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Technology Incubation Centres For International Youth Development (A Case Study Of Kenya)

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DECLARATION

I, Dorothy Njagi hereby declare that this research project is my original work and has not been presented for a degree in any other University.

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This project has been submitted for examination with my approval as University Supervisor.

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DEDICATION

This work is dedicated to my dear parents for instilling in me great values that have made me go this far and achieve success at various fronts. To my mum, thank you for mentoring me and guiding me throughout my life journey, you remain my role model. To my late dad, in my heart you remain forever.

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ABSTRACT

This study examines technology incubation centres' contribution to international youth development in Kenya. The concept of the technology incubation centres is increasingly being recognized as a practical tool of entrepreneurship. Kenya seems to be making major strides in its improvement in the ST&I sector and the success is being reflected in the economy. However, there are gaps/ loop holes that exist in Kenya's technology sector that have greatly hindered the maximization of incubation centres to a level that would propel Kenya's economic development to a higher level.

The variables analyzed include legal, policy and institutional frameworks, functioning, skills development, employment creation and recognition and challenges encountered in the operations of the technology incubation centres.

The study is conceptualized using a framework that analyses variables like existing sound system, structure, personnel, innovation, nurturing young firms, providing facilities, business networking forums, advocacy, legal advice and IP protection, development funds, government policies and the private sector experience. These factors lead to youth skills and entrepreneurship development, employment and business opportunities.

This study finds out that technology incubation centres contribute to international development of the youth. However, this can only be achieved if strong policy, legal and institutional frameworks are in place. For sustainable functioning, a balance needs to be struck in the set up, research and training and programs. The programs need to be comprehensive, systemic and well planned so as to achieve the expected outcome. In Kenya, sustainability is lacking, as there are challenges of inadequate resources like manpower, low stakeholder input and inadequate funding.

In addition, the study finds out that challenges like lack of long-term courses and trainings that provide both theoretical and practical skills, competing interests between the innovators and the incubation centres and financial constrain incubation centres impacts cannot be achieved.

Recommendations emanating from this study include introduction of policies that address technology incubation centres directly to promote sustainability of the start-

ups and encourage the existence of real enterprises. The government needs to give more direct support for the technology incubation centres as they are recognized as one of the contributors of achieving the vision 2030 goals. It should also work with the private sector in strengthening holistic entrepreneurial support within the technology incubation centres. Further, it is necessary for a balance to be struck between policies and services provided at the technology incubation centres. Since the success of technology incubation centres ultimately results to economic growth and development, it is important for further research to substantiate the economic value attained from the success of technology incubation centres in Kenya.

ABBREVIATIONS AND ACRONYMS

AAS	African Academy of Science
APHL	Association of Public Health Labs
ARC	Advisory Research Committees
ASTIPI	African Science, Technology and Innovation Policy Initiative
ATPS	African Technology Policy Studies
AU	African Union
CBK	Central Bank of Kenya
CDC	Centre Disease Control
CIC	Climate Innovation Centre
CNN	Cable News Network
CPA	Consolidated Plan of Action
EU	European Union
GDP	Gross Domestic Product
IDU	Incubator Development Unit
ICF	Intelligent Community Forum
ICT	Information Communication Technology
ISP	Incubator Support Program
KARLO	Kenya Agricultural and Livestock Research Organization
KCIC	Kenya Climate Innovation Centre
KEMRI	Kenyan Medical Research Institute
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KIRDI	Kenya Industrial Research and Development Institute
KU	Kenyatta University
MoEST	Ministry of Education, Science and Technology

MTP   Medium Term Plan

NACOSTI National Council for Science Technology and Innovation

NARL   National Agricultural Research Laboratories

NEPAD   New Partnership for Africa's Development

NSTEDB National Science and Technology Entrepreneurship Development Board

NTIE   National Framework for Innovation and Enterprise

NZTE   New Zealand Trade and Enterprise

OEM   Original Equipment Manufacturer

PAIPO   Pan African Intellectual Property Organization

REC   Regional Economic Communities

R & D   Research and Development

SME   Small and Medium Entreprises

STEM   Science, Technology, Engineering and Mathematics

STI   Science, Technology and Innovation

STISA   Science Technology and innovation Strategy for Africa

TIS   Technology Incubation Scheme

TVET   Technical and Vocational Education and Training

UN   United Nations

UNDP   United Nations Development Program

UNESCO United Nations Education Science Cultural Organization

UON   University of Nairobi

UX   User Experience

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CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction

Technology Incubation Centres, also known as science parks in some countries, are companies or facilities designed to foster entrepreneurship and help startup companies, usually technology-related, to grow through the use of shared resources, management expertise, and intellectual capital.[1]

Technology incubators' major focus is on technology; they mainly deal with bridging the entrepreneurial gap with a primary goal of creating entrepreneurship and ultimately stimulating innovation and technology start-ups.[2]

There are several countries in the world like Korea, Japan and China that accredit their success on innovative technology. Kenya is catching up but at a rather slow pace since there is a disparity in the skills gained from school and the skills required in the market. This has also contributed to the high rate of unemployment in the country. On the other hand, there are many youths who have ideas in the country but are lacking access to a platform where they can improve on these ideas and translate them into entrepreneurial activities, which would have a great impact on economic success.

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[1] www.investorwords.com

[2] Aernoudt Rudy "Small Business Economics" September 2004, Volume23, Issue 2,pp127-135 http://link.springer.com/article/10.1023/B:SBEJ.0000027665.54173.23#page-1

1.2 Background to the study

Economic transformation in Africa will only be achieved if more efforts are put in Science, Technology and Innovations (ST&I). Investing more in education, science and technology, as well as building of the right skills cannot be overemphasized. In many cases, this has been lacking in the development process, thus creating a mismatch in available opportunities and the skills from the higher education sector.

Graduates' skills and knowledge need to be matched up with the growing economic opportunities so that they can be of impact to the development of African countries. In this regard, governments need to be committed to inclusivity through involvement of the youth and women who have often been marginalized. However, this has been changing as the demand for higher education has rapidly increased with more women advancing their education to University level and access to education in other levels of education has also changed for the better.[3]

Efforts of investing in science and technology need to be strengthened regionally. There is much more that needs to be adhered to in the science-policy discourse as most of the policies have not been implemented. A quick look back into the journey that Africa had walked in science-technology- policy discourse illustrates that it has been dominated by rhetorical commitment to anything said or signed concerning the importance of science and technology for Africa's development. There is so much evidence around the world to support any decision made to invest heavily in science and technology and innovation as a sure means to developing individual countries and

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[3] UN Millennium Project 2005. Innovation: Applying Knowledge in Development.
Task Force on Science, Technology, and Innovation pp.3

continent in general. Ghana and South Korea who had similar GDP in 1957 are a classical case of how Science, Technology and Innovation (STI) can help transform a country. The difference between countries that have utilized STI for development seem to lie in the presence of evidence-informed policy on STI and commitment in implementing the policy.

Similarly, the trend is evident even beyond the continent. For instance, since Korea got on the path to modern economic development in 1960, the Korean government has led in the area of economic development policies, including technological development. In those early days, Korea focused on reverse engineering and Original Equipment Manufacturer (OEM) to learn and acquire imported technology. However, recent trends such as a rise in technological protectionism, strengthening of intellectual property rights, increases in the price of imported technologies, and pressure to open markets, require a higher level of technology to maintain continued economic growth.[4]

Likewise, the most recognized global entrepreneurs are the ones in the technology industry. They include Mark Zukerberg the founder of facebook who, only at the age of 30 is contributing greatly to the economies of their countries only because they had an idea that was well nurtured. Others include Bill Gates the founder of Microsoft, and the late Steve Jobs who was an information technology entrepreneur and the co-founder of the renowned Apple Inc.

Kenya's economy was rebased in 2014 during this exercise use of technology was seen as a new major contributor to the development of the country's economy. With

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[4]Science* Policy* Africa a newsletter of the African Academy of Sciences volume 18, Number 1. pp 2

40 percent of economic growth in East Africa being driven by information and communication technology, the future certainly looks brighter.[5] Rebasing of the economy is the process of updating the economy by changing the base year to a more current one where the constant prices are put together. The process creates a better platform for the government to make more informed policies that address challenges like unemployment, poverty and other inequalities. The importance of this process is to enable economies to change their production systems, consumption designs, international dynamics, technology and innovations among others.[6]

Prospects show that the information technology industry in Kenya is expected to grow by 20 percent annually, and with this, the need for skilled professionals to drive the entrepreneurship and innovations is inevitable. Kenya has however realized this need and has established incubation centers to deliver this role as they have facilities to nurture talents and ideas that will be used to propel development today and for the future generations.

Kenya's commitment in improving the science and technology sector is reflected in its second Medium Term Plan (MTP) 2013-2017. The country recognizes science, technology and innovation (ST&I) as development enabling tools that propel the country to a new level of regional and global competitiveness. This is further illuminated and emphasized in the Kenya Vision 2030 - Kenya's blueprint strategy document for achieving an annual growth rate of 10% - and the constitution.

Under this backdrop, it is with no doubt that ST&I can help in the generation and management of a knowledge-based economy, which raises productivity and

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[5] SMEs and the East Africa ICT Sector 2010: Transforming East African ICT Sector by Creating a Business Engine for SMEs pp iii
[6] Analysis likely implication on rebasing GDP in Kenya: United Nations Development Programme (UNDP) , October 2014

efficiency. This can be achieved through various initiatives like Public Private Partnerships (PPP), connecting industry with the education sector, value chain evaluation, and by harmonizing various sectors and institutions for improved cooperation. The sector is set to put in significant efforts in ensuring that all sectors of the economy have access to technology, which will increase production and quality in a variety of product processes and services. It is note worthy that among the identified priority areas for upgrading ICT capacity include establishment of county based ICT incubation Hubs to empower the youth.[7]

In the past, universities have been blamed of focusing on teaching theoretical courses, which have driven students to rely heavily on the limited formal jobs market, as the skills do not prepare them for enterprise.[8] The tertiary education landscape in Kenya is however taking a new shape for example with most universities shifting focus to a concept that, a few years back, was seen as a preserve of the west. Again, it seems universities including those in Nairobi have no qualms sinking massive figures into these projects albeit with support from a number of organizations.

In the past, Kenya had not realized the impact that can be drawn from ST&I for example, the person who discovered the phenomenal service M-pesa is still a mystery. M-pesa is the most successful mobile phone based financial service in the developing world. Dr. Shem Ochuodho in an email to Dr. Mukhisa Kituyi former minister of trade noted "*I have to record my disappointment. As usual with others who have commented on this subject before,* we credit (in my view) all the wrong people, but leave out the true unsung hero: the young university student who 'invented' M-

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[7] Transforming Kenya: Pathway to devolution, socio-economic development, equity and national unity. Second Medium Term Plan (MTP) Report, Government of the Republic of Kenya 2013.
[8] Business Daily (Kenya) "Varsities' incubation hubs key to Kenya growth" Friday April 26 2013 Available on : http://www.businessdailyafrica.com/Varsities-incubation-hubs-key-to-Kenya-growth/-/539546/1759036/-/vyvd58/-/index.html

pesa – the inventor/innovator! Not even his name is mentioned, or known! In the history of technological innovation in Kenya, the 'Governor of the Central Bank' (notably Micah Cheserem and the present) will have a special place! On the M-pesa issue, among those mentioned the only one I would fret – given the power – would the CBK Governor, who was bold enough to let this 'experiment' take root."[9]

12 years on since its discovery M-pesa has spread to India, Afghanistan, Rwanda, South Africa, Tanzania and Uganda. I would imagine that such a great discovery would be a globally embraced service due to its convenience just like the well-known Facebook, twitter and Microsoft that have spread worldwide.

However, Kenya seems to be making major strides in its improvement in the ST&I sector. Nairobi was last year voted the most intelligent city in Africa by the Intelligent Community Forum (ICF) a New York- based think tank focused on communities which "use information and communication technology to grow prosperous, inclusive, sustainable economies'' for a second year in a row, the main reason being the fact that Kenya has embraced technology well enough. "We see a strong foundation being put into place (in Nairobi); sensible, pro-growth government policy, a more diversified economy, and an innovation ecosystem of startups, international companies and universities," said Robert Bell, Intelligent Community Forum co-founder.[10]

This study is aimed at finding out the challenges that the incubation centres in Kenya are facing in their efforts to benchmarking with others in the developed world. It will mainly highlight the gaps in the formation, the functions, the structure, operations and

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[9] https://bizextras.wordpress.com/2011/05/23/so-who-invented-m-pesa/
[10] http://saharareporters.com/2015/02/12/nairobi-kenya-africa's-'most-intelligent-city'--icf

the systems that are not at the same standards with others. It will therefore, come up with recommendations that can influence policy makers, academia and the government to support the existing incubation centres to bridge the gaps that exist so that the centres can emerge as centres of excellence whose efforts reflect on the economy of the country.

The study will therefore be carried out in Nairobi city the capital of Kenya since it is home to a number of tech hubs, including:

1. @iLabAfrica at Strathmore University

2. iHub

3. Nailab

4. FabLab at The university of Nairobi

5. Chandaria Business innovation and Incubation Centre at Kenyatta University

6. 88mph

7. Columbia Global Centre, Africa

8. Climate Innovation Centre

9. Kenya Brave Venture Labs

10. Growth Africa

11. C4Dlab

1.3 Problem Statement

In 2007, UNESCO's General conference approved the launch of an African Science, Technology and Innovation Policy Initiative (ASTIPI) which aimed at developing ST&I policies for all those African countries still without one, as part of UNESCO's contribution to the African Union's Science and Technology and Innovation (ST&I)

policies, as part of UNESCO's contribution to the African Union's science and technology Consolidated plan of Action (CPA). The New Partnership for Africa's Development (NEPAD) also launched the African Science, Technology and Innovation indicators (ASTII) programme in 2007 as one of the programme areas of the CPA.[11]

"Now I call you the power of creativity. This technology and creativity should be used not only by you Kenyans, not only by Africans, but should be everywhere," said Ban Ki-moon during his visit to the offices of the non -profit technology company Ushahidi and its offshoot, iHub, while in Nairobi Kenya in October 2014. Bank Ki-moon went further to emphasize the use of creativity and ideas, for the productivity and greater progress of the country and also in other developing countries, which can result to at least 50 per cent more than in the past.[12] There are quite a number of technology incubation centres in Kenya, dealing with technologies such as Ushahidi, both University based and independent like: Afrilab at The university of Nairobi, Chandaria.

Business innovation and Incubation centres, @iLabAfrica at Strathmore University, iHub, 88mph and Nailab. However, the youth in all these centres are not being recognized at global levels yet they have ideas that can have a great impact not only in Kenya but in the region and globally as well. This study looks at incubation centres in Nairobi and aims at identifying the gaps/ loop holes that exist in Kenya's

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[11] Science* Policy* Africa a newsletter of the African Academy of Sciences volume 18, Number 1. Pg 2

[12] http://www.un.org/apps/news

technology sector that have greatly hindered the maximization of incubation centres to a level that would propel Kenya's economic development at a large extent.

1.4 Objectives

1.4.1 Main objective

To analyze the role of technology incubation centres for international youth development, with a focus on youth skills development, employment and recognition.

1.4.2 Specific objectives

1. To assess the legal, policy and institutional framework for technology incubation centres in Kenya

2. To understand the functioning of technology incubation centres in Kenya

3. To assess the impact of incubation centres on skills development, employment and recognition

4. To assess challenges faced by incubation centres for youth development

1.5 Research questions

1. What are the legal, policy and institutional frameworks for technology incubation centres in Kenya?

2. How do incubation centres in Kenya function?

3. What is the impact of incubation centres on skills development, employment and recognition of the youth in Kenya?

4. What are the challenges faced by incubation centres for youth development?

1.6 Justification

This study identifies gaps in the technology incubation centres that are a hindrance to empowerment of Kenya's youth. It will bring out the areas that need to be worked on so as to reap fully from the centres and also to make technology a major boost to the economy. The study will help policy makers to review and come up with strategies that can build the youth to become people who can change the world by use of technology.

Further, it can be useful in informing policy formulation for technology related organizations in that they will come up with policy that is technologically inclusive and policy that will help build and transform youth ideas to income generating ventures that will get global recognition.

The study will greatly benefit the field of academia especially the Universities that offer technology related courses and those that have established technology incubation centers like University of Nairobi, Strathmore and Kenyatta University. This will be achieved by bringing out the need of a new focus of strengthening the technical capacities of students and institutions at large so as to build a skilled human resource base.

1.7 Literature Review

1.7.1 Technology Incubation Centres: The Concept

Technology incubation centres have different names in different parts of the world. In united Kingdom they are known as Science Parks, in France they are called "Technopolis', in Germany they are called Technology Centres or Technology Parks and in USA they are known as "Research Parks'. All these centres share a common concept of having a space, physical or cybernetic, which is maintained by experts or professionals that offers value-added services.

Incubation Centres differ in their role, financiers and their goals,[13] but in general, they are established with the sole purpose of building the economy as well as encouraging research output and innovation. They are characterized by a managed open space, which provides training, technical, and business advise, financial service, and a conducive environment that allows nurturing of the youth. This also calls for a skillful team of experts that oversees the general operation of the incubation and decides on the start-up companies that will enter the incubator.

The idea of the technology incubation centres is increasingly being recognized as a practical tool of entrepreneurship. In the contemporary world, it has become a norm to break from the traditional way of business operations and replace it with modern ways, which are majorly technology dominated. This is evident that technology is the game changer in both manufacturing and service sector.

The concept is highly being embraced by small and medium enterprises hence stimulating their growth. In Pakistan for example, there is a disparity in the

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[13] Scaramuzzi Elana "Incubators in Developing countries: status and Development Perspectives" The World Bank, Washington DC, May 2002.pp4

educational and research sector and the same time the service and manufacturing sectors are not willing to take up new concepts. However, for the economy to record progress, the need for new ideas and technology concepts cannot be overemphasized. Therefore, through technology incubation centres Pakistan has to build a strong partnership between research and production sector so as to broaden its economic base.[14]

The concept of technology incubation centres in Poland is considered for business support and for exchanging know-how in technology. They are designed with the main objective of knowledge commercialization and enhancing the innovative character of their economy. They are an important component of business support infrastructure as they deliver diverse services to entrepreneurs. This support system makes it possible for their technological and organizational development of their companies.[15] A decade after Poland had established the technology incubation centres, it had 65 incubators that had spurred the existence of 1,500 firms and created about 6,000 jobs. In mid 2014 there were 176 active innovation centres, which, shows the tremendous growth in these centres. Poland, in 1990 through the UNDP assistance came up with the incubator concept. Then, in 1992 they came up with the Association of Polish Business Incubators and Innovation Centres that stimulated the growth of the concept. This with more support from World Bank and the European Union (EU)

[14] Economic and Social Commission for Asia and the Pacific: Strengthening technology incubation system for creating high technology-based enterprises in Asia and the Pacific; Uited Nations, economic and Social Commission for Asia and the Pacific. United Nations New York 2001.pp 232

[15] Bakowski Aleksander and Mazewska Marzena et al , Polish agency for Enterprise Development,. *Innovation Centres And Business Incubators In Poland In 2014*. Sopot: Institute for Sustainable Technologies – National Research Institute, 2014. Web. 22 May 2016. pp 5

further boosted the concept from technology commercialization to a system that would contribute in employment creation to improve the polish economy.[16]

In Turkey the concept is a collaboration framework with universities that was established in 1980s. The Ministry of Industry and Trade regulates the Technoparks. The parks are aimed at encouraging high-tech companies to grow the technology and software by use of university facilities or high-tech institute to propel research and development. They also look at growing the economy through promotion of direct foreign investment by encouraging conversion of innovation into products and services. All Technoparks have to obtain legal status with the Law of Technology Development Zones adopted in 2001.[17]

In Nigeria the concept was implemented since 1990s and has been the basis for the establishment of sustainable entrepreneurial skills for the community. Technology based start-ups have been promoted and stimulated through these social and economic development processes designed to nurture technology based business ideas. It has also been an effective policy tool for boosting business ideas and skills.[18]

Technology incubation centres concept is therefore ultimately meant to bring returns to the country. Such returns include employment opportunities, technology transfer, saving foreign currency and substituting imports with local manufactured products that speed up the industrialization process. Governments need to allocate a

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[16] Lalkaka, Rustam. *Technology Business Incubation*. Paris: UNESCO Pub., 2006. Pp 105

[17] Kaplan Zeynep 2011, 'The dynamics of Europe's industrial structure and the growth of innovative firms: Technoparks in Turkey: A source of technological development?', Conference on Corporate R&D, Concord.

[18] Jibrin Mohammed, Makoyo Mahdi and Amonye Mike, 2013, Technology incubation programme for development of sustainable entrepreneurial skills in Nigeria, International Journal of Engeneering Research and technology ISSN:2278-0181

considerable amount of money for research and development for utilization in innovation.[19]

1.7.2 The History of Incubation Centres

The emergence of technology incubators can be traced in the United States back in 1950's, which was established with the sole purpose of responding to plant closures in Batavia and New York. However, it was never considered an industry until 1980 where these programmes were established. They focused on a number of technology companies or on a collaboration of light industrial, technology and service firms known as mixed-use incubators.[20]

In 1975 another incubator was established in United Kingdom aimed at creating jobs in steel closure areas when British steel formed a subsidiary called British steel Industry (BSI).[21] 65 years later, these centres have advanced to also include media platforms that deliver news to entrepreneurs. This is done through media, education, jobs and big data analytics.

In South Korea, technology incubation centres can be scantly traced back in the 1980's when the country was undergoing massive economic growth. Research and Development has been their major investment area and attracted Foreign Direct Investment (FDI) towards technology transfer and technology commercialization. Since 2008, the Ministry of Education, Science and Technology have coordinated

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[19] *University-Industry Linkage and Technology Transfer Office* (2013) Available at: file:///Users/dorothynjagi/Downloads/Pilot_TBIC_EstablishmentDocument%20(1).pdf (Accessed: May 2016). In-line Citation: (*University-Industry Linkage and Technology Transfer Office*, 2013)

[20] Mutambi, J., Byaruhanga, J., Trojer, L. and Buhwezi, K.B. (2010) 'Research on the State of Business Incubation Systems in Different Countries: Lessons for Uganda', *African Journal of Science, Technology, Innovation and Development*, 2(2), p. 5. In-line Citation: (Mutambi et al., 2010)

[21] Aernoudt Rudy "Small Business Economics" September 2004, Volume23, Issue 2,pp127-135 http://link.springer.com/article/10.1023/B:SBEJ.0000027665.54173.23#page-1

science and technology matters. In 2011, the country established a new science and technology a body that controls 75% of its R&D budget.[22]

Today, South Korea is the most innovative country in the world according to Bloomberg. The 2015 ranking that had six categories of different innovations saw South Korea placed top 5 in 5 out of the six categories and position one in three categories. South Korea toped the list of owing to the protection they offer to patent holders making others not to build upon their ideas. Most of these patents are on science and technology. Another category that South Korea led in was the postsecondary education that measures the education levels of a country's workforce.

This in relation to technology brings out the relevance of education in technology. In the same analysis, Kenya ranked at the bottom since it has not yet achieved the minimum level of universal education. Finally South Korea led in research and Development, which is greatly supported by both public and private sectors. It is unavoidable to note that in 1957 the GDP per capita of both Ghana and South Korea were at par. Today, the two countries cannot be compared.[23]

South Korea boasts of high levels of manufacturing and industrialization, this is as a result of government support in these sectors. The Science and Technology Parks (STP) are regulated similarly to industrial parks even if the two differ. This is because both share a distinct similarity of developing land and infrastructure. They are thus regulated by the Ministry of Science and Technology. Industrial parks were developed in the 1960's to promote the export-driven sector. That is when the

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[22] *refme.com* (2012) Available at: https://ec.europa.eu/growth/tools-databases/ketsobservatory/sites/default/files/policy/KOREA.pdf (Accessed: 29 May 2016). In-line Citation: (*refme.com*, 2012)

[23] http://www.bloomberg.com/graphics/2015-innovative-countries/

Government of Korea made a decision to establish a system to develop diverse types of industrial parks to suit various socio-economic situations. In this regard, the legal system for development of industrial parks was diversified in the 1970's and 1980's.

To resolve this, the government simplified the system to "industrial sites and Development Act" and "Industrial Cluster Development and Factory Establishment Act." These two laws act as the legal ground for designation, development and
 Management of industrial parks and business support and are applied to each policy.[24]

In the United States technology incubators were used in the 1980's as a major policy tool in efforts to restructure the declining industrial areas by both the local and State government. They were used in supporting the growth of clusters of technology – based firms. The involvement of new technology-based firms to economic and innovative growth cannot be overemphasized.[25] Guided by this vision, the United States policy makers give a major focus to policies of these technology-based firms. However, even with this focus and policy, there is scarce information on how these firms support new technology-based firms in overcoming various challenges as well as how they utilize their potential to innovate.

Therefore, it is paramount to note that there is no single policy, practice, or service that is perfect to drive technology incubation success. It is the harmonization among a

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[24] Yim, D.S. (2013) *Promotional Strategies and Policies for Developing Local Economy and Establishing Science and Technology Parks in Colombia*

[25] Shapira, P. (1997) *Technology Incubators: Nurturing small firms*. Available at: http://www.oecd.org/sti/inno/2101121.pdf (Accessed: June 2016). In-line Citation: (Shapira, 1997)

number of these policies and practice that generate the expected outcomes and success. This is as a result of the diverse needs from various customers; again these clients have got different preferences. It is also worth noting that these centres serve clients from different industries like agriculture, energy, corporate e.t.c who have different objectives and goals. In this case, it is a matter of studying the clients business and requirements vis a vis the policies that will ensure success has been achieved.[26]

In Colombia, the government has realized the importance of integrating development and the need for a knowledge based economy. In this light, it has introduced policies to promote its growth. They include a balanced regional development based on local conditions and the promotion of science and technology parks in the country. It has further increased its investment in science and technology and linked technology to industry. On the other hand, South Korea has continuously excelled in regional development and establishing science and technology parks. Therefore, there are a number of policy lessons to be borrowed from South Korea. These include: establishment of government research institutes for manufacturing industry so as to boost the manufacturing sector and securing qualified technicians and engineers to motivate more skilled young people to those schools. Others include; establishing National Research and Development projects for industrial technology and ensuring that the coordination for science and technology policy is done appropriately.[27]

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[26] Lewis, D.A., Harper-Anderson, E. and Molnar, L.A. (2011) *Incubating Success. Incubation Best Practices That Lead to Successful New Ventures*. Institute for Research on Labor, Employment, and the Economy, United States of America: University of Michigan.

[27] Yim, D.S. (2013) *Promotional Strategies and Policies for Developing Local Economy and Establishing Science and Technology Parks in Colombia*

In a country case study by infoDev it shows that Brasil coordinates incubation within the small and medium enterprise support policy and the science and technology initiative. This greatly contributes in support of new incubator creation as well as expansion of the existing one. In New Zealand, there is a good integration of Incubator Support Program (ISP), small and medium enterprises (SME) with support from the New Zealand Trade and Enterprise (NZTE) and Incubator Development Unit (IDU).

The size or years of operations do not in any way predict the success of a firm. This is however misconceived by many investors, donors and practioners who often link the size and years of existence of a firm to success. A research by the University of Michigan found out that what leads to success is the incubator's programming and management that play a major role in achieving success; particularly, the staff-to-client ratios. The operational model also has significance in its success, majority of successful centres employ a not-for- profit model. This clearly illustrates that the profit-making element of an incubation centre does not determine its success. The research established that the major objective of the centres should be, creating job opportunities, promoting entrepreneurial environment in the community, developing the local economy, accelerating new industries and businesses and building or maintaining businesses to the host region.

The other element was on Private- Public Partnerships where most of the successful firms had support either from government, development agencies, higher education institutions and other incubator stakeholders. This was illustrated by the fact that at least 60% of the centres expenses were accounted for by client rent and service fees.

Therefore, the stakeholder input is vital for promoting progress and opening up opportunities for employment among others. [28]

In India the technology incubation centres also known as technology accelerators have existed since 1980's purely under the government and they started involving or being established under private sector in the 90's As of 2014 the country had 300 registered incubators. This is managed under the National Science and Technology Entrepreneurship Development Board (NSTEDB). The centres have been providing support functions including mentorship for entrepreneurs by the experts.

Majority of developed countries recognize technology incubations as the basis for economic growth, with Korea and Japan recognizing them as the sound approaches for increasing research related activities. Other countries like China, Trinand and Nigeria are slowly following this approach.

In Switzerland technology incubation centres came up in the 90's when unemployment levels rapidly increased and the federal technology and innovation policy started to model their activities in relation to employment and creating new firms.[29]

In Hong Kong, the number of incubation programmes has drastically increased since the early 1980s. This is as a result of the recognition that incubation centres improve growth of emerging entrepreneurs, create job opportunities and they allow rapid

[28] Lewis, D.A., Harper-Anderson, E. and Molnar, L.A. (2011) *Incubating Success. Incubation Best Practices That Lead to Successful New Ventures*. Institute for Research on Labor, Employment, and the Economy, United States of America: University of Michigan.

[29] Thierstein alain and Willhelm Beate "Entrepreneurship and regional development" *Incubator, technology, and innovation centres in Switzerland: features and policy implication* November 2010, volume 13 issue 4 (2001), pp315-331

development of regional economy. Again, they are established to foster local innovation capacity and technology.[30]

Singapore on the other hand in 2008 founded a Technology Incubation Scheme (TIS) under the National Framework for Innovation and Enterprise (NTIE) programme, which was set up in 2006 as a department within the Prime Ministers office. The TIS is supported by NTIE by co-investing 85% into Singapore-based start-ups. The equivalent of S$500,000 is given per company upon the endorsement from the Technology incubator. The technology incubator is required to co-invest the remaining 15% of investment into the start-up. Further, active mentorship and guidance is also provided to the start-up apart from the funding.

In addition, the technology incubator will be given an opportunity to buy over NRF's stake in the start-up within three years by repaying the capital and interest this is done to encourage the incubator. This is done so as to align the interest of all parties towards the success of the start-up companies and encourage them to develop the entrepreneurial ecosystem in Singapore.[31]

South Africa in 2008 launched the National Industrial Policy and foresees also small enterprise support. The incubation policy was piloted in 2001 and is now part of the SEDA Technology Program (STP).[32]

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[30] Sun, Hongyi; Ni, Wenbin; Leung, Joseph. International Journal of Management■24.2■ (Jun 2007): 346-363.

[31] www.nrf.gov.sg/ available on http://www.nrf.gov.sg/innovation-enterprise/national-framework-for-research-innovation-and-enterprise/technology-incubation-scheme

[32] The International Bank for Reconstructiion and Development /World Bank (2013) *Global Good Practice in Incubation Policy Development and Implementation*

In many technology incubator set –up these centres are linked to universities or research institutions mainly because of resource availability. For example they is a need to have technology laboratories, equipment and libraries. These are not resources that are easily affordable and accessible by an firm or company thus, they require support from the well-established research institutions and universities.

In 2011, Ethiopia established it's first ever technology incubation centre- Iceaddis. It is a co-working space for the youth that encourages networking between techies, entrepreneurs, investors and personnel's from the creative industries. It provides a place for exchange and support for innovative ideas that can be of benefit to viable businesses that relate to local demands and development. It is open to both young techies and founders of start-ups who use it to connect to the developer and technology community. Today, the centre is home to 14 startups, 125 events and 5,000 individuals and the community list is still growing.[33]

With most Incubators in Kenya and Africa having been established within the last decade this may seem like a fairly new concept however, the idea came up as a means to boost the reducing manufacturing areas. The incubators were aimed at creating starts-ups to generate employment opportunities and provided services to both low and high-tech enterprises.

1.7.3 Functioning of incubation centres in other countries

In Turkey technology incubation programmmes are referred to as Technoparks and started in 1990. Up to date the programme supports a number of incubators by fully financing them and collaborating with technical universities. Most of these members can utilize the space to connect with others and share different skills, they also give a

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[33] http://www.iceaddis.com/

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chance to people who cannot be available to work physically in the hub but can do it virtually.

Unlike incubation centres in USA and Europe that have an ultimate goal to nurture new young firms at their inception stage, the incubation centres in Kenya are yet to fulfill this role. In developed countries incubation centres offer management and legal advice, platform to access new markets, seed funding and networks for business take off as well as assistance on how a business should function.

Majority of technology incubation centres have a core mandate across the globe with other functions differing depending on their goal and clients needs. These roles are nurturing young firms, providing facilities and business networking forums, advocacy and providing legal advice and IP protection.

In India, their technology business incubators apart from providing the core mandate above, they strive to link talent with people, capital with resources and know-how with knowledge. In community mandate, they serve to elevate a number of economic and social economic policy needs like accelerating the growth and expansion of job opportunities. By promoting the development of new companies, they create a community of entrepreneurial climate. They also function to promote technology commercialization by allowing a platform for the movement of ideas from the research laboratory to the marketplace, which start at the point of idea generation to creation of wealth.

Other socio-economic roles include: diversifying local economies, building or accelerating growth of local industry clusters and retention of businesses. Equality is

also considered through promoting the mainstreaming of gender in technology and business by encouraging women to venture into entrepreneurship. This further extends to revitalizing of the community as growth and development is recorded.

The benefits are noticeable as they help in reducing the entrepreneurs can reduce the cost of launching their enterprises, increase their potential in managing a competitive enterprise.[34]However, these benefits are not guaranteed and cannot be quantified as many of the benefits are realized in the longer-term.

In entrepreneurship and innovation ecosystem, they provide entrepreneurs with an enabling environment when establishing their start-ups. With networks from the incubation centre, they can be assured of sustained sales revenue and profitability.

1.7.4 History of incubation centres in Kenya

In Kenya, the establishment of technology incubation centres may seem like a fairly new concept however, the concept dates back to the colonial government that established several scientific R&D facilities to support the agricultural and health sectors.[35] These include: The Scott Agricultural Laboratories established in 1903 that was the first agricultural experimental station in Kenya. This is the current National Agricultural Research Laboratories (NARL). Back in the days, the laboratory was used as a centre for testing crops like wheat and coffee e.t.c before research stations were established in other areas in Kenya. The centre further brought on board socioeconomics research to complement most of the research that focused on

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[34] Bulsara, H.P., Gandhi, S. and Porey, P.D. (2005) *Techno-innovation to Techno-entrepreneurship through Technology Business Incubation in India: An Exploratory Study*. Available at: http://www4.pucsp.br/icim/ingles/downloads/pdf_proceedings_2008/05.pdf (Accessed: June 2016). In-line Citation: (Bulsara, Gandhi, and Porey, 2005)

[35] http://www.nacosti.go.ke/about-us/history

biophysical science. This was out of recognizing that there was a challenge in adopting technologies that were generated and shared to various clients.[36]

Other institutions included Coffee Research Services established in 1908 and Veterinary Research Laboratories established in 1910 both created with a mandate to carryout research in their respective industries. These two are the current Kenya Agricultural and Livestock Research Organization (KARLO).[37] Others were Medical Research Laboratory established in 1958, which is the current Kenyan Medical Research Institute (KEMRI), It is the first research institution to partner with the new independent Government of Kenya in 1964. The institution supports medical research not only in Kenya but in the entire African continent.[38]

Year's later after attaining independence, Kenya established more ST&I institutions in its development priorities. A key institution in promoting research, science and technology in Kenya is the Ministry of Education, Science and technology (MoEST). This Ministry is mandated to provide, promote and coordinate lifelong education, training and research for Kenya's sustainable development.[39]

In 1977, through the Science and Technology Act, cap 250 Kenya established advisory institutions to the government on matters of science and technology. These include Advisory Research Committees (ARCs) and the National Council for Science

[36] http://www.airc.go.ke/
[37] http://www.kalro.org/Coffee_Research_Institute
[38] http://kemri-wellcome.org/about-us/#ChildVerticalTab_12
[39] http://www.statehousekenya.go.ke/government/science.htm

and Technology (NCST), which is the current National Commission for Science, Technology and Innovation (NACOSTI) was established under the Science, Technology and Innovation Act, 2013.

The institute has a mandate of developing Kenya's priorities in ST&I in relation to the economic and social policies of the Government and the countries international commitments. The commission also plays a role in devolving of sound ST&I policies and budget under the new constitution dispensation by collaborating with county governments. It advises both the national and county governments on ST&I policies including the planning and assessment of important financial resources among other functions.

Another institution is the Kenya Industrial Research and Development Institute (KIRDI), which was established in 1979 under the Ministry of Trade and Industry. This institution is mandated to offer multidisplinary research and development in industrial and allied technologies. It had 5 research and technology divisions namely: Engineering, Energy and Environment, ICT, Leather and Textiles, and food technology divisions.

It's core mandate is coordinate with the relevant ministry in matters pertaining to research policies and priorities, undertaking research, collaborating with other institutions in offering research related trainings and research findings dissemination among other roles.[40]

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[40] http://www.kirdi.go.ke/50-general-articles/81-home-article

The contemporary technology incubation centres in Kenya however came into being in 2010, the first and most popular being (iHub). It is a technology innovation community where youth interested in technology, tech companies, investors, and hackers are given a space to work in and build start-ups.

Majority of incubation centres inception can be related to the problems in the Kenyan education sector in Kenya. There has been a disparity between the skills earned in school and the labour market demands. Therefore, posing a challenge in translating education skills into market demands. In 2013, Kenya embarked on a curriculum review process- 'The curriculum review framework: Transforming society through curriculum reforms' that proposes competency- based assessment. This is driven by the need to introduce a focus on application of skills and knowledge other than just studying to pass exams. This system is custom made to ensure that learners achieve the desired competencies rather than studying for competition purpose.

This is a very good move if implemented, as primary school pupils will have the number of subject reduced to accommodate teaching that is suitable for their age. While those in high school, can start establishing their careers.[41]

This disparity has contributed to the rising case of unemployment and with the recent global economic downturn there has been an urgent need to deal with unemployment. It has further made the youth to find alternative sources of income thus prompting the establishment of technology incubation centres. This is in line with the Kenya Vision 2030 that considers education as an important aspect of socio-economic development.

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[41] Oduor, A. (2016) *Standardmedia.Co.Ke*. Available at:
http://www.standardmedia.co.ke/article/2000196234/8-4-4-education-system-may-be-scrapped-this-week/?pageNo=2 (Accessed: May 2016). In-line Citation: (Oduor, 2016)

The country's blueprint also recognizes that science, technology and innovation for economic growth. Therefore, education reform cannot be overemphasized, as there is a major gap in skilled manpower to move it up to development.[42]

1.7.5 Role of incubation centres in employment, skills and experiences from other countries

Incubators play an important role in fostering the creation and growth of small and medium-size businesses. Their roles range from providing affordable space to providing core business support functions, such as business development, financing, marketing, and legal services. Factors considered important to success in clued public policy that facilitates the creation of venture capital and provides business infrastructure, private sector partnerships for mentoring and marketing, community involvement, a knowledge base of university and research facilities, and professional networking.

In Nigeria, experts have been providing policy recommendation to the government for the centres to deliver substantive contributions to address small and medium enterprises growth. In the Unites States of America they are regarded as tools of entrepreneurship and highly supported by the government for many decades now.

According to the Division of Capacity Building and Youth Development of the African Union, Africa has recently been recognized as the youngest continent in the world in terms of its population with 65% being below thirty-five years and over 35% between the ages of 15-35. On the other hand unemployment among the youth has

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[42] *National Curriculum Policy* (2015) Available at: http://www.kicd.ac.ke/images/PDF/national-curriculum-policy.pdf (Accessed: May 2016). In-line Citation: (*National Curriculum Policy*, 2015)

rapidly been on the rise with about 10million youth entering the labour market on an annual basis, which is a situation that has seen many governments battle so as to improve the livelihoods of its people.[43]

Not only is unemployment an African problem, it is a global crisis with 73 million young people being unemployed worldwide. Among the employed youth, a number of them are in low paying jobs or in the informal sector. It is therefore necessary to highlight areas of opportunity not only for income generation but also for providing sustainability purposes. In the world today there are numerous opportunities and one of the newest is in the digital world.

Information Communication and Technology (ICT) as emerged as a transformational area in all sectors of the economy from health, manufacturing to transport. For example, Uber application, which is a transport application that allows taxi's to find clients within their location just by use of a phone. It is the newest entrant in Kenya and has seen many youths venture in it for business.
ICT has also opened up opportunities particularly for the youth as these opportunities demand good computer skills.

Against this background, majority of governments around the world have also recognized how viable this is and how it contributes to development. Governments are now working to create policies that encourage the youth to take up these opportunities. The numbers of youth who are plunging into this new field are yielding

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[43] National Youth Fund, Definition of Youth. 2014 [ONLINE] Available at: http://www.youthpolicy.org/factsheets/country/kenya/. [Accessed 21 June 16]

a lot of benefits from it. These benefits range from learning areas, job-matching services, to creating funding sources for their businesses.

The private sector and not-for profit organizations have also not been left out the support of this new environment. [44]

1.7.6 Challenges in establishing technology incubation centres

Technology incubation centres require adequate resources when being created. Many have been faced by numerous challenges like lack of enough funding to weak support from the public- private sector. To promote the funding, a number of them are aligned to government ministries, civil society or universities as it becomes affordable to establish these centres under a higher education institution. This is because the technology incubation centres need a number of equipment and a big facility to ensure smooth running of the activities.

The problem may be magnified when the financial resources are inadequate while the need for employment opportunity is huge. This would make the cost per job created in the incubator high in the short term.

The public-private sector partnerships encourage and motivate the incubators to invest more in their clients, which promotes efficiency. In study carried out by the University of Michigan, showed that incubation centres with large budgets which is both expenditure and revenues performed better than those with budget challenges. This was attributed to client service delivery capacity. The source of the revenue is also another critical factor whereby those centres with rent and service revenues,

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[44] Coward, C., Caicedo, S., Rauch, H. and Rodriguez, N. (2014) *Digital opportunities: Innovative ICT solutions for youth employment*. United States: International Telecommunications Union.

generally performed better than other programs. In terms of expenditure, centres who invested in staff and program delivery had better results.

Other challenges may be recorded where the funders or donors of a particular incubation centre may be driven by different objectives especially if they are from public and private sectors. For example the government may be looking to support a tech hub with an aim of creating more job opportunities while the private sponsors are looking at a return on their investment. This two conflicting objectives can create an output problem.

Another challenge is on the partners that most incubator facilities select to work with. Majority of them are well-established companies that record huge profits. The partnership with the tech hubs gives them an upper hand in their growth, which can be considered to be unfair especially in communist societies. This is because the huge firms or companies benefit at the expense of the young firms.

More challenges are based on the client and entrepreneur relationship where the entrepreneur becomes independent and works directly with the client. However, when business fails they assign the blame to the incubator programmes. Thus it is important to link the incubators to an industrial park to avert such problems.

There can be conflict of interest also when the senior employees in an incubator centre are hired to work for prominent people in government. This is an exercise, which if done for long can lender the operations of the incubation centre political.[45]

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[45] Lalkaka, R. (2006) *Technology Business Incubation*. 1st edn. Paris, France: United Nations Educational Scientific and Cultural Organization. In-line Citation: (Lalkaka, 2006)

1.8 Conceptual framework

Technology Incubation Centre
Existing Sound System

Functions
- Nurturing Young Firms
- Providing facilities
- Business Networking Forums
- Advocacy
- Legal advice and IP protection

Outcomes
- Youth skills and entrepreneurship development
- Employment
- Business Opportunities
- Technology Innovations
- Recognition/Awards

Formation
- Structure
- Personnel
- Innovation

Stakeholder Inputs
- Development Funds
- Government policies
- Private Sector experience

Figure 1: Conceptual framework
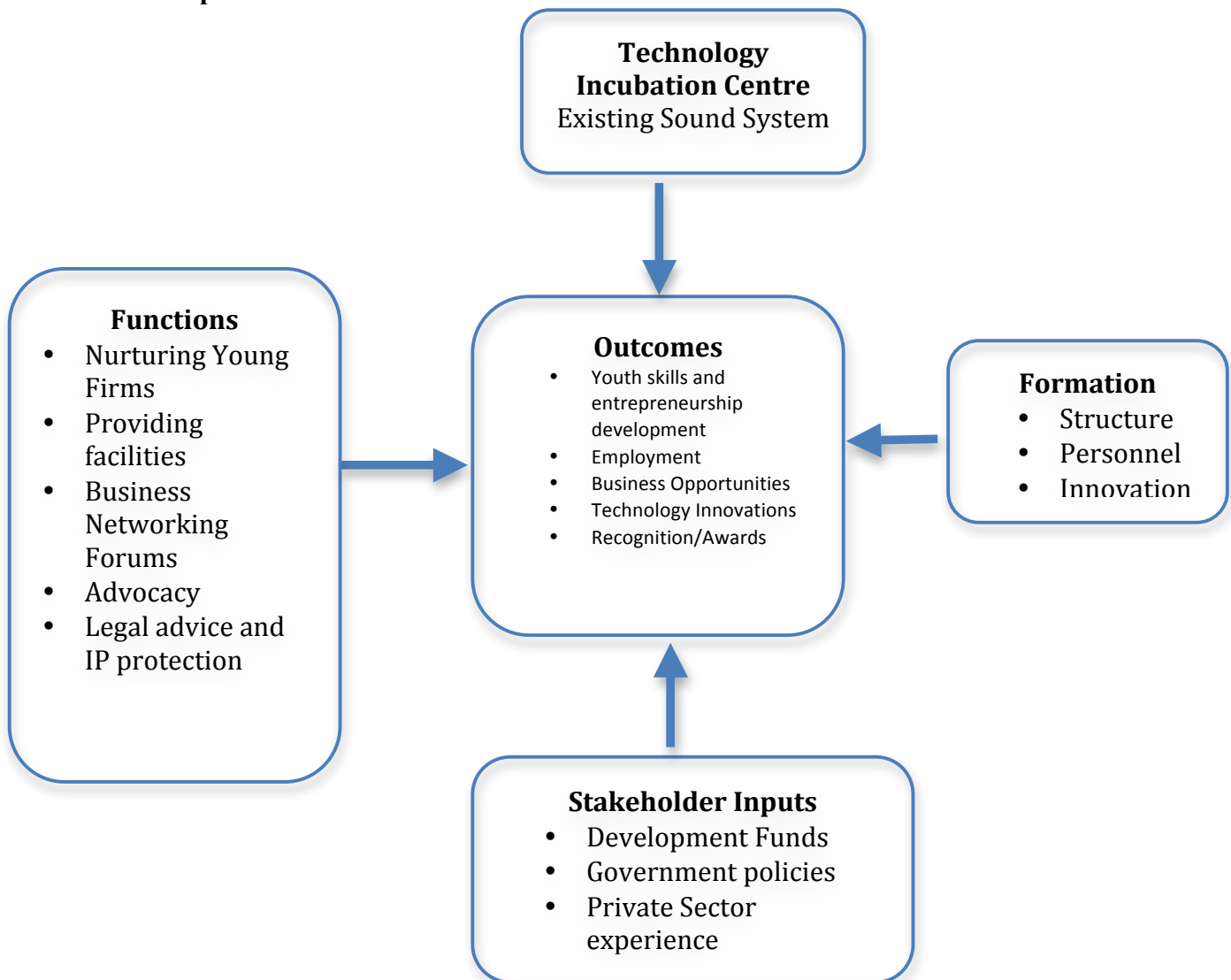
1.8.1 Explanation of conceptual framework

The variables in the framework include stakeholders' input, functions, the existing sound system in the incubation centres in Kenya and the formation of the centres. These are interrelated and are the key factors that lead to Youth skills development, open up employment and business opportunities for the youth as well help them to

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come up with technology innovations that can build up to international youth development.

1.8.2 Technology Incubation Centres

Technology incubation centres are aimed at enabling small, young enterprises to remain alive and promote the growth of potential start- ups. They are also known to significantly minimize the collapse of these small business start-ups as they provide skills on how to run them. Majority of the developed countries used the centres to restructure their economic systems.

1.8.3 Formation of the Incubation Centres

The formation of the incubation centres is critical for its proper functioning and this is determined by the objectives it aims to achieve. The structure and the personnel involved provide a critical basis for its operation and survival. To get the holistic human resource needed for their operation, Experts in technology and innovations as well as established entrepreneurs need to be the key people involved in the formation of incubation centres.

1.8.4 Stakeholder's input

Incubation centres are initiatives of both private and public contributions and support. This is done so as to enhance their sustainability and also create strong industrial networks for them to generate the required skills for the students.

Government policies provide clear guidelines on the operation, survival and sustainability of these centres. Apart from government support, these centres also depend a lot on development agencies that provide seed funding for the start-ups or even fund the general operations of the centres.

1.8.5 Functions of the incubation centres

Technology incubation centres have a common function of providing a platform where sustainable small enterprises can be established through the provision of operating facilities, training, rules and regulations to govern membership, practical assistance and availability of professionals.[46] Other functions include: assisting the students or entrepreneurs in developing a prototype and acquiring standard international technology skills. The technology incubation centers provide; working area, access to reading materials or library, access to Internet, legal services, especially patent advice, mentoring and training services.

The functions of the centres in some cases may not be well articulated and adhered to making it difficult for the real purposes to be executed. This leads to a loophole in protection of the youths' innovative ideas in the incubation centres if majority of them are not well informed about patenting and other vital information.

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[46] Business Incubators and Small Enterprise Development: The Nigerian Experience, Small Business Economics, 2001, Volume 17, Number 3, Page 15, **Oyeyemi Adegbite**

1.8.6 Hypothesis

Technology incubation centres in Kenya are limited in their outcomes as they lack proper functioning systems and funding. Kenya incubation centres do not play a significant role in skills development, employment and recognition of the youth.

1.9 Methodology

The study employs qualitative research designs. It is descriptive, as well as analytical, using both empirical and secondary data.

1.9.1 Data Collection

This research covers a population sample of about 100 persons drawn from the 11 incubation centres (@iLabAfrica at Strathmore University, iHub, Nailab, FabLab at The University of Nairobi, Chandaria Business innovation and Incubation Centre at Kenyatta University, 88mph, Columbia Global Centre, Africa, Climate Innovation Centre, Kenya Brave Venture Labs, Growth Africa, and C4Dlab at the University of Nairobi), research officers from various technology based non-governmental organizations e.g. African Technology Policy Studies Network (ATPS) and Future Agricultures Consortium, technology institutions like Kenya Industrial Research Development Institute (KIRDI), Kenya Institute for Public Policy Research and Analysis –(KIPPRA), government institutions like National Commission for Science, Technology and Innovation (NACOSTI), Kenya Vision 2030, and private sectors people behind successful technology based ideas, (M-pesa, M-Shamba, Farm Drive, Ghafla, Ma3route among others)

Research tools used included questionnaires with open-ended questions that were administered to the youth in the incubation centres outlined in this study. Interviews were done with the different research officers in the organizations that deal or support technology incubation centres.

1.9.2 Data Analysis and Presentation

The study follows a qualitative research design, thus data is presented in a narrative form. The ethical considerations are pegged on legal aspects that can create problems to do with information technologies for example those relating to intellectual property rights, threats to the security of systems and data, and product liability. This raises questions of the protection of the company's interests on the one hand, and protection of the individual's interests on the other. In managing information technology the researcher makes due consideration of the legal aspects.

1.9.3 Thesis Outline

Chapter one has looked at the introduction and the background of the research study, highlighting the mismatch of available opportunities in the market and the skills that the youth have. The chapter also highlighted the problem statement that mainly aims at identifying the gaps that exist in Kenya's technology sector, which have greatly hampered the maximization of technology incubation centres to a level that it can contribute to youth employment, skills building as well as international recognition.

The chapter also set the objectives of the study that include; assessing the legal, policy and institutional frameworks for technology incubation centres in Kenya, understanding the functioning of technology incubation centres in Kenya, assessing the impact of incubation centres on skills development, employment and recognition

and assessing challenges faced by incubation centres for youth development. In the justification of the study, it was clear that the study is aimed at informing policy makers to come up with technologically inclusive policies that can propel the youth to greater heights as well as in transforming the economy.

The chapter further reviewed literature of technology incubation centres, the concept, the history both in Kenya and other parts of the world, functions and role in employment, skills and experiences from other countries.

In addition, the chapter explained the conceptual framework, which entails various variables like stakeholders' input, functions, and existing sound system in the incubation centres in Kenya. The variables were linked to youth skills development, employment and business opportunities and technology.

The hypothesis was also stated and the methodology of the study that will include a mixed research design that is descriptive and analytical, employing both empirical and secondary data.

Chapter two assesses Kenya's legal, policy and institutional framework for technology incubation centres with a keen focus on the provisions in the vision 2030 including legal measures. The provisions are highlighted in the medium-term plans MTP 1 (2008-2012) and MTP 2 (2013-2018) that provide roadmaps towards its success. The chapter also looks into the international conventions, declarations and protocols that are geared towards the modeling of the technology incubation centres into centres of excellence and economic development. Finally, the chapter looks at the number of challenges that are holding the country back in the full optimization of that sector

Chapter three focusses on the functioning of technology incubation centres in Kenya. The chapter comprehensively looks into the general functioning of technology incubation centres in Kenya including their focus areas, the set up, programs and trainings as well as their research function. It also analyses whether the existing system is functional and if it meets the global standards as well as identifying their existing gaps.

Chapter four assesses the impact of incubation centres on skills development, employment and recognition of youth in Kenya. The chapter divides the impact into short, medium and long-term benefits as it is to measure the impact of these centres as some can only be recognized after a long period of time. This is due to the fact that there is no sufficient data about this especially in developing countries like Kenya. Lastly, the chapter looks at the challenges that hinder the achievement of all these plans.

Chapter five provides conclusions of the study, tests the hypothesis and gives recommendations and areas for further study. The recommendations target the policy makers, government, higher education institutes and the technology incubation centres as well.

CHAPTER TWO

LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK FOR TECHNOLOGY INCUBATION CENTRES IN KENYA

2.1 Introduction

This chapter looks at the background of Kenya's legal, policy and institutional framework for technology incubation centres, what they provide and the existing gaps. Kenya has policies, major documents and statements that guide the existence and operations of technology incubation centres in Kenya. In addition, there are laws in Kenya as well as government frameworks, quality controls e.t.c that govern their existence and operations. The Kenya Vision 2030 a long-term policy document that addresses the development of Kenya into a middle-income country has political, economic and social pillars that are anchored on a holistic adoption of ST&I as the implementation tool. The policies, institutions and national priority areas outlined in the document are examined to identify if they are pledging enough support and are directly looking at shaping the operations of technology incubation centres.

This policy document further has five-year medium-term plans MTP1 (2008-2012) ad MTP 2 (2013-2018) that provide roadmaps towards its success. Under this plans, various institutions both private and public are tasked with the implementation of various operations and set up of technology incubation centres in Kenya. Kenya has also ratified to international conventions, declarations and protocols that are geared towards the modeling of the technology incubation centres into centres of excellence and economic development.

However, in all these forward looking plans there are no direct plans on how technology incubation centres are supported as well as some roadblocks encountered in the implementation of these policy, legal and institutional frameworks.

2.2 Policy frameworks on technology incubation centres in Kenya

The government of Kenya recognizes policy priorities around the integration of science, technology and Innovation (ST&I) is paramount for national prosperity. This is outlined in the Kenya Vision 2030, which the Government has been implementing since 2008. The vision has three pillars that include, political, economic and social. The three pillars are secured on macroeconomic stability, sustenance in governance reforms, promotion of equality and wealth creation for the poor, improvement of infrastructure, energy, ST&I, land reforms, human resource development, security and public sector reforms.

The political pillar is aimed at providing a democratic political system for the people. This is through various strategies including adherence to the rule of law, support of issue based politics, enhancing public service delivery in a transparent manner, promoting security, and peace-building and conflict management. The political pillar is paramount as it defines the leadership of the country. ST&I requires a lot of political buy-in as many policies have to be politically approved. During the leadership of President Moi, ST&I was not very much supported and there was very little development that was anchored on ST&I. Until former president Kibaki came into power with a new system of leadership that ST&I got government support and was even considered in the 2010 constitution. Therefore, ST&I needs to be supported all the way from the constitution, institutions and down to the community.

Economically, Kenya envisions recording an economic progress of 10% p.a in the next 25 years and continuously sustaining that trend. This is achievable through developing six key sectors in the economy. They include tourism, agriculture, retail trade sector, manufacturing, business process offshoring and the financial services sector. Kenya is starting to recognize that for economic progress to be realized, ST&I should be the backbone of the strategies. Economic sectors like manufacturing, tourism and agriculture are now relying on ST&I for their productivity. Hotels in Kenya are now booked online and use technology for all their systems. Agriculture is also picking up the trend where applications are being used for agricultural decision-making and for promoting farmers output.

The social strategy is geared towards building a just and unified society that promotes equality in resource distribution and in a clean and secure environment. This is achievable if only the key social factors are provided equally to all the citizens. They include; education and training, health, water and sanitation, the environment, housing and urbanization, gender, youth, sports and culture as well as equity and poverty reduction. This is in consideration of the marginalized and the physically challenged. All these will be anchored on ST&I as the tool for implementation.

The vision has a strong pillar on ST&I, which proposes to have a strong application of ST&I to raise productivity and efficiency across the three pillars. ST&I promote sustainable development linked to natural resources, global economic competitiveness and equity. It acknowledges the important contribution of R&D in promoting economic development in developing countries. The Government in the vision 2030

promises to create and implement an ST&I policy framework to support the vision. In this regard, the Government will channel resources and build efforts to scientific research, build capacity in technical field, raise the quality in teaching STEM subjects at all levels of education including polytechnic and universities.

The ST&I priorities were defined in the Medium Term Plans I (2008- 2012), and II (2013- 2018). The plans spells out the development of innovative ideas into products, processes and services, measures aimed at creating more jobs, and averting other disasters and climate change atrocities among others.

The MTP 1 2008-2012 had more focus on the development of technological infrastructure, technical and entrepreneurial skills as well as ensuring that social and regional equity is being promoted. This was with a more direct effort of transforming innovative ideas into products, processes and services so as to create more employment opportunities for the youth. This would further focus on protecting the environment and reducing climate change atrocities. It was actualized as during the period several technology incubation centres were established including the premiere iHub. The plan also had provisions for government policy leadership aimed at enhancing the achievement of ST&I goals. This was implemented through the Ministry of education, science and technology. It promoted consistent implementation of ST&I programmes, projects and plans and further established an appropriate business environment needed for the performance of ST&I initiatives. It further set a ground for providing a framework for gathering resources including funding

support.[47] During the period, a blueprint of the 5000 acres Konza City was designed, which is an IT business hub established to host a science park among other facilities.

The National Sectorial Priorities analyzed and developed the following policies as highlighted in the MTP II that are aimed at establishing a favorable environment for the growth of ST&I. The policies are all aimed at addressing ST&I challenges which include a missing integrative policy framework to propel effective fusing of ST&I into the economy; lack of a harmonized national research objective; the existence of a linear and fragmented innovation system; "Silo Mentality" of researchers among others.

Subsequently, MTP II (2013-2018) has created four strategic areas to facilitate the growth of ST&I in Kenya the areas include; strengthening ST&I institutions, building capacity in human resource and workforce, promoting innovation in priority sectors and promoting funding for ST&I. The plan hopes to implement a multi-disciplinary approach that will promote economic growth, employment opportunities and improved quality of life. At the same time the government will foster the building of value adding new knowledge and secure it using intellectual property rights. Capacity building of relevant research bodies including universities and private sector will also be in order to pursue success in research. During the period of implementation some progress has been recorded including the formulation of the ST&I Act that provided for the establishment of the National Commission for Science and Technology (NACOSTI) to succeed the National Council for Science and Technology (NCST).

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[47] Republic of Kenya. Kenya Vision 2030 Medium Term Plan I 2008- 2012; Education and Training: Towards a Globally Competitive and Prosperous Kenya. 2010 pp 29-33

An institute mandated with the coordination and regulation of the development of ST&I in the country.

The MTP 2 also has provisions for more efforts to be put in building the business angle of ST&I by speeding the commercialization of new research innovations to allow for their market penetration, distribution and survival in the market. A number of applications have transformed from ideas to real products a good example being the M-shamba mobile application that enables farmers' access market prices for their produce. The Application was endorsed by the Communication Authority of Kenya and financially supported by them. This shows the government support in ST&I ideas. However many more need to be supported. Benchmarking of these innovative products with other international set standards and strategies is also necessary through collaborating with national and international research. This will be done through resourceful and environmental sensitive strategies that can be promoted in many sectors.

For this to be achieved, a number of policies have been prepared by the government to combat the challenges. These policies include; the establishment of an institutional and regulatory framework that will promote and manage ST&I. Promoting ST&I that will grow the economy through national priority areas like space science. Higher education institutions have embraced this policy by coming up with technology incubation centres in institutions like C4D lab at the University of Nairobi. The Lab has championed the 'Nairobi Innovation Week' which now been declared an annual event. The event brings together various stakeholders from different sectors like government, academia, private sector, innovators, students, techpreneurs among

others. It provides an avenue for youth innovators that create an impact in our society to be recognized and celebrated[48].

The same institutions will mobilize resources and coordinate ST&I so that the economy can reap fully from it. All these will be coordinated through the national priority areas. Further, the government will allocate 2% of its GDP per year to support the research and Development sub-sector. This is a message that was drummed up during the Nairobi Innovation week on 1-5 August 2016. This is to encourage investors and other stakeholders in funding ST&I. The legal aspect too cannot be overlooked where through partnerships the government will nurture and protect intellectual property rights of practioners in ST&I. Further, a platform that will bring together ST&I stakeholders for knowledge sharing and awareness creation will be established to promote networking among stakeholders.

Capacity building of professionals in ST&I will also be a priority so as to develop a high number of highly qualified professionals as possible.

2.3 Legal frameworks on technology incubation centres in Kenya

Kenya has recognized that for it to achieve regional and global competitiveness, it must invest hugely in ST&I as well as transform the country into a knowledge-based economy. For this to be accomplished there has to be well-stipulated and followed policies and institutional and legal frameworks that address and protect citizens' needs.

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[48] http://innovationweek.co.ke/

One of the major challenges in promoting ST&I in Kenya is the poor intellectual property rights framework for scientists, researchers and innovators. However, in MTP 1 2008-2012, the government had pledged to develop laws, needed for implementation of the ST&I initiatives through the Ministry of education, science, technology and innovation in consultation with the office of the Attorney General.

Certainly this was delivered, as in the new constitution passed in 2010 there is a provision for a binding role of the national values and principles of governance on all State organs, state and public officers and all persons when they apply or enact and interpret the constitution. It is also binding when one makes or interprets public policy decisions. This provision in Article 10(1) is a clear indication that the law protects people who interpret and act according to the set policy and laws. This is quite encouraging as it means that the ST&I policies are also protected under the constitution.

Article 10(2) further provides for the participation of the people and inclusiveness and protection of the marginalized, good governance, integrity, transparency and accountability as well as sustainable development which is what ST&I policies endeavor to promote.

Article 11(2) (b) and (c) is more elaborate and specific to ST&I as it recognizes the role of science and indigenous technologies in the development of the nation. It also clearly stipulates the promotion of the intellectual property rights of the people of Kenya. This clearly reflects on the major challenge in the ST&I sector as majority of

the innovators have not obtained patenting rights as the process is long and expensive thus one may end up losing their idea along the way.

For ST&I development to be achieved, a very fundamental area which is education has to be promoted too as these two go hand in hand. Education contributes greatly to the skills and knowledge needed in ST&I. On the same background, the constitution in Articles 20, 35, 42 and 43 recognizes the right to education for every person including the marginalized. For education to be inclusive, there must be inclusivity and equality. The constitution recognizes and provides for accessible education for the vulnerable individuals and groups like women, the aged, persons with disabilities, children, youth, members of minority as well as members of particular ethnic, religious or cultural communities. Other education related regulations include: The Education Act that provides for free basic education, TSC Act that provides for the registration and management of teachers, Kenya National Examination Act that addresses the examinations malpractices. Others include the Technical and Vocational Education and Training system (TVET) bill that provides for the establishment of a technical and vocational education and training system. There is also the University Act that provides for the development of university education, accreditation and governance of universities and the establishment of a Commission for University Education. Education has several provisions in the constitution, which explains its importance in the well being of any nation.

Apart from education promotion, there are laws that are specific to science, technology and innovation including:

Science, Technology and Innovation Act, 2013

This law provides directly for the promotion, and regulation of the ST&I development in Kenya and also introduces ST&I into the production system of the economy. It provides for establishment of the National Commission for Science and Technology (NACOSTI), which is the successor of National Council for Science and Technology. The commission is in charge of regulating and ensuring that quality has been achieved in ST&I sector as well as advising government on those matters. The Act also provides for carrying out research in Kenya with a license. The provision stipulates that individuals who wish to undertake research in science and technology must obtain a license under this Act. Establishment and registration of research institutions is also provided for in the Act where anyone wishing to establish a research institution must make an application to the commission in the prescribed manner of the grant or a Certificate of Registration. Further, there is the establishment of the Kenya National Innovation Agency under this act, which, shall be responsible for developing and managing the Kenya National Innovation System. The system shall be mandated to provide linkages between universities, research institutions, Private sector, the Government among other actors in the system. Under the Act through NACOSTI and the Ministry of Education, science and technology (MOHEST) coordinate the national ST&I week is organized on an annual basis. The event has been organized since 2012 and it brings together policy makers, researchers, innovators, academicians, industrialists, students and the public. In a role that is directly linked to the improvement of technology incubation centres, the system is also tasked with the establishment of science and innovation parks, institutes or schools or designate existing institutions as centres of excellence in priority sectors. It shall also be

responsible for benchmarking and implementing international best practices for national innovation standards.

Further, in promotion of youth talents, the agency shall search for and nurture innovative ideas from individuals, training institutions, the private sector and similar institutions. During the National Science, Technology and Innovation Week 2015, innovators were issued with grants to support their innovations. So far a total of 975 research projects have been funded. Among the innovations included a mobile phone car tracking and security system, mobile phone charger and mobile irrigation system. In addition it shall develop and regularly update a database on innovation in partnership with other relevant institutions. It shall also keep track and maintain a database of latest and future global technology. It shall also extend a legal role of creating awareness on intellectual property rights among innovators.

On the same backdrop, the agency shall be responsible for the inclusion of ST&I in the country's programs and policies at all levels as well as implement the national innovation and commercialization policy.

In promotion of international youth recognition the agency will establish and maintain a Presidential or alternative award system for novel innovations, subject to prescribed conditions. A more direct role to incubation centres is the creation of synergies among different technological innovations, incubation initiatives for diffusion of technology in Kenya.

More roles will be to create a National Research Fund, shall have financial provisions on the commission funds. Lastly, it shall establish a museum of science and technology. [49]

The law provides for the necessary legal framework that support the technology incubation centres however, there is no clear record of how it directly supports the centres.

2.4 Institutional frameworks on technology incubation centres

As it is globally recognized that ST&I contributes to the social, economic and political progress, the relevant institutions cannot be ignored. Kenya has in along time acknowledged the role that ST&I institutions play in fostering economic transformation.

The Ministry of Education is the ministry that is in charge of ST&I, it is divided into two Departments namely Education and Science and technology. This explains that the Government acknowledges the great role played by science and technology. Under the Department of Science and Technology policies on Science and Technology are formulated. Further the Department is mandated to coordinate, inventory and dissemination of scientific and technological research.[50]

The government together with other partners will identify and nurture innovators. It will also work to protect intellectual property rights of scientists and researchers,

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[49] http://www.kenyalaw.org/
[50] https://www.kenyans.co.ke/government/ministry-education-science-technology

which is very critical as most innovators hardly get a chance to actualize their ideas as most of the time they get adopted by other people who steal the idea. Through the Ministry, institutions of higher educations have been have been able to establish technology hubs within the institutions. The Ministry is supporting these innovations by creating a favourable ground for their operations. However, there is still much more that needs to be done especially at the county levels as only the urban youth stand to benefit from these tech hubs.

In addition, the government pledges to create a platform for ST&I knowledge sharing and awareness creation. This will be achieved through highly trained professionals in ST&I, which the government will subsequently support in their training.[51]

The National Commission for Science and Technology (NACOSTI), is the commission in charge of regulating and ensuring that quality has been achieved in ST&I sector as well as advising government on those matters. The commission also empowers the youth through congresses and meetings where they target the youth in secondary schools. They get speakers to talk to them on become the agents of transformation in the society. Further, the commission opened an ST&I desk program in collaboration with other ST&I institutions. The desk helps to address challenges of effective coordination, regulation and quality research- based policy advice. It serves as ST&I institutions as focal points for information sharing among stakeholders. [52]

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[51] Republic of Kenya. Kenya Vision 2030 Medium Term Plan II 2013- 2018; Education and Training: Towards a Globally Competitive and Prosperous Kenya. 2012 pp 49-56

[52] Okoth, W. (2014) 'ST&I Desk Program', *The World of Science, Technology and Innovation*, (22), p. 3.

The commission further leads in ST&I policy revision like the gender policy and nanotechnology. It also offers ST&I grants on behalf of the Ministry of Education Science and Technology. The purpose of the grant is to support scientific research and technological innovations for development. The funding target areas include research projects, innovation projects, research projects by women scientists; postgraduate research projects; post-doctoral research projects, bilateral matching grants, research facilities and support of scientific conferences and symposia.[53]

ST&I is a strong pillar of Kenya's Vision 2030 and thus higher education and training initiatives which are the institutions that promote it need to be well structured in order to achieve it. Therefore, Universities play a critical role in the progress of ST&I as they act as the link between the innovations skills building and the industry. Developing a highly skilled Human Resources is a strong pillar under the ST&I policies in Kenya under the National Sectorial Priorities. This further reflects on the role that the higher education institutions play in achieving this strategic policy. At the same time, it recognizes strengthening the ST&I institutions where the innovations are developed.

Kenya dominates a number of incubation hubs in Africa and comes in second after South Africa in number of tech hubs. The major incubation centres in Kenya include: @iLabAfrica at Strathmore University, iHub, Nailab, FabLab at The university of Nairobi, Chandaria Business innovation and Incubation Centre at Kenyatta University, 88mph, Columbia Global Centre, Africa, Climate Innovation Centre, Kenya Brave Venture Labs, Growth Africa and C4Dlab. iHub Kenya provides a tech

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[53] *Annual Report 2012* (2013) *National Council for Science and technology*, (NCST/075), p. 23.

co-working space where young entrepreneurs get free internet and venture funding due to the strong network of international venture capital community. iHub was initially funded by institutions like the Humanist Institute for Cooperation (Hivos) and Omidyar Network for the space, Ushaidi and Zuku for the lease and internet connection respectively. It is currently in partnership with technology cooporations Intel and Microsoft.

iLab Africa under the Strathmore University has its functions around the achievement of millennium development goals and Kenya's vision 2030. Under its incubation theme exists iBiz Africa that provides space to nurture the youth capacity in developing ICT answers and business that benefit and change the society positively.[54] Nailab is also technology centred and fastens start-ups with a view of developing innovative and technology driven ideas.[55]

The climate innovation centre is driven by climate changes and center's its functions around development of innovative ideas around water management, renewable energy and agri-business. It further provides a platform for business acceleration, financing, market development and matchmaking. Embassy of Denmark, and UKaid sponsor the centre. Its partners include: Strathmore University, Kenya Industrial Research Development Institute, Price water House coopers and Global Village Energy Partnership (GVEP).[56]

54 http://www.ilabafrica.ac.ke/index.php/ilabafrica/
55 http://www.nailab.co.ke/
56 http://www.kenyacic.org/

The Brave Venture Labs are aimed at building sustainable African ideas and companies to solve global challenges.[57] The C4Dlab at the University of Nairobi provides training on entrepreneurship and building scalable software's and how to launch them in the global market.[58]

2.5 International and Regional Policy, legal and Institutional conventions, and declarations

Kenya has not only set national policy regulatory and institutional frameworks but has also been a signatory to a number of international conventions that promote ST&I. International agreements, protocols and declarations form a vital foundation to matters surrounding ST&I at various levels.

For example, Kenya is also part of International policies in ST&I like the Daejeon Declaration on Science, Technology, and Innovation for the Global and Digital Age. These policies were developed in Korea on 20 and 21 October 2015 to discuss how ST&I can help shape a future. This is through sustainable economic growth, job creation and enhanced wellbeing. The declaration acknowledges a vital component of the changes in science and technology systems being influenced by digitization and globalization stating that member states should keenly and consistently aim to update their national and international policy agendas and instruments.[59]

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[57] https://braveventurelabs.com/
[58] http://www.c4dlab.ac.ke/startups/
[59] http://www.oecd.org/sti/daejeon-declaration-2015.htm

Further, the government is a signatory to the Abuja declaration where African countries declared their commitment to allocating at least 1% of their GDP to ST&I. This 1% should be set aside every year to promote the ST&I value chain (from pre-R&D to commercialization) from the Government and other sources. [60]

Similarly, Kenya being a member state of the African Union (AU) is also part of the Science Technology and innovation Strategy for Africa (STISA 2024) implementing nations. This is a strategy for promoting the long-term AU agenda 2063, which is emphasized by science, technology and innovation as multi-function tools for achieving development in Africa. On the same backdrop, STISA states that it will establish the Pan African Intellectual Property Organization (PAIPO) to implement the AU policy in the field of Intellectual Property. This body will promote the dissemination of patent information, provide technical and financial support to invention and innovation and promote protection and exploitation of research results.[61]

Further, the AU through STISA, recognizes the importance of Universities in promoting ST&I "building our universities as the centers fro excellence, as exemplified by the Pan African University." Therefore, investing in Universities as the Premium institution in ST&I development cannot be overemphasized.. It further has implementing institutions like member states, which are the 54 African countries in funds mobilization. The member states will also work hand in hand with other partners in implementing various initiatives in the strategy. Other institutions include

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[60] The Heads of State and Government of Africa and South America ,*Abuja Declaration* (2006) Abuja, Nigeria: Africa- south America Summit. p. 14. In-line Citation: (*Abuja Declaration*, 2006)

[61] Science, technology and innovation strategy for Africa 2024

Regional Economic Communities (RECs) who will play a critical role in integrating the STISA in other development plans. Finally, there is NEPAD agency, which has a Science, Technology and Innovation Hub (NSTIH), which shall support the technical implementation of the strategy and coordinate resource mobilization.

Kenya was also part of the committee on Development Information, Science and Technology for mainstreaming Gender in Science, Technology and Innovation Systems in the East African Community. The committee was aimed at recognizing ST&I policies and programmes and analyzing the status of gender mainstreaming in ST&I in the East African Community. The committee aimed to develop and adopt specific East African Community "Gender mainstreaming in STI framework and protocol, which is a clear indication of the efforts put in to create effective frameworks for ST&I.

2.6 Challenges faced in the Policy, Legal and Institutional Frameworks in Kenya

As much as Kenya has invested greatly in ST&I policy, legal and institutional frameworks, there are a number of challenges that are holding the country back in the full optimization of that sector. These challenges include lack of an independent institution to advise the government on ST&I issues. The National commission on Science, Technology and innovation operates as a department under the Ministry of education meaning it lacks full power to coordinate R&D activities.

There is also a lack of a unified national research agenda for the various research agenda's, which means that higher education institutions each has its own research

programmes. This lack of a harmonized agenda has caused confusion in achieving the set goals in ST&I. There is also lack of adequate funding for the innovations thus, making it impossible for them to be commercialized. This is because of the poor networks between innovators and the industry that is supposed to take up the research outcomes or innovations are weak. On the same front, majority of the investors are foreign thus, there is a risk of implementing the outcomes out of Kenya, which will benefit other countries at the expense of Kenya.

There has been a poor coordination between the local industry structure in sourcing for products as they often get their products from other companies therefore there is a low demand for R&D and innovations. The high numbers of imports in Kenya also do contribute, as more often people will import products other than acquiring them from local sources.

There is also a disconnect in research agenda and national development goals and market needs which presents a poor picture for the investors making not interested in funding Kenya ST&I initiatives. Another challenge is the over reliance on foreign experts in scientific issues has seen the local expertise not fully utilized thus minimizing the interest in scientific industry among people in Kenya as they will not liv up to their potential.

Another challenge is the lack of political buy–in for ST&I due to poor advocacy at policy levels. There needs a strong advocacy body of ST&I that will carryout policy engagement and dissemination among the policy makers.

The take up of science subjects in schools has also contributed to the slow growth of the ST&I industry. This is even worse among the girls who hardly have interest in chemistry, computer and information technology science, engineering, geosciences, life sciences, mathematical sciences, physics and astronomy, social sciences (anthropology, economics, psychology and sociology) STEM subjects. These are subjects that form the foundation for science expertise and contribute to ST&I.

The lack of appropriate methods for implementation, evaluation and review of ST&I initiatives is another challenge in ST&I. Another challenge in the legal front is the unresponsive property rights regimes and lack of awareness of STI benefits among the Kenyan population. There is a weak connection between the existing ST&I institutions, which weakens the entire system, as there is no promotion of a common agenda.[62] Finally, in all the frameworks, there is very little mention of the technology incubation centres but a broad definition of ST&I institutions meaning there is still a gap in recognizing these centres.

2.7 Conclusion

Technology incubation centres are considered to be drivers of economic development globally. They have also promoted globalization, socio- economic development as well as contributed to competitive performance across countries. Incubation centres have also gained momentum and recognition in Africa at a rather fast pace. Thus, the civil society, higher education institutions and business investors need to advocate for effective legal measures that are non- bureaucratic. The government of Kenya has put

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[62] Republic of Kenya. Ministry of Higher Education, Science and Technology, Sessional Paper no 7 of 2012, Policy Framework for Science, technology and innovation: Revitalizing and harnessing science, technology and innovation in Kenya, 2012. Pp7

in efforts to propel the ST&I sector to a higher level however, the implementation of these frameworks has not been fully done. Kenya needs to formulate regulations and policies to promote and elevate the knowledge infrastructures as well as enhance speedy access to financial resources for the young entrepreneurs and incubators and ensure financial sustainability is achieved. There is also need to create a strong link between the technology incubation centres and the market so that the innovators and researchers can gain from their ideas. That is the only way other stakeholders will be encouraged to venture in the same field. Therefore, Kenya needs to bring into perspective the great economic value that comes with technology incubation centres and establish strong policy, legal and institutional frameworks that directly stipulate or guide the operations of these centres. With effective frameworks and supportive independent bodies the centres can fully contribute to employment opportunities, skills development and recognition for the youth.

CHAPTER THREE

FUNCTIONING OF TECHNOLOGY INCUBATION CENTRES IN KENYA

3.1 Introduction

This Chapter entails the general functioning of technology incubation centres in Kenya including their focus areas, the set up, programs and trainings as well as their research function. It also analyses whether the existing system is functional and if it meets the global standards as well as identifying their existing gaps.

Nairobi, Kenya is home to a number of technology incubation centres. These centres have come up within this decade. This is a contributing factor to the city being ranked top in Africa as the 'most intelligent' city by the Intelligent Community Forum. In 2015, Nairobi became the first African city to get listed to the world's top 21 "intelligent communities" according to Cable New Network (CNN). The ranking recognizes communities that have taken steps to create an economy that can prosper in the broadband economy on the basis of ICT. This is further supported by statistics from the World Bank that indicate that 17.3 million Kenyans use the Internet out of the 2.714 billion users globally.

Among the top factors leading to this recognition is the establishment of incubation centres. The centres have become hosts to investors, technologists, tech companies and hackers who have the interest of solving global problems through technology. The steady growth of these centres has revolutionized how business is done in

Kenya.[63] However, there are major gaps in these incubation centres as well as challenges that are holding them towards achieving international set standards. The major gaps include, offering legal support, linking them with long term investors, as well as strong structures and able personnel. The incubation centres include: @iLabAfrica at Strathmore University, which is a Centre of excellence in ICT innovations. Established in 2012, the lab serves as a multidisplinary research centre involving linkages between students, the government, industry players and investors and funding organisations.[64] Similarly, iHub is Kenya's first technology incubation centre established in 2010 as well as one of the first in the continent. The hub provides a co-working space for technologists, investors, young entrepreneurs, researchers and programmers[65]. Also, in 2012, Nailab opened its doors in Nairobi in the same building with ihub. It's main focus is to grow innovative technology driven ideas[66]. FabLab at The university of Nairobi school of Engineering concentrates on growing the small and medium enterprises. It was founded in 2013 and is also a fabrication lab.[67]

Additionally, Chandaria Business Innovation and Incubation Centre at Kenyatta University was launched in July 2011 with the sole purpose of promoting an innovation culture among Kenyan youth. This is done to provide a platform for

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[63] http://edition.cnn.com/

[64] http://www.ilabafrica.ac.ke/index.php/ilabafrica/

[65] www.**ihub**.co.ke/

[66] http://www.nailab.co.ke/

[67] f**ablab**.**uon**bi.ac.ke/

nurturing ideas in to real businesses.[68] Uniquely, the 88mph is a technology garage that financially invests in startups. These are both web and mobile startups aimed at improving African markets.[69] Furthermore, the Columbia Global Centre, Africa is an international centre established in 2012 in Nairobi. It provides space for research, policy and academic activities in Africa. Not only does it facilitate research, it also promotes dialogue and technical support for African countries[70].

Comparatively, the Climate Innovation Centre (CIC),is a technology incubation centre that mainly focuses on clean energy technologies geared towards acceleration of development. It focuses on developing innovative solutions in energy, water and agribusiness to address climate change challenges. Recently in 2015, Kenya Brave Venture Labs was launched with a focus on building African companies to solve global challenges.[71] Growth Africa supports acceleration of ideas into real businesses or investments.[72] Finally, the C4Dlab launched in 2013 at the University of Nairobi supports innovative and technology viable computing ideas that can be used in solving real life problems. So far it has made more than 12 prototypes of innovative products.[73]

This makes them a total of 10 active technology incubation hubs within Nairobi.

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[68] http://www.ku.ac.ke/chandaria-biic/

[69] http://www.88mph.ac/

[70] http://globalcenters.columbia.edu/nairobi/content/about-1

[71] https://braveventurelabs.com/

[72] http://growthafrica.com/

[73] http://www.c4dlab.ac.ke/about/

3.2 Technology incubation Centres set up and process

Majority of the technology incubation centres in Kenya share a similar general set up. This includes facility and space offered, the equipment and other amenities, the centres team composition and roles. The membership selection criteria and the roles they play, other support services as well as the partners and stakeholders involved in their functioning is what differs from one centre to another. This forms part of the current system of these centres. A quick assessment gathered the following:

iLab Africa is hosted within the Strathmore University is hosted in an ultra-modern building. The centre has taken up two floors where, there is an office block, four innovation labs, open working spaces and business incubation offices that have a capacity of up to 100 people. The team consists of the Director, IT Business Project Manager, Business Development Manager, Operations Manager, Project Manager and the Incubation Manager.

iHub was started in March 2010 and has consistently continued to serve the tech community in Kenya. It is a combination of various initiatives for example ihub research, mlab (with eMobilis and University of Nairobi) and ihub consulting. There is also the user experience (UX), started in 2014 in partnership with Saneray, Ushahidi and BRCK; a design and rapid prototyping facility that will be situated in industrial area with a smaller location within iHub at Bishop Magua Centre. The iHub team consists of the research lead, managers and project coordinators.

The Chandaria business innovation and incubation centre, operates within the presets of Kenyatta university and offers intakes on a monthly basis. It provides support to innovators ranging from business development services, seed capital, working space,

telephone services, high speed internet, stationery, administrative support, professional guidance and mentorship for 12 or more months.

The centre has hired support staff who assist in offering these services including a full time professional administrative assistant, receptionist, cleaner and messenger. Other services offered include; business basics assistance, networking activities, marketing assistance, high-speed Internet access, help with accounting/financial management, access to bank loans, loan funds and guarantee programs, help with presentation/ pitching skills, links to higher education resources. More of this include; links to strategic partners, access to angel investors or venture capital, comprehensive business training programs, advisory boards and mentors, management team identification, help with business etiquette, technology commercialization assistance, assistance with regulatory compliance and intellectual property management.

During the mentorship phase the innovators are given the opportunity to meet renowned entrepreneurs who talk to them on technology related matters. These mentors are drawn from various sectors including; the academia, public and private sectors. The academia team from Kenyatta university is comprised of representatives from departments like the bio chemistry and bio technology, fashion and design, agricultural science and technology, computing information technology, centre for entrepreneurship and enterprise development, visual and performing arts and the School of Business. In addition, a selected team of professionals from relevant disciplines is available on a daily basis to offer advisory support to the innovators. There are also external mentors who are well-established business people in the country as well as board members consisting of professionals in both public and private sectors.

On a regular basis, potential start-ups are given a chance to come to the centre and pitch. This is done every week on Fridays for two hours.

The centre is governed by rules and regulations where the start ups and companies are closely monitored. Companies are exited from the centre if they do not attain satisfactory growth for the first six months but those that are successful stay on for 12 months.

To join the CBIIC one needs to apply online and fill out details including: the project title and description, its business plan, proof of the innovation and enclose supporting documents like photos and video links.

Nailab is an incubation centre that not only focuses on technology related ideas but also on ideas that can progress into businesses. It is dedicate to lowering the entry barriers for ICT entrepreneurs who want to start and scale up their business. It offers support services including office space, shared facilities, product development, and business development training and co-creation or entrepreneur interaction opportunities. Qualifications for entry are achievable by any entrepreneur with a viable business solution that issuing technology as a basis.

Applications are done online where shortlisted candidates are expected to make a presentation to the judges and from this phase the successful ones are invited to join the program. The team comprises of a product development officer, project assistant, outreach coordinator and other administrative positions like accountant, office assistant, operations manager and communication and marketing.

Similarly, the C4DLab at the University of Nairobi serves the entire university community including faculty, students, staff and also the alumni. It has a reach of

more than 70,000 people. The lab provides an office space that is well equipped with fast internet, printing services, office stationery, comfy chairs, meeting and brainstorming space. It also provides a pool of talent selected from within the organization and the innovators are given a chance to hire interns from the School of Computing and Informatics to help them with technical bits of the start-up. In addition the lab provides mentorship and training from leading mentors and entrepreneurs, venture capitalists, industry experts and academics. Mentorship is provided through calls, lectures and informal meetings.

For innovators to join the centre, they must have start-ups that are viable, that bear multi-disciplinary characteristics, relevance to computing, proof of concept, composition of team members and exhibit a level of commitment. Further, there are particular requirements that demand that the idea bears a computing element, it must be innovative and technologically viable and be able to solve real life problem. Further the start-ups should commit to have at least two full time individuals to work on the product.

The start-ups are required to pay KES. 2,000 as a commitment and the lab gives priority to the University of Nairobi students.

Other centres include Growth Africa, which is an international incubation centre that supports enterprising change through acceleration of start-ups. It offers business planning and development skills, peer and industry networks, and investor access through connections, financial modeling, leadership coaching and mentoring. The team consists of the founder, managing director, business facilitator and partner, programmes manager, growth catalysts and other support staff in finance and administration. The centre sits on a 500sqm office space where investors and

ecosystem players sit unlike other incubation centres where innovators are hosted. The Growth Africa has a different set up and focuses more on accelerating start-up through investments and offering market information and partnerships.

The Kenya Climate Innovation Centre (KCIC) is an incubation centre that focuses particularly on climate and clean energy technologies. It also provides capacity building services and financing to entrepreneurs. The centre offers a working space for start-up companies at the Strathmore Business School. It also facilitates networking and business meetings facilities, technical expertise, technical skills and business mentorship.

The centre partners closely with the government and other interest groups so as to support the adoption of green technologies. It also plays a key role as the contact for international interests of technology transfer and joint collaborative arrangement on research and development through local institutions. Applications are done online and target entrepreneurs who are keen on commercializing their venture. It offers services as well as facilities ranging from financing, business acceleration skills, market development and matchmaking services for a period of 12 months.

There are several challenges in the current existing system in the technology incubation centres. These centres do not give detailed legal advise to the innovators or even provide legal support in terms of procedures and regulatory processes.. Majority of the successful start-ups had to find their own lawyers who took them through different intellectual property laws including patents, copyright and trademarks depending on the kind of incubation.

There also lacks enough personnel capacity to meet the demand of the innovators as majority of them work with consultants who do not work on full time basis.

With all the functional elements of the technology incubation hubs in Kenya it is quite evident that there some missing elements as the composition plays a key role in determining the success of start- up companies. Almost all the technology start-ups are driven by the youth and are contributing to economic development of the country. Another major challenge is getting investors and adequate seed funding for these start-ups. For example in 2015, 88mph announced that it had put on hold investing in African start-ups. The ideas are many and important to the society but they lack enough funding to propel them into businesses. Government support in all these start-ups is also minimal as investors in the private sector support majority of them.

3.3 Programs structure provided in Technology incubation Centres in Kenya

Technology incubation centres offer various programs ranging from academic courses to networking. What differs is the length of the programs, what each program entails, cost of each program and the different forums and events offered under the program.

@iLabAfrica has academic centered programs which include two postgraduate courses including: Masters in information System Security that is geared to increase the number of IT security professional in Kenya who can handle IT securities like cyber-attacks. The two-year course is offered online and focuses on both technical and managerial aspects of the subject. The second course is Masters in Mobile Telecommunication innovation and development. The course enhances students' skills in innovation and entrepreneurship in the telecommunication sector to promote sustainable development.

There are also short courses like excel as a business intelligence tool, which is a 3-day training workshop designed to provide on-demand access to business for faster decision making. The program offers an affordable way for making decisions out of information drawn form data. The other course is Teens and kids ICT boot camp that promotes creativity in kids and teens therefore bringing the amazing ideas into real life. Finally, there is the certificate in mobile application development which a very up to date demand as many business organization need an application so as to offer a personalized service to their clients.

Similarly, Nailab has a programs designed to enhance students skills. The program takes 6 moths and includes 3 months of product development and business polishing and the rest of the 3 months focus more on building strategic partnerships. Their programs are free, however they have a legal element where a partnership is drawn and equity shares discussed.

The C4dlab offers academic short course programs too in oracle certificate, cyber security, ICT integration among others.

The Kenya climate innovation centre has climate change oriented programmes that come with a variety of projects including; bio-organic soil fertility technologies, solar milk chillers, roselle hibiscus flower juice and tea bags, angel funding platforms for agripreneurs, ritoke banana snack, lisha bora project for alleviating poverty, and food processing and innovation among others.

The Fab la at the university of Nairobi has a wireless device-programming project that enables the control of domestic devices and appliances by sending instructions

through short messaging services (SMS). The project allows for a remote command interface for nay device that that could accept user commands through sms.

Fablab at the University of Nairobi runs an active program of Robotics Outreach Program (FROP). The program is aimed at introducing basic engineering to schools students so as to provide a practical approach to the concepts taught in class.

The 88mph runs two accelerator programs that is: a 12 month and one week programme. These two programmes provide start-ups with mentorship sessions where they sit with investors and work on their business. The selected startups are also given some seed funding to accelerate their start-ups into businesses that target the African market. The programmes are offered in Kenya, South Africa and Nigeria.

Further, the Columbia Global centre has a President global innovation fund that was launched in March 2013 by President Lee C. Bollinger. The program provides grants for faculty members to leverage and engage Columbia's global centres network. This enables the growth of projects and research collaborations, which further increases opportunities for research, teaching and service as they are modeled as venture funds. The projects must engage with one or more of the centres in eight countries namely; Jordan, China, Turkey, India, Kenya, France, Brazil or Chile and the projects can be based in any of them.

One of the major program challenges experienced in these centres is the duration of the program which, many times is not enough to guide and support the start up take off. For example a 6 months program does not guarantee the build up and modeling of an idea into a business. Further, the networking program are short-term in nature some going for as short as a day long where the centres invite a renowned tech 'guru' to talk to the innovators. Regrettably, there have been cases where these renowned

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experts who are well-established business people, even take up the innovators ideas and build on them and later own them as they have the power. A number of innovators are not very confident and comfortable to share their ideas with investors, as they don't feel protected.

There is also a sense of insecurity in among the innovators especially when pitching to potential investors as some of the incubation centres use them as bait to attract potential donors to fund the incubation centres and not the innovators. These centres will usually get donor funding to sustain the centres using the innovators ideas at the expense of the innovators.

3.4 Research and Training undertaken in Technology incubation Centres in Kenya

Technology incubation centres have a number of research that have been carried out and others that are ongoing. At the same time, there are technology projects born out of the research findings. Trainings are also offered at a regular basis to both the innovators and other external interested parties in the technology world.

iLabAfrica at the Strathmore University focuses on research for development in the efforts of attaining vision 2030. The research is focused on 3 main areas including ICT Research and Innovation, Incubation and Entrepreneurship and ICT Policy Research. To address the various problems, the centre has established thematic areas that innovators can work towards. One key thematic area is ehealth/mhealth research and innovation projects that are aimed at addressing existing health care issues in the public health sector using trending ICT solutions.

Under this thematic area, there are projects like the implementation of open source lab information systems (BLIS) in county labs across Kenya. This project, which is a partnership of the Ministry of Health in Kenya, Centre for Disease control (CDC) Association of Public Health Labs (APHL), IBM research lab responds to the challenge of many lab requests in county hospitals. It helps in reducing movements between the clinician and lab technicians in the health facilities as it automatically tracks the specimen movement as it receives the clinicians' request and returns results. In return it gives the duration of the test and helps in quality control documentation.

Other projects include the mHealth4Afrika- Community – based ICT for maternal Health care in Africa that analyses how technologies can assist in strengthening healthcare delivery in urban, rural and deep rural clinics across Africa focusing on end-user needs. Further, there is the Drug resistance and Microbial/ Viral Mutation and Resistance for Africa that is a very new project that relies on the BLIS system to collect and collate disparate, disaggregated data from the microbiology module across all the county labs. It will address the challenge of predicting possible disease outbreaks that can eventually result to drug resistance. There is also the cervical cancer risk awareness research and education programme that enables evidence-based decisions that avert issues of disparate, incomplete and inaccurate data.

iHub carry's out both qualitative and quantitative research on technology innovation and entrepreneurship as well as the intersection between governance and technology in Africa. They also offer trainings and consultancy services on innovative use of data, hardware and design, as well as user experience and market research. Their research is aimed at innovating the research process, increasing the visibility of

African tech researchers, improving the quality of tech research and publication outputs from Africa, surfacing information that can influence decision making of technology stakeholders and identifying new opportunities for technology entrepreneurs. Research and technology mentors further take the research output from iHub through a review process.

At C4Dlab, ICT driven research is undertaken so as influence policy in Kenya for example, the research on re-introduction of VAT on ICT equipment in Kenya: Special focus on Mobile phones by Tonny K. Omwansa. Other research includes "Cloud computing in Kenya: A 2013 baseline survey" among others.

3.5 Start up support as an element of the functions in the centres

There are quiet a number of technology start-ups that have been supported in various technology incubation centres in Kenya. Majority of them have sprout to become independent businesses that impact people and help in solving one problem and another. Their existence was influenced by the elements of functioning, which is now contributing to the development of the country.

From ihub the two most popular and successful start-ups include Ma3route and M-farm. Ma3route is a web/mobile and sms platform provides traffic information to connected users. It sources for the data from the crowd where each person posts their geographical traffic status information online for others to be informed. It aims to address the major traffic challenge in developing countries by providing timely transport information.[74] Ultimately, this information can be used in city planning and developing transport regulations in emerging economies. The second start-up is

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[74] https://www.ma3route.com/

Mfarm an online application and sms platform that connects farmers by providing market information. It provides a pricing transparency to give farmers the best market deal by avoiding middlemen who used to provide them with the price as well as the buyers. It also reduces the challenge of missing a market to sell their produce.

NaiLab Africa is also home to a number of popular start-ups including the online entertainment news platform Ghafla that offers latest news in the entertainment industry including gossip about popular people in the industry in Kenya. Another popular one is tasketu an online errand running and tracking platform that targets Kenyans living in the diaspora. Other start-ups that have developed into real businesses under Nailab include: 'cladlight', Young Freddie, 'Wezatele', 'Ukall', 'Sematime,' Card planet among others.

The C4Dlab at the University of Nairobi has also helped develop a number of businesses including: Farm drive, a mobile/we application that is giving farmers a chance to access financial services. The platform targets less privileged smallholder farmers where they their data is generated in an innovative way from their value chains for financial inclusion. Another start-up is Throughpass Africa, a soccer-networking platform that that brings together professional footballers to connect with coaches and fans. The network gives aspiring footballers a chance to create their profiles on an integrated platform. Another popular one is 'Jibonde' fresh which is a virtual hub for fresh foods that documents informal food kiosks all in an effort of promoting quality and health foods.

The Chandaria Business Innovation and Incubation Center has seen over 60 start-ups develop in to businesses. It provides the innovators with technical guidance, business advisory services, networking and marketing, company registration and office

working space. Among the successful ones include 'Salsy' innovate, which is a company that produces an integrated student identification card that offers more functions like ATM cards, supermarket royalty cards, near fields connection among other uses. This card helps parents to monitor or track the way their children use their pocket money. Another one is Mazuri Mobile a technology company that deals in lost and found. It provides tracking services for portable items. The company is currently seeking for investors.

Growth Africa on the other hand has supported over 100 start-ups by providing programmes and advisory input. These start-ups have helped in creating 24,00 jobs and raised USD 42million. The most popular App from Growth Africa is 'M-shamba' a mobile application that provides trade of agricultural products where farmers post their products and interact using SMS, android app and website. 'M-Shamba' Limited provides necessary and well researched agricultural information to farmers, extension workers, agribusinesses for enhanced agricultural production so as to promote sustainable economic development. Another successful start-up is 'iProcure' an agricultural supply chain platform operating in East Africa. The platform provides services to clients who have a desire to improve their supply chain services and as a result deliver essential farming inputs and other value adding products to clients in rural areas.

88mph has come up with about 16 start-ups and has invested about USD 1.7 million in them. The most popular include 'mdundo', which is a mobile phone application that sells African music via scratch cards. The App helps anyone from any part of the world to access African music as downloads on the mobile phones.

Another one is yum an online delivery service for food and grocery. It enables clients to order from restaurants by checking through their online menu and this helps in making it easy for the restaurants to save the orders for quick reference when the client re-orders. So far the company has over 10,000 customers and connections with over 250 restaurants.

It has not been a rosy journey for these start-ups since in as much as they came up as a result of incubation; they still had to put in extra efforts in their own capacity to succeed. However, some technology incubation centres like ihub provide a number of platforms for the innovators to pitch their ideas. A popular platform is Pivot East, which is a pitching competition that gives innovators a chance to compete. During these conferences, investor and venture capital fund are involved.

3.6 Conclusion

The functions of technology incubation centres in Kenya as analysed above are many and very interconnected. The system cannot be complete without one element, from the set up, the training, research, and programs to the start-ups as the output. It is evident that the set up requires enough resources to function from manpower to stakeholders input. Investor funding which is a major challenge in a number of the centres cannot be overlooked, as that is the basis for survival and sustainability. The programs too need to be comprehensive, systemic and well planned so as to achieve the expected outcome. Further, the technology incubation centres cannot operate without carrying out research that can influence policy in the field of ST&I and decisions of technology stakeholders.

In addition, start-ups play a key role in the functioning of technology incubation centres, as there are the outputs of the other functional elements. However, a number

of challenges are still facing these centres threatening their sustainability. Therefore, a balance between all the elements is very vital and most importantly attracting more funds for sustainable development and economic growth.

CHAPTER FOUR

IMPACT OF INCUBATION CENTRES ON SKILLS DEVELOPMENT, EMPLOYMENT AND RECOGNITION

4.1 Introduction

Technology incubation centres are established with a sole purpose of enhancing technological innovation, promoting entrepreneurship development, and providing solutions for existing problems within the community, which will ultimately translate into economic development. It is however very difficult to measure the impact of these centres as some can only be recognized after a very long time. For example full utilization of the skills earned can only be determined either by employment of the innovator or after the start-ups matures into an enterprise and contributes to market development and production in an economy.

This may take close to 5 years and considering that there is no sufficient data about this especially in developing countries like Kenya, owing to the fact that this concept is less than a decade old, it may be difficult to analyse it fully. For this reason the impact in this study has been divided into short, medium and long-term outcomes achieved from these centres respectively. The short-term outcomes are those that enable innovators to learn, build their skills and motivate them throughout their program. The medium term plans include the build up of start-ups and creating employment opportunities. The long-term opportunities include international recognition of successful start-up enterprises, awarding and also leveraging state

policies. Ultimately, this results into economic growth and a raise in a country's profile making it a favourable investors destination.

Significant benefits from technology incubation centres include creating new businesses, which increase the cash flow from successful incubators. These further results to benefits in the community as the rate of unemployment is reduced. The new business enterprises expand business reach to other quarters like increasing tenant satisfaction translating to more business in real estates.

However, there exist several challenges that hinder the achievement of all these development gains. This chapter will mainly analyse the output of the technology incubation centres and their contribution to development among the youth. Development among the youth will be broken into 3 including; enhancing their skills, creating employment opportunities and gaining international recognition.

4.2 Assessment of contribution of technology incubation centres to skills development

The goal of any technology incubation centre is to hone up innovators skills. It is with no doubt that Information Technology (IT) skills cannot be ignored, as this is the backbone for any existing incubation centre. In Kenya majority of the technology incubation centres offer short-term programmes in IT related courses. Their IT skills are enhanced and further nurtured to commercially viable businesses promoting commercialization of R&D into business ventures. However, majority of education

based centres offer long programs that equip students with both theoretical and practical skills and knowledge that give them a good chance of being employed.

iLab Africa at the Strathmore University offers academic programs in post graduate studies taking as long as two years. They offer a Masters in Mobile Telecommunication Innovation and Development, which aims to address the growing demand in telecommunication sector where people are seeking for innovative solution to problems. The course targets the agricultural sector micro finance services and mobile money transfers, which are rapidly growing and being accessed by many. The other program is Masters in Information system Security (MSC. ISS) an online course aimed at addressing the increasing problem of cyber crime in Kenya. The course offers technical and managerial aspects, which are comprehensive enough to enable any graduate to get a security related job.

The Lab also offers short-term courses including certificate in mobile application development that provides skills in mobile application development. It is a course that is highly in demand as mobile applications have become common in Kenya and are increasingly being used in running a number of businesses especially in the banking sector. The course takes three months and enables students to gain skills in developing and execute applications on android supported mobile devices. Another course is Excel as a business intelligence tool, a very hand on 3 days course that equips management with data use for decision-making at the organizational level. It enables the managers to effectively come up with eye-catching visualizations by use of modern charting techniques and to analyze and package large data volumes. Further it equips them with skills in connecting to external data sources and to create

and put together interactive dashboards. Other courses are kids ICT boot camp that take just a few days and encourage kids to take up IT related ideas to a higher level.

There are also other avenues of skills development during events and talk shows that bring together innovators and IT experts on one platform for a learning experience. These events may not offer hands on skills but they help in encouraging potential innovators to take IT for business with an open mind and seriously.

Nailab is also keen in building skills of innovators as it offers a 6 months program that concentrates both on theory and practice of IT products. The centre offers entrepreneurship program that provides skills in innovative technology. The program runs from 3-6 months where innovators are taken through product development and business refinement for 3 months and the remaining months they concentrate on product push into the market. Through the 6 months innovators also get to benefit from other skills through mentorship and networking with other innovators.

 The C4DLab at the University of Nairobi offers a number of skills building trainings including Cisco courses, design thinking, cyber security, big data, and cloud computing and oracle data administration. The Lab also organizes quarterly innovation forums where leaders in innovation are invited to share insights with the innovators. This plays a great role in connecting local developers with global tech companies and investors.

Through various networking avenues provided by the incubation centres, innovators get to learn a lot, however short-term. In most networking sessions experts in

technology related courses are invited to mentor the innovators and through these talks many of them can pick up important skills ranging from IT to business development and marketing strategies. For example in August 2016, Renowned US IT expert Mark Zuckerberg the founder of facebook visited the country and toured the ihub technology incubation centres where he shared with the incubators information about his road to success and his current strategies.

Other skills include presentation skills especially for pitching purposes. Majority of the innovators learn these skills once they join the centres as these are not skills taught in schools.

Entrepreneurship skills cannot be ignored in any technology incubation centres as the ultimate goal is to accelerate growth in small medium enterprises as they dominate the market share in developing countries. These enterprises also do provide employment for the youth, which contributes to economic growth.

Mentorship for polishing of skills is also a very essential exercise in any incubation centre. Through mentorship programs, freelance developers have transitioned into professionals. In this realization the Chandaria Business Innovation and Incubation Centre at the Kenyatta University has heavily invested in renowned investors who offer mentorship to innovators. They include Manu Chnadaria the Chairman of Chandaria foundation, Chris Kirubi the Chairman of Haco Industries Kenya, Dr Samuel Macharia the chairman Royal Media services among others. Mentors offer real life experience skills to the innovators that are aimed at motivating them.

Mentors offer soft skills to innovators, which are not necessary taught in various technical courses and they are equally important in running successful businesses. These skills include teamwork, communication skills, problem solving, work ethics, business adaptability, and conflict resolution among others. These social skills improve the innovators performance in their business as they get a better understanding of business world operations. They play a role in empowering them in areas like risk taking, earning job satisfaction and helps in molding their business abilities.

However, in all these skills earned the major gap identified in incubation centres is the intellectual property skills are not provided. There is very little advice given about patenting, trademarks and design rights acquisitions. According to World Intellectual Property Organization (WIPO), Intellectual property refers to creations of the mind: inventions; literary and artistic works; and symbols, names and images used in commerce. It is divided into two main categories namely Industrial Property, which includes patents for inventions, trademarks, industrial designs and geographical indications. The second is copyright that includes literary works such as novels, poems and plays, films drawings among others. In technology incubation centres the most applicable right is patent right under the industrial property.

Patent rights give researchers more protection and promotes the dedication of additional resources for further innovation. Through this protection, creativity and invention is encouraged which, eventually benefits the general public as they get to enjoy new products. Patent owners have the right to decide who may use their patented invention for the duration of time covered by the patent. Thus they have the

mandate of deciding who can use their inventions on mutually agreed terms. Further, they can decide whom to sell their invention rights. Therefore, making it a rewarding process of generating better and more efficient products for consumers.

On the other hand with the provision of these rights, the consumers confidence in buying these products is boosted as counterfeiting of products becomes difficult thus there is assurance of there being quality products in the market. [75]

Intellectual property rights are essential in any business development as they promote competitive strategy and product development. Product improvement is promoted as well as product design.

4.3 Assessment of contribution of technology incubation centre on employment and other opportunities

Technology incubation centres enable young innovators to create employment opportunities for the previously unemployed as well as create more business opportunities. This is experienced when their start-ups progress into enterprises therefore helping entrepreneurs to tackle challenges in industry entry and reducing business rate failures.

Through start-ups jobs are created, neighborhoods get to benefit from new businesses and productivity is increased. As they continue to grow, similar young start-ups bring

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[75] WIPO (2011) *What is intellectual property?* Available at:
http://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf (Accessed: 23 September 2016).

about competition, which is good for business development ultimately strengthening the economy to meet the global set standards.

From the Pivot East survey, carried out in April and May 2013, showed that 80% of pivot finalists in 2011 and 2013 had successfully registered companies. 75% of these startups reported that their enterprises had been growing with 19% suspending their businesses. 27% had already begun enjoying their profits. On the other hand, 75% of the founders in the other finalist startups were still working on their startups.[76] This is a clear indication that startups do create employment opportunities.

Technology incubation centres also provide a platform where IT companies hand pick innovators to work for them. These companies are mostly big IT firms include software development firms, Search Engine Optimization (SEO) and marketing firms, mobile app development firms, media houses, investment management firms, among other big corporate organisations. They seek innovators to fill positions like social media community engagement, which is a position that requires skills like formatting websites, SEO management, generating reports from social media sites reports among others. Other positions include ICT developers, whose duties entail analyzing and maintaining IT systems, program development, and writing new software programs.

Quality Assurance (QA) developer positions consists of roles like software testing, fixing bugs, fixing both technical and functional software solutions, software programming and creating end-to-end test plan. Senior net developers develop applications using the net and reengineer existing applications while java developers

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[76] http://pivoteast.com/pivot/mlab-east-africa-outcomes-two-years-later/

are responsible for managing the interchange of data between servers and users to ensure that there is high performance and responsiveness to requests from the front-end. Java developers also design wire frames into high quality code and maintain code quality.

Web designers are also other positions that are highly sought for from the technology incubation centres and involves maintaining hardware and softwares and creating web programs. Other positions include digital brand managers, digital advertising coordinators, interface developers, mobile application developers, and software engineers. These being a day-to-day task at technology incubation centres then companies find it easier to source for employees from here.

Other contribution of employment creation is the establishment of successful start-ups that develop into enterprises that offer employment. In Kenya, this has been evident especially in the popular establishments like Ghafla news that was incubated and funded by 88mph now employs more than 20 employees who work around the clock to gather entertainment stories. The online news company now serves an audience of over 2 million per month meaning the demand for news and entertainment is growing by the day.

Another successful start- up incubated in ihub is ma3route that offers traffic updates that has employed more than 8 employees to work on content management, operations and data management as well as other administrative duties. These among many more successful incubators prove that technology incubation centres are centres that create new jobs for the youth.

4.4 Analysis of recognition gained by the youth from technology incubation centre

There are various high-level platforms both locally and internationally that have seen the start-ups gain recognition as agents of positive socio-economic impacts. Technology enterprises emerge from technology incubation centres, they can have so much impact that they transform how business is done and get recognized in global markets. Kenyan enterprises are slowly getting to this level though at a slow pace.

Locally in Kenya, Pivot East, East Africa is the first and only competition that provides a platform for innovators to pitch their start-ups. The competition has been running for the last five years and has been awarding winners to raise the quality of mobile start-ups. The winners receive a variety of prizes ranging from 12 months free service of up to KES.10,000 per month in angani credits. Angani credit is a service company offering pay-as-you-go cloud based services in Kenya including virtual office, Closed-circuit Television (CCTV) back up and media storage platform. In previous years, winners have won funding of up to USD 10,000 per start-up form m:lab East Africa.

Internationally, Kenyan innovators have been recognized by various organizations depending on the sector. The most common IT companies include Google, Motorolla Solutions and IBM among others. Among these technology incubation bled enterprises are Farm Drive a C4DLab incubated enterprise that provides financial access to underserved farmers using innovative credit models. Farm Drive has been recognized and even received funding from investors out of it. Farm Drive has been creating impacts in the community by helping farmers to access credit facilities

through technology driven application. Majority of the well-established banks do not give credit to individuals who cannot provide security making it hard for the underprivileged farmers to access the service. Therefore, Farm Drive gathers all the necessary data about the farmer from various places like agro-dealers and produce offtakers, puts it together on the application and presents it to banks for credit. The farmers can then use the credit in increasing their productivity by buying seeds, pesticides, and irrigation equipment among other farming necessities. This ultimately boosts agriculture resulting into economic growth. Recently, they were recognized by Yahoo news after the Africa-based Canadian non-governmental organization (NGO) Engineers Without Boards (EWB) pledged their seed investment in Farm Drive. The Ngo recognized the great talent that Farm Drive executed in empowering millions of farming households with access to finance. The Managing Director of EWB Nicky /Khaki was pleased to partner with Farm Drive stating that they were delighted to work with them as they echo their mandate of supporting start-ups that confront the underserved in Africa.[77]

In addition, Farm Drive was also recognized by the British Broadcasting Corporation (BBC) as a tech-savvy approach enabling farmers to reap from it. The BBC reported that Farm Drive is a technology application that is changing the way farmers operates in accessing finance. [78]

Further, Ma3route a web and SMS based start-up has also been recognized in Kenya and East Africa. It won Pivot East 2013 awards, the East Africa's first startup pitching

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[77] http://finance.yahoo.com/news/engineers-without-borders-canada-mercy-202700931.html;_ylt=AwrC1jHgRU9Xg1sAPsSTmYlQ;_ylu=X3oDMTE0dW5rb2I1BGNvbG8DYmY xBHBvcwMyBHZ0aWQDVklEUUJDS18xBHNlYwNzYw--
[78] http://www.bbc.com/news/business-33610593

competition. Through this award, Ma3route was selected to partner with IBM in its global entrepreneur program. This program is aimed at boosting start-ups with through resource provision, global reach including a good understanding of global enterprise customers.

MEDKenya a mobile application platform that provides symptoms checkers, first-aid information, doctors and hospital directories and other health alert services are aimed at making health accessible to all Kenyans. This application has helped citizens to overcome the challenge of having to go to the hospital for all health solutions including minor ones that happen regularly in the households. It has empowered the citizens to find out about their symptoms and other first aid steps right at the palm of their hands without having to go to hospital even when it is not necessary. This application won an award of the best mobile health application in 2011 under Pivot East. It was later recognized in 2012 by global Ericsson application awards and awarded in Stockholm, Sweden. The Ericsson application Awards is an annual competition for developers of applications. The team was recognized among 200 contestants from all over the world.

M-Shamba a mobile application that promotes trade among the farmers community by enabling them to post their products and find out about other products using SMS, website and android mobile application. M-Shamba has been getting rid of a critical challenge in the agricultural value chain, which is market access. Majority of the farmers not only in Kenya but in Africa face a challenge of getting market for their produce. More so they face a challenge of knowing the market prices, which is helpful in avoiding unfair completion. The application has transformed a number of

smallholder farmers lives and in return, has won several awards locally including 'Top Innovator Award' as the best means of overcoming food insecurity in Africa. It has also been recognized by Innovate for Africa as a company with the most innovative products in social change and in enhancing food security in Africa. It was also recognized during the Jomo Kenyatta University of Agriculture and Technology (JKUAT) as the best project under the software development category. The application has also won the best application in agriculture and under the Transform Kenya Award as the application that brings change in the society.

Mfarm, a mobile application that empowers Kenyan farmers with accurate market prices by providing up-to-date market prices directly to farmers. It also bridges the gap between farmers and buyers. Mfarm also provides an online platform for learning how to grow various crops and fruits by guiding the farmers on the regions with the most suitable soils for a particular type of crop, the disease likely to attack the crop and the preventive measures to take. The platform further gives the right season and temperatures to plant particular crops. This information helps farmers to avoid losses in their produce as they can take all the preventive measures as provided by Mfarm. In 2013 the application was recognized by Mpesa foundation and was awarded KES. 20 million. Recently, the company Chief Executive Officer (CEO) Jamila Abass the co-founder of M-farm was nominated for the new African Woman Awards price. The award seeks to recognize extraordinary women who have made a change in their communities as well as their countries.

With most awards being local and very few international awards, it shows that Kenyan technology incubation centres need to play more in enabling innovators to access global opportunities.

4.5 Gaps in skills development, employment and recognition from technology incubation centres

There are various challenges that hinder the achievement of skills development, employment creation and recognition in Kenyan technology incubation centres. In skills development major technology incubation centres lack the capacity to provide holistic skills that are both practical and theoretical. Other technical skills but more often offer short-term training, information and business support services, networking resources, marketing and financial advice. Majority of them just offer facilitation but no regular in-house skills and certification. It would be complicated if an innovator wishes to progress with his start-up but lack some form of certification to show or support his skills.

It is also important that the technology incubation centres provide information not only about intellectual property laws but also about world intellectual property services and policies so that they can abide to them too before competing in international challenges. This could be a good approach to reduce any fear of losing their ideas to other international investors or innovators.

In Kenya there is also a challenge of competing interests between innovators and the technology incubation centres as the centres tend to concentrate also on their global

recognition at the expense of the innovators. Since these centres are new they are also keen on improving their profile yet at the same time the innovators are seeking global recognition of their start-ups and enterprises.

In as much as big companies search for employees to fill positions in IT from technology incubation centres, there still lies a gap in the skills offered in the centres as majority of the positions do not only demand the skills acquired from the technology centres but much more from higher education institutions. Therefore, this demonstrates that innovators from technology incubation centres established within higher education institutions have an upper hand of bagging these positions. However, a big percentage of innovators in the centres are university students pursuing IT related courses so by the time they are done they can easily join the job market industry.

Another challenge in the efforts of providing employment, recognition and skills building are financial constrains. Majority of technology incubation centres in Nairobi are financially constrained and depend on partners to support them. With this challenge they cannot sustain their programs, which are the backbone of skills provision. That is the major reason why they offer more of short than long-term courses that are not sufficient for industry take up. This challenge is further experienced in enterprises where newly established SME's lack adequate finance to propel their businesses to greater heights. They also lack credit avenues to access capital, as the capital options in Kenya are high. This slows down their rate of success making it difficult to measure the impact of technology incubation centres, as the factors of production are not easily accessible.

4.6 Conclusion

The impacts of technology incubation centres in Kenya as evaluated in this chapter are many however it is not very easy to measure them as majority of them may take long to be realized. However, when divided into short, medium and long-term impacts it is easier to evaluate them. The short-term impacts that include skills building have been well provided by the centres. With these skills, there is however much more that needs to be done in the creating employment, recognition, influencing state policies for the positive impacts to be reflected in the Kenyan economy.

There are a number of challenges in achieving this as technology incubation centres do not offer long-term courses and trainings that provide both theoretical and practical skills. Another challenge is the competing interests between the innovators and the incubation centres, which slows down the progress in incubation centres. In addition, lack of provision of holistic skills tends to slow down the growth of start-ups as the innovators will take more time trying to put every element of an enterprise together even after leaving the incubation centre. For example majority of the start-up founders have had to acquire intellectual property law skills through their own means.

Finally, the major challenge is on financial constrain that are slowly making these centres unreliable. The impacts of skills building, employment creation and global recognition are attainable in Kenya and can be achieved but they require proper planning and support both from the government and private sector.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Investing in science, technology and Innovation (ST&I) in the 21st century is inevitable for any country that seeks to improve its economic status. Kenya has however realized this need and has come up with strategies that can build up to technology based economic progress that has been well stipulated in the Medium Term Plan (MTP) 1 and 2 of the Kenya Vision 2030. In these strategies there is a priority area of upgrading the economy through county based ICT incubation centres all in the larger efforts of empowering the youth. This has resulted in the existence of a number of technology incubation centres in Nairobi within the last 6 years. However, there is the down side of this, which is the existing mismatch of education skills and market demands that have slowed down these great plans. Weak policies too that do not directly support technology incubation centres, public private partnerships and government commitment to this are still lacking. This section discusses the summary of the research findings, conclusion and recommendations for policy makers and for further research. These recommendations will be made on the basis of the findings of the objectives of the study that seek to analyze the role of technology incubation centres for international youth development, with a focus on youth skills development, employment and recognition.

5.2 Summary of findings

This study analyzed the role of technology incubation centres for international youth development, with a focus on youth skills development, employment and recognition.

Specifically the study sought to examine the relationship between various pillars of technology incubation centres including legal, policy and institutional frameworks, functioning, impacts and challenges against skills development, employment and recognition of the youth.

Chapter one introduced the study by giving the background of the study, problem statement, objectives, research questions, justification, and literature review which gathered that technology incubation centres concept is rapidly being globally recognized as practical tools of entrepreneurship. The literature review findings show that the centres are becoming a norm in business support and operations, exchanging technology know-how, and as an avenue of sustainable entrepreneurial skills in the communities. Successful execution of this concept is ultimately meant to reflect in the economy as increased employment opportunities, skills development and youth recognition. The history of this concept dates back to the 1950's in the United States; with time other developed countries followed suite including the United Kingdom, South Korea, Turkey, Singapore and recently African countries have picked up the concept. Technology incubation centres function by providing workspace facilities, business networking platforms, training and legal advice all with a goal of nurturing young innovators. In the same chapter, the literature review gaps identified included government's direct support for the centres and research outputs from the centres. The conceptual framework variables including stakeholders' input, functions, the existing sound system in the incubation centres in Kenya and the formation of the centres were discussed. The methodology employed was a qualitative research design. It was descriptive, as well as analytical, using both empirical and secondary data.

Chapter two discussed Kenya's legal, policy and institutional frameworks for technology incubation centres, most of them being covered in the vision 2030 blueprint. These policies include; the establishment of an institutional and regulatory framework that will promote and manage ST&I. On the legal front, there is the science, technology and innovation Act, 2013 that provides directly for the promotion, and regulation of the ST&I development in Kenya and also introduces ST&I into the production system of the economy. Institutions like Ministry of Education, science and technology and the National Commission for Science and Technology (NACOSTI) are the major institutions that support ST&I in Kenya. However, in all these frameworks, there is none that provides support directly to technology incubation centres.

Chapter three discussed the general functioning of technology incubation centres in Kenya including their focus areas, the set up, programs and trainings as well as their research function. For proper functioning, adequate resources are required from manpower to stakeholders input. Investor funding was identified as a major challenge and barrier to effective functioning of a number of the centres. The study gathered that for effective running of programs, it is required that they be comprehensive and well planned so as to achieve the expected outcome. However, majority of the technology incubation centres in Kenya are limited in their functioning as they face challenges of funding and inadequate resources thus threatening their sustainability.

Chapter four discussed the impacts generated from these incubation centres including skills development, employment and recognition. This was divided into short, medium and long-term outcomes considering that technology incubation centres are a

fairly new concept in Kenya and some of these impacts require enough time to be measured. Major gaps identified in impact realization is lack of enough professional capacity, inadequate information about intellectual property laws, competing interest between the innovators and the centres as well as financial constrains.

5.3 Testing the hypothesis

From the study it is evident that strong policy, legal and institutional frameworks promote proper functioning of the incubation centres. Further, for sustainable functioning, a balance needs to be struck in the set up, research and training and programs. The programs need to be comprehensive, systemic and well planned so as to achieve the expected outcome. In Kenya, sustainability is lacking, as there are challenges of inadequate resources like manpower, low stakeholder input and inadequate funding. Therefore, it is fair to conclude that technology incubation centres in Kenya are limited in their outcomes as they lack proper functioning systems and funding.

In addition, with challenges of lack of long-term courses and trainings that provide both theoretical and practical skills, other challenges like competing interests between the innovators and the incubation centres and financial constrain incubation centres, expected impacts cannot be achieved. Thus, the study also confirms that incubation centres in Kenya do not play a significant role in skills development, employment and recognition of the youth.

5.4 Conclusions

The study after analyzing all the variables has concluded that Kenya is on the right track in using science technology and innovations for realizing economic progress,

however, more efforts need to be channeled directly to technology incubation centres. This is in terms of policies, legal and institutional support from both private and public sector.

Among these external determinants there also needs to be internal balance in terms of how the centre functions. This is in terms of its formation vis a vis the output which is nurturing young innovators, providing facilities, business networking forums, advocacy, legal advice and IP protection.

Funding was a significant challenge highlighted in the study and is one of the barriers towards the successful running of technology centres in Kenya. Investor funding was identified as a major challenge in a number of the centres. This needs to be looked at more keenly, as that is the basis for survival and sustainability. The programs too need to be comprehensive, systemic and well planned so as to achieve the expected outcome.

5.5 Recommendations

This section discusses the recommendations emanating from the study both for policy and further research. The recommendations include:

For policy makers the study recommends that there is need to introduce policies that address technology incubation centres directly and ensure that the funding element is well addressed while promoting international set standards and sound practices. Adequate funding has been a major challenge in technology incubation centres in Kenya and has seen majority of the centres that focused on investing in start-ups take

breaks in funding. This affects the sustainability of the start-ups and they end up as dreams that cannot be actualized into real enterprises.

The Kenyan government needs to give more direct support for the technology incubation centres as they are recognized as one of the contributors of achieving the vision 2030 goals. The support should include strengthening relevant support institutions like National Commission for Science Technology and Incubation (NACOSTI), Ministry of Education, Science and Technology, The Information and Communication Technology (ICT) Authority.

The Kenyan government should also work with the private sector in strengthening holistic entrepreneurial support within the technology incubation centres. All elements of entrepreneurship should be addressed so as to promote the existence of strong enterprises. This is through trainings in business basics, legal assistance, access to capital, presentation skills, networking skills, financial management, and integration with higher education institutions, mentorship support, marketing and access to capital

To achieve success in incubation centres, there is need to strike a balance between policies and services provided at the technology incubation centres. This is because the services vary from one client to another and there is no standard remedy for the success of an incubation centre. Therefore setting policies is not only enough but also the balance between these policies against the services and practices is equally important for success to be registered. This will further be made possible by the management practices and quality of staff. These two elements promote efficiency hence reflecting on the clients' satisfaction, which will ultimately contribute to the success of the incubation centre.

5.5.1 Recommendations for further research

This study did not examine the economic dimension in terms of progress and contribution to GDP that will be achieved if technology incubation centres in Kenya are successful. It is important to substantiate the economic value attained from the success of technology incubation centres. This is mainly because technology was a key-contributing factor to the progress in our economy during the rebasing in 2014 when the Kenyan economy was recalculated under the 2009 to 2013 year.

BIBLIOGRAPHY

Aernoudt Rudy "Small Business Economics" September 2004, Volume23, Issue 2,pp127-135

Annual Report 2012 (2013) National Council for Science and technology, (NCST/075), p. 23.

Bulsara, H.P., Gandhi, S. and Porey, P.D. (2005) *Techno-innovation to Techno-entrepreneurship through Technology Business Incubation in India: An Exploratory Study*. Available at:
http://www4.pucsp.br/icim/ingles/downloads/pdf_proceedings_2008/05.pdf
(Accessed: June 2016). In-line Citation: (Bulsara, Gandhi, and Porey, 2005)

Business Daily (Kenya) "Varsities' incubation hubs key to Kenya growth" Friday April 26 2013. Available on: http://www.businessdailyafrica.com/Varsities-incubation-hubs-key-to-Kenya-growth/-/539546/1759036/-/vyvd58/-/index.html

Coward, C., Caicedo, S., Rauch, H. and Rodriguez, N. (2014) Digital opportunities: Innovative ICT solutions for youth employment. United States: International Telecommunications Union.

Gee Sherman (1981) "Technolgoy Transfer, Innovation, and international competitiveness; A Wiley- interscience publication, University of Michigan

Harm-Jan Steenhuis, Erik J. De Bruijn – *International J ournal of Technology Transfer and Commercialisation 2005 - Vol. 4, No.2 pp. 172 - 193*

International Jounal of technology management (1997) volume 13, No. 7/8 published by Inderscience enterprises Ltd wit hthe assistance and cooperation of the united Nations Educational, Scientific and Cultural Organization (UNESCO)

Lalkaka, R. (2006) *Technology Business Incubation*. 1st edn. Paris, France: United Nations Educational Scientific and Cultural Organization. In-line Citation: (Lalkaka, 2006)

Lewis, D.A., Harper-Anderson, E. and Molnar, L.A. (2011) *Incubating Success. Incubation Best Practices That Lead to Successful New Ventures*. Institute for Research on Labor, Employment, and the Economy, United States of America: University of Michigan. In-line Citation: (Lewis, Harper-Anderson, and Molnar, 2011)

Mutambi, J., Byaruhanga, J., Trojer, L. and Buhwezi, K.B. (2010) 'Research on the State of Business Incubation Systems in Different Countries: Lessons for Uganda', African Journal of Science, Technology, Innovation and Development, 2(2), p. 5. In-line Citation: (Mutambi et al., 2010)

National Curriculum Policy (2015) Available at: http://www.kicd.ac.ke/images/PDF/national-curriculum-policy.pdf (Accessed: May 2016). In-line Citation: (National Curriculum Policy, 2015)

Nelson, R. and Rosenberg, N. (1993) ' Technology innovation and national systems'. In R. Nelson (ed) National Innovations systems, New York: Pinter Publishers, pp3-21

Oduor, A. (2016) Standardmedia.Co.Ke. Available at: http://www.standardmedia.co.ke/article/2000196234/8-4-4-education-system-may-be-scrapped-this-week/?pageNo=2 (Accessed: May 2016). In-line Citation: (Oduor, 2016)

Okoth, W. (2014) 'ST&I Desk Program', The World of Science, Technology and Innovation, (22), p. 3.

refme.com (2012) Available at: https://ec.europa.eu/growth/tools-databases/ketsobservatory/sites/default/files/policy/KOREA.pdf (Accessed: 29 May 2016). In-line Citation: (refme.com, 2012)

Republic of Kenya. Kenya Vision 2030 Medium Term Plan I 2008- 2012; Education and Training: Towards a Globally Competitive and Prosperous Kenya. 2010 pp 29-33

Republic of Kenya. Kenya Vision 2030 Medium Term Plan II 2013- 2018; Education and Training: Towards a Globally Competitive and Prosperous Kenya. 2012 pp 49-56

Republic of Kenya. Ministry of Higher Education, Science and Technology, Sessional Paper no 7 of 2012, Policy Framework for Science, technology and innovation: Revitalizing and harnessing science, technology and innovation in Kenya, 2012

Samli, A.C and Yavas, U. (1985) ' Reverse technology transfer; demarketing lessons from less developed countries' In a.c Samli (ed.) *Technology transfer.* Westport, Connecticut;Quorum Books, pp.133-142

Scaramuzzi Elana "Incubators in Developing countries: status and Development Perspectives" The World Bank, Washington DC, May 2002.pp4

Science* Policy* Africa a newsletter of the African Academy of Sciences volume 18, Number 1. pp 2

SMEs and the East Africa ICT Sector 2010: Transforming East African ICT Sector by Creating a Business Engine for SMEs pp iii

Shapira, P. (1997) *Technology Incubators: Nurturing small firms*. Available at: http://www.oecd.org/sti/inno/2101121.pdf (Accessed: June 2016). In-line Citation: (Shapira, 1997)

The International Bank for Reconstructiion and Development /World Bank (2013) *Global Good Practice in Incubation Policy Development and Implementation*

Thierstein alain and Willhelm Beate "Entrepreneurship and regional development" *Incubator, technology, and innovation centres in Switzerland: features and policy implication* November 2010, volume 13 issue 4 (2001), pp315-331

Transforming Kenya: Pathway to devolution, socio-economic development, equity and national unity. Second Medium Term Plan (MTP) Report, Government of the Republic of Kenya 2013.
[1]Science* Policy* Africa a newsletter of the African Academy of Sciences volume 18, Number 1. pp 2

UN Millennium Project 2005. Innovation: Applying Knowledge in Development.
Task Force on Science, Technology, and Innovation pp.3

University-Industry Linkage and Technology Transfer Office (2013) Available at: file:///Users/dorothynjagi/Downloads/Pilot_TBIC_EstablishmentDocument%20(1).pdf (Accessed: May 2016). In-line Citation: (*University-Industry Linkage and Technology Transfer Office*, 2013)

Yim, D.S. (2013) *Promotional Strategies and Policies for Developing Local Economy and Establishing Science and Technology Parks in Colombia*. . In-line Citation: (Yim, 2013)

WIPO (2011) What is intellectual property? Available at: http://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf (Accessed: 23 September 2016)

https://bizextras.wordpress.com/2011/05/23/so-who-invented-m-pesa/
http://saharareporters.com/2015/02/12/nairobi-kenya-africa's-'most-intelligent-city'--icf
http://www.nrf.gov.sg/innovation-enterprise/national-framework-for-research-innovation-and-enterprise/technology-incubation-scheme

http://link.springer.com/article/10.1023/B:SBEJ.0000027665.54173.23#page-1
http://www.iceaddis.com/
http://www.airc.go.ke/
http://www.ilabafrica.ac.ke/index.php/ilabafrica/
http://www.nailab.co.ke/
http://www.kenyacic.org/
https://braventurelabs.com/

http://www.c4dlab.ac.ke/startups/
http://www.nacosti.go.ke/about-us/history
http://www.nacosti.go.ke/about-us/mandate-functions
http://www.kirdi.go.ke/50-general-articles/81-home-article
http://www.kenyalaw.org/

http://www.statehousekenya.go.ke/government/science.htm

http://www.bloomberg.com/graphics/2015-innovative-countries/

http://www.oecd.org/sti/daejeon-declaration-2015.htm
https://www.kenyans.co.ke/government/ministry-education-science-technology
http://innovationweek.co.ke/
http://www.forbes.com/2010/04/16/technology-incubators-changing-the-world-entrepreneurs-technology-incubator.html

http://finance.yahoo.com/news/engineers-without-borders-canada-mercy-202700931.html;_ylt=AwrC1jHgRU9Xg1sAPsSTmYlQ;_ylu=X3oDMTE0dW5rb2I1BGNvbG8DYmYxBHBvcwMyBHZ0aWQDVklEUUJDS18xBHNlYwNzYw--
http://pivoteast.com/pivot/mlab-east-africa-outcomes-two-years-later/

APPENDIX: QUESTIONNAIRE

Dear respondent, I am a student at The University of Nairobi pursuing a Masters degree in International Studies, kindly take a few minutes to complete this questionnaire which is a research tool for academic purpose that will help me to research better, and interpret my findings on the role of incubation centres for International youth development. Your specific answers will be completely anonymous, confidential and used only for research purposes, but your views in the combination with those of others are extremely important. Kindly give a very honest answer to the following questions.

SECTION A: BACKGROUND INFORMATION

Name of respondent:

Gender: Male ( )   Female ( )

Age: <20 Years ( ) 21- 30 years ( ) 31-40 years ( ) 41-50 years ( ) 51-60 years ( )
>61 Years ( )

Name of Institution/Organization:

Department:

Position/rank:

Sector: Public/civil servant ( ) Private sector ( ) NGO ( )

Level of Education: First Degree ( ) MSc ( )   PhD ( ) Professor ( ) Others ( )
specify_____

Telephone number:

E-mail:

1. What are the core mandates of this incubation centre?
2. Do you think that technology is a key instrument for promoting economic growth? Explain
3. Do you think technology incubations centres in Kenya have adequately fulfilled the core mandate? Explain
4. How important do you think technology incubation centres are to youth development considering: youth empowerment, prosperity of the surrounding community, advise on how to launch tech ideas, creating employment, providing help on how to deal with investors, inviting successful tech personalities from the start up world to mentor them, organizing demo days for funders to present their ideas, offering fundraising advise and connects them to opportunities.
5. Which technology sectors of the economy does the centre support?
6. What amenities/services does the incubation centre provide?
7. What role does NACOSTI and MoEST play?
8. Kindly give a list (and role) of institutions that have supported you or your colleagues in transitioning their ideas into real income generating businesses?
9. List measures you think the government can put in place to enhance generation, access and utilization of technology incubation centres?

Impact and relevance

10. What is the relevance/impact of technology incubation centres for International youth development?

SECTION B

11. What is your understanding of technology incubation centre?
12. What are the functions of this technology incubation centre?
13. What difference do you think they make in the development of the youth?
14. What is the formation and structure of incubation centres in Kenya
15. What input have different players contributed e.g. government policies, private sector, Ngo's and other policy makers in the growth of technology incubation centres in Kenya
16. What is the transition of the ideas built in the incubation centres in Kenya to income generating ideas
17. What challenges do youth face in the incubation centres?

Interview Questions for different players in technology related organizations

1. What are the efforts put in place for stimulating the creation and expansion of small and medium-size businesses through technology incubation centres?
2. How can you help the youth in unlocking financial capital to build their ideas in the incubation centres?
3. Is there a way of using government procurement to stimulate technological development?
4. What measures are in place for protecting the rights of inventors while promoting technological development in developing countries esp. in Kenya?
5. What has been put in place for attracting foreign direct investment and enabling the youth to become part of global value chains?
6. Do you have mechanisms for advising governments on science, technology, and innovation needs to be improved?
7. Are there measures in place to strengthen the capacity of scientific and technical academies to participate in advisory activities?
8. Do you train decision makers in science technology and innovation?
9. What governance mechanisms need to be put in place for managing global technology?
10. How do you examine the impact of rule-making and standards-setting organizations on developing countries' capacity to use technology to promote development?

11. How do you Increase the capacity of multilateral an bilateral institutions to promote technological incubation?
12. How do you manage the benefits and risks of new and existing technology?

Thank-you for spending some time to complete this questionnaire. Please return it to:
  dorothy.njagi@gmail.com