, infrastructure and other activities including construction works. To be able to fulfil such management tasks. The team needs to have expertise in not only R&D, but also business, marketing, negotiation and communication skills;
c) A strong science base in the surrounding areas of the technology park is already available to provide potential tenants;
d) The city or area where a technology park is located is attractive to researchers and talented staff. The park mostly comprises of incubation centres; innovation spaces; workshops and laboratories; close to hospitality facilities (Hotels & Convention Centres); residential utilities such as water, electricity, and gas; green open areas and sports facilities; industries and logistics; institutions and R&D centres; as well as government liaison offices;
e) An entrepreneurial culture is available in the city or country where the technology station is to be located. This factor is particularly important if the key objective of the technology is to foster start-ups and entrepreneurs.
f) Availability of financial resources, especially seed and venture capital.

2.6.3 Administrative Structure of Technology Park

It is nearly impossible to create a standard administrative structure that could be applied to any technology park. Therefore, governance system should be created for the respective technology park to fit the social situations and characteristics of the parent organization. The recommended structure for technology parks in Tanzania is that, there should be managers with suitable professionalism and experience; the board of directors; policy makers and other staff members in different fields of specialization.

2.6.4 Functions of Technology Park

Functions of Technology Park include but not limited to:

a) Providing a platform that involves multiple actors and activities going on in a prescribed area;
b) Providing the necessary administrative support service to potential entrepreneurs who are interested in having spaces at the technology park;
c) Creating a conducive environment for establishing ICT, engineering, electronics, telecommunication, biotechnology and other related knowledge-based industries; and
d) Attracting foreign and local companies to set up operations in the park.

2.6.5 Operations of Technology Park

In order to operate effectively, the technology park must have a clear coordination of tasks; consultation procedures and coordination bodies for promoting the development of mutual trust; and a political arbitration body for resolving disputes between partners. The engagement of policy makers as chairs of the association is discouraged, instead, a board of directors should be set, which consists of the founding partners, policy makers and other relevant professionals. Representatives elected into different bodies, economic and financial players, and researchers and academics should also be grouped into relevant bodies. The managers recruited to head the technology parks must have relevant experience for working both in the public and private entities.

Science park coordinators must pay attention to public and private interests. These coordinators are involved in a broad range of activities which include, among others, exploring companies, developing companies, facilitating promotions as well as promoting technological research. As such, the broad responsibility of science park coordinators is to bring people together and identify projects. The ability of these coordinators to listen and communicate effectively is essential to the successful operationalization and development of technology parks

CHAPTER THREE

3 SUPPORT FOR INVENTORS AND INNOVATORS

The different forms of innovation centres shall have support system for innovators which is meant to create enabling environment for enhancing the development and commercialization of innovations, inventions and technologies. The centres should have the capacity to provide technical, legal, business, training, mentoring, networking and dissemination services to the innovators, inventors and industrialists. The centres should also set clear requirements and procedures on how various support services can be accessed.

3.1 Technical Support

The technical support services for innovators, inventors and industrialists that are expected from different forms of innovation centres include but not limited to:

a) Ensuring access to expertise, specialist support and facilities;
b) Providing technical support such as development of plans for space, facilities and or relevant infrastructure for inventors and innovators;
c) Raising the awareness of innovators, inventors and industrialists on the potential challenges and impact of innovative projects;
d) Developing mechanisms for early identification and control of unsuccessful projects;
e) Developing mechanisms for embracing motivation and success i.e. a system of rewarding innovation and invention actions; and
f) Providing technical assistance in evaluating inventions and innovations.

3.2 Legal Support

The legal support services for innovators, inventors and industrialists that are expected from different forms of innovation centres include but not limited to:

a) Facilitating linkage with relevant organizations/offices for legal advice;
b) Providing guiding on finding new ways of sourcing, selling or licensing technologies and/or innovations; and

c) Providing legal support for development, promotion, IP protection and commercialization of innovations.

3.3 Business Support

The business support services that are expected from different innovation centres include but not limited to:

a) Providing advice on business opportunities and models;
b) Helping in business development, dissemination and social diffusion;
c) Facilitating engagement with relevant investors and collaborators;
d) Enhancing the understanding on future markets for innovations and inventions;
e) Connecting innovators, inventors and industrialists to partners for potential commercial and technological collaborations; and
f) Providing information and supporting linkages on accessing finances.

3.4 Networking and Dissemination

The services to inventors and innovators in relation to networking and dissemination include but not limited to:

a) Facilitating communication and networking with local, national, regional and international partners that are performing similar or related works;
b) Assisting in finding partners, experts, facilities in favour of developing and commercializing inventions and innovations;
c) Organizing networking and collaboration events related to innovation and invention;
d) Facilitating publicity of innovations and inventions; and
e) Facilitating communication and networking with sources of knowledge

3.5 Training and Mentoring

The services expected from different forms of innovation centres in terms of training and mentoring include but not limited to:

a) Conducting mentorship programs through boot-camps and other forms of engagement approaches;

b) Facilitating access to knowledge through linkage with higher education and research and development institutions;
c) Providing coaching programs meant for increasing capability to innovate and grow;
d) Providing assistance for evaluation of inventions and innovations through prior-art searches;
e) Identifying institution(s) that are relevant for supporting the inventions and innovations being development;
f) Incubating inventions and innovations insitu or in an incubator; and
g) Assisting the government to disseminate open-source innovations and inventions.

3.6 Infrastructure and Utilities

The services expected from different forms of innovation centres in terms of infrastructure and utilities include but not limited to:

a) Conducive working space for developing and/or improving innovations and inventions;
b) Water, electricity and other forms of utilities for daily use by innovators, inventors and/or industrialists; and
c) Hardware, software, networks, data centres, facilities and related equipment used to develop, test, operate, monitor, manage and/or support information technology services and communication.

CHAPTER FOUR

4 COMMERCIALIZATION OF INVENTIONS AND INNOVATIONS

4.1 General Overview

Invention and innovation constitute the basis for commercialization of research results and innovations. The two phenomena differ in that invention starts with ideation process while innovation deals with a broad range from ideation to improvement(s) of a product or service.

The major challenge that most higher learning institutions, R&D institutions, industries and other key stakeholders have faced for decades is inadequate mechanisms for enhancing the transfer and commercialization of research findings and technologies. Precisely, lack of prerequisite skills for enhancing technology transfer and commercialization has contributed to non-commercialization of research findings and/or proven technologies/innovation in Tanzania and elsewhere.

The commercialization of innovations and research findings involve a number of stakeholders, with conflicting interests and expectations. The stakeholders may include R&D or S&T institutions, researchers or creators of IP, IP management unit, industry or licensees as well as government or sponsors. This scenario calls for various instruments to guide these and other stakeholders involved in the commercialization process and beyond. The guidelines herein intend to enable different stakeholders and potential partners/investors to understand the underlying philosophy and value of generated intellectual property assets (generated research results or developed proven technologies or innovation), their rights, privileges and obligations in any commercialization arrangements.

4.2 Intellectual Property Regulatory Framework

Intellectual property framework is aimed to promote the creation of valuable ideas and protect them from being misused or stolen. The four most common types of IPs are copyright, patent, trade and service mark, and industrial design. In Tanzania, the regulatory framework for IP protection is managed by the national IP

offices/authorities. Worth noting, the IP issues are territorial and non-union such that the IP laws and regulations in Tanzania Mainland are separate from those of Tanzania Zanzibar.

4.3 Intellectual Property and Technology Transfer Frameworks

In the United Republic of Tanzania, there are a number of legal and institutional frameworks that govern the protection and transfer of IP and technology. The laws that govern/guide IP and technology transfer in Tanzania include Patents registration Act 1987 Cap 217 R.E 2002, Trade and Service Marks Act 1986 Cap 326 R.E 2002, Copyright and Neighbouring Rights Act 1999 Cap 285 R.E. 2002, Copyright Act No. 14, 2003 Zanzibar Industrial Property Act No. 4, 2008, Fair Competition Act No. 8 of 2003, The Merchandise Marks Act (1963) R.E 2002, Plants Breeders Act of 2012, Act No. 7 of 1986 establishing the Commission for Science and Technology (COSTECH).

4.4 Registration and Protection of Property Rights

The protection and/or registration of IPRs for proven technologies or innovations can be done through national, regional and international legal frameworks. In Tanzania, there are different national authorities that have been established with the aim of protecting and promoting IP and innovations created by universities, R&E institutions/colleges, industries, individuals and any other sources. The owners of IPRs and innovations reserve the right to decide on countries in which to seek protection in addition to their country of origin. The choice of a country depends on the existence of potential markets, licensees, or industrial/business partners. The IP and innovation protection is only valid in the territory where protection is granted. Therefore, an IPR obtained within a jurisdiction is only valid in that jurisdiction. The registration and application for IP protection is done by/through Business Registration and Licensing Agency (BRELA) and Copyright Society of Tanzania (COSOTA) for Tanzania Mainland protection as well as Zanzibar Business and Property Registration Agency (BPRA) and Copyright Society of Zanzibar (COSOZA) for Zanzibar.

4.4.1 The Business Registrations and Licensing Agency (BRELA) and Zanzibar Business and Property Registration Agency (BPRA)

The BRELA administers industrial property (patents, trademarks and designs) protection in Tanzania Mainland; while BPRA administers the same in Tanzania Zanzibar. The Industrial Property must be registered to obtain protection under IP regime; and the protection is territorial.

4.4.2 The Copyright Society of Tanzania (COSOTA) and the Copyright Society of Zanzibar (COSOZA)

The COSOTA administers protection of copyright and neighboring rights for authors and performers of created works in Tanzania Mainland; while COSOZA administers the same in Tanzania Zanzibar. Copyright is an automatic right, (not necessary for registration) hence the protection starts once the author of the work creates it. It is advised however that one must register in order to have full evidence of protection when the copyright is exploited and in the matters of litigation/infringement and evidence of true ownership of the work.

4.4.3 The Commission for Science and Technology

The Commission for Science and Technology (COSTECH) is the principal institution that coordinates all matters related to science, technology and innovation in the country. Therefore, it is the key stakeholder and responsible for promotion of invention, innovation and research in the country by playing a linkage role with relevant bodies responsible for registration and protection of property rights. COSTECH through the Centre for Development and Transfer of Technology (CDTT) shall be responsible for registration of Technology and Innovation Centers, ensuring compliance to guidelines and monitoring and evaluation of performance of the same.

4.4.4 The Fair Competition Commission

The Fair Competition Commission (FCC) is an independent government body, mandated to promote and protect effective competition in trade and commerce; and to protect consumers against unfair and misleading market conduct throughout Tanzania mainland. It administers tribunals on unfair practices in the markets as well as counterfeit products.

4.4.5 The Plants' breeders' registry

The plant breeders' registry is responsible for promotion of plant breeding and agricultural advancements. This is done through the grant and regulation of plant breeders' rights and for matters connected herewith. An invention concerning plants is protectable if plant breeders' rights with respect to any plant variety are new, distinct, uniform and stable.

4.4.6 The Judiciary System

The judiciary system is mandated with the enforcement of IP concerning infringements, counterfeit and piracy of works, products/technologies.

4.4.8 Obtaining Intellectual Property Protection

The higher learning institution and R&D institutions have many options for protecting IPs such as inventions, software, literary works, artistic works and plant varieties etc. These are likely to have the following protection options: patent, industrial design, trade and services mark, trade secret, utility model, plant breeders' rights and copyright. The rationale behind IP protection includes but not limited to providing the means of getting innovative products to the market for public benefit, commercial and public recognition of important technologies, attraction of new R&D resources and partnerships for universities since they work closely with inventors and innovators, obtaining returns on investment, stimulates economic development, to identify and negotiate with a commercial partner for license or collaboration agreements, to maintain relationship with commercial partners, commercialization of innovation leads to news firms & industries, job creation and economic growth.

4.5 Models of Technology Transfer

The technology transfer can either be horizontal or vertical. Horizontal transfer is the movement of technologies from one area to another. It occurs through foreign direct investment (FDI) or when a local company acquires technology from a foreign country. Horizontal technology transfer can occur through Joint Venture, Turn Key, Franchise, etc. Technology transfer can equally occur within a country. Vertical transfer occurs when technologies are moved from applied research centres to R&D departments and to the market. The technology transfer includes four fundamental stages: search, adaptation, implementation and maintenance.

4.6 Coordination of Commercialization

In commercialization of IP related to public fund(s) process and administration, coordination is managed from the national to institutional level (individuals, higher learning institutions, and R&D institutions). At national level, an Act of Parliament or Order commonly governs the establishment of the national authority or office.

4.6.1 The Art and Science of Negotiation

In technology transfer, effective negotiation is about a long-term relationship in which the parties are setting a stage for productive, often long-time relations between sponsor and research entity, technology developer and inventor, or licensor and licensee. Effective negotiation is a function of being prepared, understanding the value proposition involved in each deal, having the authority to negotiate it, accessing content knowledge, having negotiation process knowledge, respecting relationships affected by a deal, and practicing keen communication skills and problem solving, good judgment, and discretion.

4.6.2 Commercialization Process

There are many models of commercialization, however, this section does not recommend any of the models because commercialization is highly context dependent and what may work well for some technologies may not work for others. Research and test marketing is rather essential for identification of primary target consumer groups. The primary consumer groups should consist of innovators, early adopters, heavy users and/ or opinion leaders. This will enhance the adoption by other buyers in the market place during the product growth period.

4.6.3 Commercialization Options

Common commercialization options for individuals, higher education institutions, universities and R&D are; outright sale or, licensing of IPR, spin-off company creation, Start-up Company and agreements/contracts.

a) Outright Sale

Outright sale of IPR is the assignment of rights to a third party. Assignment implies that the seller retains no obligation to ongoing support or management of IP. This is in contrast to licensing.

b) Licensing

A licensing agreement is a type of contract between an IPR owner (licensor) and a receptor (licensee) in exchange for an agreed benefit (fee royalty, equity, or non- monetary benefits such as capacity building or infrastructure). Licensing agreements are highly flexible and are dependent on the results of a negotiation between the licensor and the licensee. Licensing terms may be highly creative and structured to meet the needs of the negotiating parties. Key issues in licensing agreements include:

i. Obligations and responsibilities for the licensee/licensor;
ii. Time limits on the development and release of the product into the market by the licensee (known as development milestones);
iii. Rights of the licensor to any improvements made by the licensee;
iv. Clear definitions of the terms;
v. Technology growth and development milestones;
vi. The term and duration of the licensing agreement (lifetime of the agreement);
vii. The payment amounts, structure, benefits sharing and term;
viii. The exclusivity and geographical scope of the license;
ix. Guarantees or warranties on the technology;
x. Dispute settlement; and

xi. Governing law.

It is highly recommended that the negotiation and drafting of license agreements should be done with close assistance from a legal specialist that has proven expertise in the licensing of technologies.

c) Spin-off Company

A spin-off company is a company that is created using resources of the institution or company from which the technology originated. The institution or company usually incubates the spin-off company at least until the first round of venture capital investment. Staff members from the institution or company are often transferred to the new company either on permanent or secondment basis.

d) Start-up Company

A start-up company is a company created by people outside an institution or a company. It is usually built on a license to one or more technologies that may originate from an institution or company, however, its other resources such as management are drawn from elsewhere. The new company route may be the only option where no licensee can be recruited to commercialize a product and where a market does not already exist for the product. On the other hand, a license may be the only option if funding for product development and marketing is not available.

e) IP Commercialization Agreements

Agreements or contracts are among vital instruments in IP commercialization or technology transfer of generated technologies and results. Contracts are used as one of the tools to accelerate commercialization of IP assets at easy which may allow further

development and exploit the technology into new products, processes, applications, materials or services.

There are various forms of IP commercialization/ technology transfer agreements depending on the nature, need and industries. The following are some examples of IP commercialization related agreements:

i. License Agreement
ii. Non-Disclosure or Confidentiality Agreement
iii. Material Transfer Agreement
iv. Inter-institutional Agreement

In summary, commercialization of innovation is clearly manifested through integration into program goals of the research enterprise in favour of increasing public impact of researches. Generally, commercialization gives the highest opportunity for control and/or reward that comes from entrepreneurial activity. It serves as an encouragement for improvement of technology through providing reward as exclusive rights for disclosure and/or making profit or earning royalty by putting the innovation or invention into practice.

4.6.3 IP Strategy to Increase Commercial Possibilities

The following are IP strategies for increasing commercialization possibilities. The use of patent information seeks to:

i. Monitor state-of-art to avoid duplication in R&D;
ii. Stimulate new ideas and improvements;
iii. Give insight into technological activities of competitors;
iv. Study the marketing strategies of competitors;
v. Protect investment and encourage returns; and
vi. Avoid possible infringement on existing patents

4.6.4 Basic Steps in Approaching the Market

The following are the basic steps in approaching the market;

1. Do Technology Audit
    i. To understand the significance of the technology;
    ii. For technical feasibility (workable or not, technology trend costs involved to make it); and
    iii. To understand the stage of R&D (prototype, pilot production, requirement for further development).

2. Analyse IPR Issues

    It is critical to understand the IP elements (patentable inventions, industrial designs, confidential information) and filing procedures.

3. Market Assessment
    i. Is there a real need (who needs it, opinion of customers)?
    ii. Market research (market potential, product acceptability, industry competitors).
    iii. Commercial viability (market size and growth rate).

CHAPTER FIVE

5 INSTITUTIONAL AND LEGAL FRAMEWORK

Various institutions have different roles in the support, development and promotion of technology and innovation centres as described below.

5.1 Government Ministries, Departments and Agencies (MDA)

Since STI is a crosscutting matter, all MDAs are obliged to facilitate implementation of these guidelines by establishing and supervising centres under their respective mandates.

5.1.1 Ministry Responsible for Science, Technology and Innovation

Roles of the Ministry responsible for advancement of Science, Technology and Innovation are to:

a) Facilitate the implementation of guidelines for establishment, operationalization and development of technology and innovation centres;
b) Receive reports from COSTECH on technology and innovation centres in different stages of development and promotion;
c) Solicit resources for establishment, development and running of technology and innovation centres;
d) Ensure that funds allocated to programmes for technology and innovation centres have impact and are aligned with the government priorities; and
e) Review these guidelines for the purpose of improvement from time to time.

5.1.2 Business Registrations and Licensing Agency and Business and Property Registrations Authority

Business Registrations and Licensing Agency (BRELA) and Business and Property Registrations Authority (BPRA) will have the following roles:

a) Protecting technologies and innovations through granting of patent, utility models, trademarks as per the relevant laws;
b) Registering business startups emanating from innovations;

c) Creating awareness of their works and procedures through exhibition, training, seminars and other public events.

5.1.3 Local Government Authorities

Local government authorities (LGAs) shall among others have the following roles:

a) Facilitating sensitization and awareness campaigns on technology and innovation centres within their respective jurisdictions;
b) Identifying and informing national coordination office on any new invention and innovation in their areas; and
c) Providing enabling environment for harbouring innovation in their respective areas i.e. through providing space for incubators, innovation spaces for fostering socio-economic development of their areas.

5.2 Tanzania Commission for Science and Technology

The Commission for Science and Technology (COSTECH) is the national coordinating entity for technology and innovation centres, through the Centre for Development and Transfer of Technology (CDTT) established by the Tanzania Commission for Science and Technology Act No. 7, of 1986. The national coordination office serves as the national centre responsible for matters related to transfer, adaptation and development of technology including the assessment and choice of imported technology. Specifically, COSTECH shall:

i. maintain a registry of Technology and Innovation Centres in Tanzania;
ii. through CDTT ensure compliance with the guidelines and STI related policies;
iii. developing tools for monitoring and evaluation (M&E) of the centres; and
iv. provide certificates of compliance to the deserving Technology and Innovation Centres.

5.2.1 National Coordination Office On Commercialization of IP

The roles of national coordination office in relation to IP commercialization or management created from public finances include but not limited to:

a) Overseeing and coordinating technology transfer or IP management offices or institutions and stakeholders' activities that are publicly funded;

b) Managing implementation as well as monitoring, evaluating and reviewing the obligations of technology transfer or IP management offices;
c) Advising on IP transactions and developing guidelines for IP transactions involving Tanzanian and non – Tanzanian institutions;
d) Promoting the protection of IP assets/innovation and intellectual property rights that are generated from public funds;
e) Liaising with stakeholders to determine the viability of obtaining statutory IP protection;
f) Concluding IP protection transactions and commercialization of such IP;
g) Aiding in negotiations on IP commercialization or transfer of technology;
h) Managing information in respect of IP under the Act;
i) Administering and managing innovation or commercialization fund;
j) Providing incentives to institutions and their IP creators from innovations created through public funds;
k) Providing assistance to institutional TTO's and related capacity building;
l) Ensure availability of appropriate technological standards and best practices;
m) Serving as an implementing organ and advisor to the government on issues related to policies and guidelines on development of technology and innovation centres;
n) Preparing and maintaining registry of technology and innovation centres and a portal thereof;
o) Facilitating the promotion and development matters related to technology and innovations centres through exhibition, media, etc.;
p) Facilitating capacity building on technology and innovation related matters such as IP, entrepreneurship, marketing and commercialization;
q) Ensuring efficient utilization of financial resources;
r) Identifying opportunities for upgrading and/or expanding the high-end technology infrastructure; and
s) Monitoring and evaluating the performance of technology and innovation centres and initiating interventions when required.

5.2.2 Copyright Society of Tanzania and Copyright Society of Zanzibar

The roles of Copyright Society of Tanzania (COSOTA) and Copyright Society of Zanzibar (COSOZA) include but not limited to:

a) Promoting and protecting literary, artistic and scientific works;
b) Registering copyright works, production and publicizing them nationally and internationally; and
c) Educating copyright creators, government enforcement institutions and the general public on copyright and neighbouring rights matters.

5.2.3 Research and Development Institutions

There are a number of R&D Institutions dealing with technology and innovation development. The roles of R&D institutions include but not limited to:

a) Collaborating with the national coordination body in the establishment, development and promotion of technology and innovation centres;
b) Providing expert assessment of the technology and innovations; and
c) Encouraging researchers to invent and innovate for commercialization.

5.2.4 Higher Learning Institutions and TVET Institutions

The roles of higher education institutions (HEIs) and technical and vocational education institutions:

a) Establishing, developing and promoting innovation and technology centres;
b) Providing support on matters related to technical, legal, business, training, mentoring, networking and dissemination services;
c) Providing technology development services to small and medium enterprises (SMEs);
d) Building capacity of innovators and inventors through training, seminars, boot camps etc;
e) Encouraging innovation by students during their final year projects; and
f) Inculcating innovative culture by introducing IP and innovation modules in the training curricula or offer course on the same.

5.2.5 Institutional Intellectual Property Management Office/Technology Transfer Office

The unit responsible for managing intellectual property portfolio and bringing that IP to the market place through licenses and formation of companies is referred as Technology Transfer Office, IP Management Office, Technology Licensing Office, or Commercialization Office, and so on. The primary role of technology transfer office is to facilitate interaction between the HEIs/R&D institutions and industry, providing service, generating income, and complying with regulations. The Institutional IP or Commercialization Policy is a key instrument for the operationalization of commercialization process. An Institutional IP Policy guides all relevant stakeholders involved in the commercialization process. The issues to be addressed by institutional IP policy include, among others:

a) Establishment of IPMO (also known as /TTO/TOT/TLO);
b) Disclosure of innovations/inventions- IP product;
c) Ownership/Distribution of income/Benefits;
d) Contract/Sponsored projects/research;
e) IP products from joint R&D;
f) Rights of invention by research assistant, student & fellows;
g) Marketing and choice of licensee;
h) Dispute resolution/litigation;
i) Patent processing/IP registration costs;
j) Commercialization of innovations;
k) Responsibilities of the creator/institutions; and
l) Reviews of the policy.

Various models are structured according to the perspectives on how technology transfer offices are going to meet different objectives under different environments. The main functions undertaken by IPMO include:

a) Assisting in the development of institutional IP policies;
b) Building capacity and providing training on IP issues, policies, and practices to HEIs R&D institutions staff;
c) Developing close linkages with researchers to identify potential innovations that may be commercialized or for which IP protection may be sought;

d) Encouraging and managing non-traditional knowledge dissemination practices such as invention disclosures, patents and other forms of IP protection such as trademark;
e) Managing the institutional IP portfolio (including patents, trademark and copyright) through identification of partners as well as negotiation of assignment and licensing agreements;
f) Assist in the creation of spin-off companies based on institutional IP through activities such as raising venture capital, negotiating legal agreements, incorporation, and developing business plans;
g) Manage sponsored research contracts; and
h) Liaise and manage relationships with industry and other potential partners, locally and international.

5.2.6 Civil Societies and Private Sector

Civil societies and the private sector shall be required to get involved by:

a) Participating in the implementation of these guidelines;
b) Providing knowledge, information, capacity building and mobilization of resources;
c) Promoting the establishment and development of technology and innovation centres;
d) Participating and facilitate the popularization of new technologies and innovations to the society;
e) Engaging in innovation activities through industrial linkages and SMEs; and
f) Taking up responsibilities by using and marketing the developed technologies.

5.2.7 Development Partners

Development partners in Tanzania have been intensively involved in supporting STI activities. Therefore, it is expected that they will continue to support the development and commercialization of technology and innovations as well as taking part in venture capital development for technology and innovation centres.

5.2.8 Financial Institutions

Financial institutions will play a strategic role in providing financial support for facilitating the implementation of technology and innovation centers' programs. They will also assist in ensuring timely mobilization of adequate financial resources for technology and innovation activities.

CHAPTER SIX

6 MOBILIZATION OF RESOURCES

Successful establishment and development of technology and innovation centres critically depend on the capacity to secure sources for financing the envisaged programmes and projects. The means of soliciting finances need to be explored aggressively in view of meeting the huge demand for financial resources. Financing means may be achieved through a combination of resource mobilization strategies described below:

a) Government subventions through the NFAST under COSTECH, respective host institutions etc;
b) Centres' financial sustainability plans, e.g. fees from tenants, licensing and royalties;
c) Grants and loans;
d) Support and contracts from Pension and Social Security Funds;
e) Partnerships such as Public Private Partnerships (PPPs), diaspora and similar arrangements; Solicit venture-capital investors and angel-investor groups; crowd-funding campaign online;
f) Regional Economic Arrangements and South-South Cooperation (SSC);
g) Competitive Proposal to Local and International Calls; and
h) Any other funding arrangement.

CHAPTER SEVEN

7 MONITORING AND EVALUATION OF TECHNOLOGY AND INNOVATION CENTRES

Monitoring and evaluation (M&E) is integral to the development of technology and innovation centres. It allows those involved in development activities to learn from experience, to achieve better results and to be more accountable. The M&E processes allow those involved to assess the impact of a particular activity, to determine how it could be done better and to show what action different stakeholders are taking. The M&E for these centres is focused on nine methods; performance indicators, the logical framework (log frame) approach, theory-based evaluation, formal surveys, rapid appraisal methods, participatory methods, public expenditure tracking surveys, cost-benefit and cost-effectiveness analysis and impact evaluation.

7.1 Innovation Spaces

The M&E of Innovation space operations and management are essential in order to assess their growth and compliance. The performance of Innovation space can be monitored and evaluated based on Table 1.

Table 1: Monitoring and Evaluation tool for Innovation Spaces

S/N	Criteria	Yes	No	Remarks
Technical				
1.	Does it have operational Manual or guideline?			
2.	Does it have relevant and qualified work force?			
3.	Does it have ongoing projects/programmes?			
4.	Does it have collaborations with other spaces or industries?			
Basic structures and infrastructures				
1.	Does it have a physical space and offices?			

2.	Does it have laboratories and or workshops?			
3.	Does it have working tools?			
4.	Does it have members /member list?			
5.	Does it have a fulltime manager?			
Governance and Management				
1.	Presence of Board or Executive Management team (depending of type of registration)			
2.	Risk management system (if any)			
3.	Financial Management and Controls (account systems and structure			
4.	Do they have recruitment plan for innovators?			
5.	Does it have internal M&E system?			

7.2 Incubation Centre

Monitoring and evaluation are the key activities for assessment of best practices and associated performance indicators. M&E therefore should provide a more responsive framework to analyse the performance of the incubator and the level of satisfaction from its stakeholders. Incubation centres can be monitored and evaluated based on the Table 2.

Table 2: Monitoring and evaluation tool for Incubation Centres

S/N	Criteria	Number	Remarks / Adequacy level
Technical			
1.	The Number of spin-offs created/anticipated with the support of the incubation centre		

2.	The annual number of enterprise creation projects implemented after feasibility study			
3.	The percentage of projects based on technology and innovation			
4.	The annual number of start-ups created/anticipated with the support of the incubation centre			
5.	The annual number of jobs created by enterprises			
6.	The number of tenants in the incubator			
7.	The annual number of people employed by tenants in the incubator			
8.	The annual number of SMEs supported with their innovative projects,			
Basic structures Infrastructures				
		Yes	**No**	
1.	Building and offices			
2.	Incubation and incubation spaces			
3.	Workshops, Foundries and laboratories (if needed)			
4.	Availability of all appropriate utilities			
Governance and Management				
1.	Presence of Board or Executive Management team (where necessary)			
2.	Presence of management structure			
3.	Presence of policies and SOP			

4.	Presence of skilled human resource			
5.	Presence of agreement documents (used during recruitment and graduation/exit)			
6.	Presence of legal support services			
7.	Presence of resource mobilization strategy to sustain the centre			

7.3 Innovative clusters

An effective evaluation system should strengthen innovative clusters ability to maintain leadership across the frontiers of scientific knowledge. The system should enhance connections between fundamental research and national goals. The M&E system also will stimulate partnerships that promote investments in fundamental science and engineering, as well as the overall more effective use of physical, human, and financial resources for social and economic benefit. Innovative clusters can be monitored and evaluated based on Table 3.

Table 3: Monitoring and evaluation tools for Innovation Clusters

S/N	Criteria	Yes	No	Remarks
Technical				
1.	Presence of a registered cluster or association			
2.	Presence of members (firms and individuals)			
3.	Linkage with R&D and Universities			
4.	Involvement and relationship with Local Government Authority			
5.	Presence of business and operation models			
6.	Presence of Cluster terms to members and implementation strategy/ constitutions			

S/N	Criteria	Yes	No	Remarks
7.	Cluster sustainability plan			
8.	Linkages to responsible ministries, agencies and another relevant private sector			
Basic structures and infrastructures				
1.	Buildings and offices			
2.	Cluster working space			
3.	Shared Workshops, e.g. Foundries and Laboratories (if needed)			
Governance and Management				
1.	Presence of Board or steering committee (where necessary)			
2.	Cluster charter/policy/ToRs			
3.	Risk management system (if any)			
4.	Financial Management and Controls (account systems and structure)			
5.	Relationship with experts from Universities / R&D Institutions			

7.4 Technology Transfer Offices/Centres

Human resource, industry research demand, R&D budget of university and economic uncertainty are the most influential factors on the performance of TTOs. The performance outputs, which are mostly affected, include licenses, patents, established spin-offs, industry research contracts and consulting income. The TTO/TTC can be monitored and evaluated based on Table 4.

Table 4: Monitoring and Evaluation tool for TTOs

S/N	Criteria	Yes	No	Remarks
Technical				
1.	Quality and Relevance of Services/Products			
2.	Articulated mission and strategies			
3.	Capacity and commitment			
4.	Ability to meet the national needs			
5.	Industrial partnership and linkages			
6.	IP Policy			
7.	Access to risk or venture capital			
8.	Patents granted			
9.	Patent applications			
10.	Invention disclosures			
11.	Plant breeders' rights granted			
12.	License agreements signed			
13.	License income generated			
14.	Industry sponsored research			
Basic infrastructures				
1.	Incubation centres			
2.	Innovation spaces			
3.	Workshops and laboratories			
4.	Technology start-up / spin-off			
Governance and Management				

1.	Presence of Technical Board/Committee			
2.	Board charter / policy / ToRs			
3.	Risk management system			
4.	Financial Management and Controls (account systems and structure)			
5.	Human Resource			
6.	Formal R&D or higher learning institutions administration and community			

7.5 Technology Stations

The M&E for Technology Stations provides grounds for technology and innovation development; and setting goals for the future success. Without a measurement process, the technology stations cannot justify their efforts in R&D, IP management, commercialization, and technology transfer in relation to their economic and social goals. The technology station can be monitored and evaluated based on the criteria set in Table 5.

Table 5: Monitoring and Evaluation tool for Technology Stations

S/N	Criteria	Yes	No	Remarks
Technical				
1.	Quality and Relevance of Services/Products			
2.	Sustainability strategy			
3.	Focused mission and a strategy			
4.	Capacity and commitment			
5.	Ability to meet the national and clients' needs			

6.	Industrial linkages (both formal and informal relationships)			
7.	Strong level of recruitment / hiring/ secondment			
Basic structures				
1.	Industrial and Logistics			
2.	Appropriate laboratories, foundries and workshops			
3.	Manufacturing equipment			
Governance and Management				
1.	Presence of Executive Management team			
2.	Charter/ policy/ ToRs/SOPs			
3.	Risk and quality management systems			
4.	Financial Management and Controls (account systems and structure)			
5.	Procurement systems			
6.	Human Resource including a Permanent in charge of the station			

7.6 Technology Parks

The M&E for Technology parks provides the performance results of the Technology Parks. The Technology Park performance areas are like impact, employment, R&D, service, company generation, operation, management, and networking. Each park has its own set of indicators to measure impact and performance, but the criteria provided herein must be adhered. Technology parks can be monitored and evaluated based on Table 6.

Table 6: Monitoring and evaluation tools for Technology Park

S/N	Criteria	Yes	No	Remarks
Technical				
1.	Quality and Relevance of Services/Products			
2.	Sustainability of intended focus area			
3.	Focused mission and a strategy			
4.	Capacity and commitment			
5.	Ability to meet the national needs			
6.	Industrial linkages			
7.	Strong level of recruitment			
Basic structures and infrastructures				
1.	Industries and Logistics			
2.	Institutes and R&D Centres			
3.	Government liaison offices			
4.	Incubation centres			
5.	Innovation spaces			
6.	Workshops and laboratories			
7.	Hospitality (Hotels & Convention Centres)			
8.	Residential			
9.	Utilities such as Water, Electricity, Gas and the likes			
10.	Green Open Areas and sports facilities			
Governance and Management				

S/N	Criteria	Yes	No	Remarks
1.	Presence of Board or Executive Management team (where necessary)			
2.	Board charter/policy/ToRs			
3.	Risk management system			
4.	Financial Management and Controls (account systems and structure)			
5.	Procurement systems			
6.	Human Resource			

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IMPLEMENTATION PLAN

Focus area	Activities	Outputs	Timeframe	Responsible Institution
Initiation of implementation	Launching of the guidelines	Guidelines officially made public	July – September 2023	Ministry responsible for Science and Technology
	Printing of the guidelines	Awareness on the presence of the guidelines and used by relevant stakeholders	September – December 2023	Ministry responsible for Science and Technology and COSTECH
Distribution of guidelines to existing centres and stakeholders	Guidelines disseminated to centres and stakeholders	Copies of the guidelines made available and used by stakeholders	August – December 2023	Ministry responsible for Science and Technology and COSTECH
Coordination of implementation	Designate program officer within CDTT	Program officer designated	December 2023–	COSTECH

Focus area	Activities	Outputs	Timeframe	Responsible Institution
			February 2024	
	Prepare implementation tools (Sample agreements, registration forms, inventory forms, M&E form, sample certificates of registration, various templates, etc.)	Prepared Tools	December 2023 – June 2024	COSTECH
	Establish inventory of available Centres and status of compliance to the guidelines	Inventory made available and maintained Identified gaps and options plan for fulfilment	March – June 2024	Ministry responsible for Science and Technology, COSTECH

Focus area	Activities	Outputs	Timeframe	Responsible Institution
	Inform and advise MDAs to establish technology and innovation centres	MDAs are informed on establishment of centres	August – December 2023	Ministry responsible for Science and Technology
	Direct R&D and higher learning institutions to establish technology and innovation centres appropriate for their business processes	R&D and higher learning institutions are given directives	August 2023 to March 2024	Ministry responsible for Science and Technology, COSTECH
Resources mobilization	Prepare and present plan to Ministry and stakeholders	Plan prepared and presented to Ministry and stake holders	July – December 2023	COSTECH, STI stakeholders
	Prepare and present budget	Budget prepared and presented to	December 2023 –	COSTECH,

Focus area	Activities	Outputs	Timeframe	Responsible Institution
	to Ministry and stakeholders	Ministry and stakeholders	February 2024	STI stakeholders
	Approve plan and allocate budget for implementation	Budget allocated and availed to COSTECH	June – July 2024	Ministry responsible for Science and Technology, STU stakeholders
	Prepare a national business for supporting establishment and running of innovation centres	National Business plan prepared	January – March 2024	Ministry responsible for Science and Technology, COSTECH, STI stakeholders
Capacity building on STI	Conduct training workshops on the gap identified such as IPR awareness, Patent information	Trainings conducted	March – June 2024	COSTECH, STI stakeholders

Focus area	Activities	Outputs	Timeframe	Responsible Institution
	search, centre management skills, Research and Innovation management			
Facilitate linkage between centres and relevant stakeholders	Identify key relevant stakeholders (higher education institutions, R&Ds, Laboratories and fabrication workshops, etc.)	Key relevant institutions identified	March – June 2024	COSTECH, STI stakeholders
	Engage with key stakeholders by means of MoU	Available MoUs and Key relevant institutions engaged	July, 2024	COSTECH, STI stakeholders
	Create online forum of centres	Online forum of centres created	August - November 2024	COSTECH, STI stakeholders

Focus area	Activities	Outputs	Timeframe	Responsible Institution
Enhance industrial development	Facilitate piloting of prototypes in industries	Prototypes tested	December 2024 – February 2025	COSTECH, STI stakeholders
	Establish and facilitate innovators and industry forum	Forum established	December 2024 – February 2025	COSTECH, STI stakeholders
Provide guidance in establishment and operationalization of centres	Assist in setting up of centres	Assistance given to new centres	February – March 2025	COSTECH, STI stakeholders
	Assist in preparation of operational tools (policies, governance, self-assessment, etc.) and procedures	Appropriate tools developed for new centres	April – June 2025	Ministry responsible for Science and Technology, COSTECH
	Assist in conducting needs assessment	Needs of centres established	April – June 2025	COSTECH, STI stakeholders

Focus area	Activities	Outputs	Timeframe	Responsible Institution
Foster establishment of shared national STI facilities	Facilitate establishment of technology stations	Technology stations established	June – December 2025	COSTECH, STI stakeholders
	Facilitate establishment of technology park	Technology Park established	June – December 2025	Ministry responsible for Science and Technology, COSTECH, STI stakeholders
	Facilitate establishment of science centres	Science centres established	June – December 2025	Ministry responsible for Science and Technology, C COSTECH, STI stakeholders