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Inclusive innovation ecosystems and township-based startups in South Africa

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A research report submitted to the Wits Business School in the University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Innovation Studies

Johannesburg, 202

ABSTRACT

In South Africa, the apartheid legacy gave rise to inequality and marginalised communities. To date, the country has the highest inequality income distribution in 2021 globally, with a GINI score of 63 (Dyvik, 2024). The score measures the income inequality in a country, and the closer it is to zero, the more equally distributed the income. Inequality is said to be inherently problematic and holds back social and economic development in the long run (Stiglitz, 2012). Harsh et al. (2018) explores the overlaps between the levels of inclusive innovation and three pathways for increasing equality through emerging technologies frameworks, with a focus on the inclusiveness of the innovation policy for nanotechnology, the development of nanotechnology, and its impact on the marginalised communities in South Africa. Inclusive innovation can potentially redress the inequality challenges brought by the apartheid regime.

New technology-based firms are essential as they are regarded as economic game changers in that they embrace continuous technological changes and play a key role in creating and commercializing new products, processes, and technologies in our societies. Particularly in South Africa, they are considered a key role player in addressing political issues such as inequality that emerged during the apartheid era, and that is redressed through the black economic empowerment (BEE) policies (Ndabeni, 2008). As a result, they are not only a source of new employment contributing towards the gross domestic product (GDP), but they are also instrumental in creating new industries such as personal computers, genetic engineering, machine vision, and robotics (Almus & Nerlinger, 1999; Kazanjian, 1988).

By applying the inclusive innovation ladder and the innovation ecosystem framework, this study evaluates the inclusiveness of The Innovation Hub's eKasiLab programme, which the local innovation ecosystem enabled to develop and support the growth of township-based innovators.

KEY WORDS

Inclusive innovation; innovation ecosystem; eKasiLab; township-based innovators; The Innovation Hub

DECLARATION

I, _____Thandeka Mhlanga_____, declare that this dissertation is my own unaided work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Innovation Studies at the Wits Business School in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

Signature: ……..

On this November 2024

Name

DEDICATION

To my two amazing children, Kwazinkosi Mashile and Ndalwenhle Mashile. Thank you for teaching me how to be present-aware and keeping me sane when life threw curveballs at me.

ACKNOWLEDGEMENTS

I would like to thank the Wits Business School and its academic officers for your patience and understanding in allowing me to complete my studies that were interrupted by personal challenges, COVID-19 and being a mom. It is not easy to juggle work, life and school with the added responsibility of being a parent. Meisie, thank you for holding us down, Sisi. Dr Diran, thank you for your continuous support and encouragement. I had almost given up on completing this degree, and you pushed me till the end.

I would like to thank Dr McLean Sibanda for being such a great mentor in my work through my NPO. Your book publication on Nuts and Bolts inspired me to do this study and, in his personal capacity, assisted me in gaining access to The Innovation Hub managers so that I could conduct my research.

I would like to thank The Innovation Hub eKasiLab managers for giving me their time and participating in my study, regardless of their academic interview fatigue, as they indicated to me as I tried to secure their interview time. The then-acting CEO of The Innovation Hub, Ms Nothile Mpisi, for her understanding that I was under time pressure in conducting the research, responded timeously to my request to grant me permission to conduct my case study research about the organisation.

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affording me an opportunity to contribute to the Higher Education Science, Technology, and Innovation Landscape (HESTIIL) Ministerial Review report, where I played an active role as an innovation scholar and undertook extensive research of key peer and industrialised nations' NSIs and provided valuable input into the report's findings and recommendations.

Thank you to my family for the love and support in all that I do.

I am grateful for the opportunity to complete my second master's degree. It was a challenge due to time constraints and other life demands, and I cannot believe it is done! Thank you to me!

God, I am grateful!

LIST OF ABBREVIATIONS

ARC- Agricultural Research Council

BBBEE- Broad-Based Black Economic Empowerment

BEE- Black Economic Empowerment

CPIs- Corporate Private Incubators

CSIR- Council for Scientific and Industrial Research

DSI- Department of Science and Innovation

DTI- Department of Trade and Industry

EO- entrepreneurial orientation

ESD- Enterprise Supplier Development

FDI- Foreign Direct Investment

GAP- Gauteng Accelerator Programme (GAP)

GDP- Gross Domestic Product

GEP- Gauteng Enterprise Propeller

HESTIIL- Higher Education, Science, Technology and Innovation Institutional Landscape (HESTIIL)

IASP- International Association of Science Parks

ICT- Information and Communication Technology

IP(s)- Innovation Platforms

IP-Intellectual Property

IPIs- Independent Private Incubators

MVP- Minimal Viable Product

NLS- National Learning System

NSI- National System of Innovation

NTBF- New Technology-Based Firms

NYDA- National Youth Development Agency

OISE-Open Innovation Solutions Exchange Platform

R&D- Research and Development

RBIs- Regional Business Incubators

SA- South Africa

SDGs- Sustainable Development Goals

SEDA- Small Enterprise Development Agency

SMMEs- Small to Medium Micro Enterprises

STP-Science and Technology Parks

TIA- Technology Innovation Agency

TIH- The Innovation Hub

TMR-Transform, Modernise and Reindustrialise

TER - Township Economy Revitalisation (TER)

TUT-Tshwane University of Technology

TVET- Technical and Vocational Education and Training

UBTIs - University-Based Technology Incubators

UP- University of Pretoria

VC- Venture Capital

Vis- Virtual Incubators

VUT- Vaal University of Technology

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CHAPTER 1: INTRODUCTION

Innovation is a problem-solving process ranging from ideation to value creation for society. The process can consist of a new combination of ideas, resources, capabilities and business models (Fagerberg et al., 2013). Technological innovation is further defined as changes in production processes and the products manufactured by the firms (Dosi et al., 2002). The value judgement of innovation should be comparable to the wider social, economic, cultural, and institutional settings in which it occurs.

From a development perspective, Heeks et al. (2014) offer two distinct perspectives on innovation. The first, mainstream innovation is “aimed at middle-and high-income consumers, producing new goods and services that improve the welfare of those consumers and or producing new processes that improve the productivity of formal producers”. The second, inclusive innovation, is? “inclusion within some aspect of innovation groups who are currently marginalised”. Heeks et al. (2013) delve deeper into the concept of inclusive innovation by introducing the “ladder of inclusive innovation”, which comprises six levels, each representing a progressively greater degree of inclusivity. Each succeeding step represents a greater notion of inclusivity concerning innovation considering intention, consumption, impact, process, structure, and post-structure perspectives. The various steps that outline how the poor and marginalised can benefit from innovation will be further unpacked in the following sections.

Voeten and Naudé (2013) caution that innovation is a two-edged sword as it may lead to harmful societal consequences in developing countries, such as uneven distribution of economic benefits or hardships to the marginalised.

The apartheid legacy marginalised access to key productive resources such as skills and land in South Africa (SA). This has led SA to be cited as the most unequal country in the world, ranking number one amongst 165 countries in the World Bank global poverty database (Bank, 2022).

Harsh et al. (2018) highlight that SA is sometimes perceived as two economies: on the one hand, SA's economic growth is driven by technology, sophisticated service, manufacturing, and the mining economy. On the other hand, it is characterised as an income and technology-poor country within a country. In their article, Heeks et al. (2013) and Cozzens (2011) overlay two frameworks, , on leveraging new technology through inclusive innovation steps to achieve just outcome. Their paper indicates that challenges are barriers to achieving an inclusive approach in the various ladder steps. One critical element they addressed was the lack of translational research from the lab into the communities due to the inability of the researchers to engage with community members. There is a lack of incentives for inclusive innovation in the intention and consumption of products or services for the poor and marginalised. There is a lack of alignment between community development plans and strategies in terms of technology focus or priorities in building pro-poor technologies to address social ills and create economic value for the marginalised communities.

Innovation does not occur in a vacuum; it requires a stimulus environment, as technological change in the current industrial regime is crucial to economic growth and development. Technological change depends on research and development (R&D) and other related activities such as education, training, production engineering, quality control, etc. (Freeman, 1995). The systemic interaction of these activities gives rise to the National System of Innovation (NSI) concept, which analyses the domestic technology development policies and the economics of technology change.

In South Africa, the NSI is considered fragmented and underdeveloped (DSI, 2020). The structure of the innovation system varies in terms of scope, innovation focus, actors, learning process, relations, and institutions. These characteristics determine whether the system can be classified as a system of innovation, innovation ecosystem or inclusive innovation ecosystem. The unique aspect of the innovation ecosystem lies in the collaborative interactions among actors, driven by networking and joint dialogue. This contrasts with innovation systems, often seen as specialized government infrastructure projects (Zheng & Cai, 2022). In contrast, the inclusive innovation system emphasises a micro-level focus, strongly emphasising socio-economic inclusion (Foster & Heeks, 2013). These structural characteristics of innovation systems will be discussed in more detail in Chapter 2 of this report. A new technology-based firm (NTF) goes through various growth stages that require support in varying resources from various actors. As such, innovation ecosystems are critical in supporting the development of NTBFs by leveraging the diverse range of actors that are a part of that ecosystem (Beliaeva et al., 2020). In South Africa, various interventions have been implemented to promote entrepreneurial culture through the business hubs that incubate and accelerate NTBFs, with support from the government, private sector and foreign investors (Mhlongo & Mzyece, 2023). While these initiatives are beneficial, they often fail to reach the township and rural-based NTBFs to the extent of an information gap, where the township and rural-based entrepreneurs are unaware of the available supporting mechanisms (UNDP, 2020). Through inclusive structural changes by relevant actors, Onsongo and Schot (2017) continue to support the growth of MPesa beyond Kenya. Furthermore, Swaans et al. (2014) look at the concept of inclusive innovation platforms in bringing together various actors to address issues of mutual concern and interest, focusing on the marginalised poor in the

agricultural sector. In their view, fostering a dynamic interplay that drives the simultaneous advancement of technology alongside social and institutional transformation. This study seeks to illustrate that through an inclusive innovation ecosystem, township-based NTFs can be supported and progress through the growth stages and form part of the mainstream economy.

Comins and Kraemer-Mbula (2016) investigated various initiatives in Southern Africa that are attempting to promote and foster innovative businesses in the region. These initiatives range from traditional science packs to co-creation space in developing tech companies to drive socio-economic development. The classification of the various initiatives is categorised into three:

I. Traditional Science parks
II. Activity-based innovation hubs
III. Co-creation initiatives

Traditional science parks are usually affiliated with a university or a research institute as they are based on the process of scientific discovery and technology- based innovation. They rely on the public sector to invest in their state-of-the-art infrastructure development, and their income relies on their tenants. The activity-based innovation centres focus on strengthening the capabilities of innovative business enterprises, and their value add is not so much on infrastructure but on easy access from a location perspective with activities that promote business cooperation, providing social capital through networking. Co-creation hubs aim to promote innovation for social and commercial purposes, focusing on networking and collaboration with a broader range of stakeholders. They are perceived as creative experiments as they attempt to address social and environmental challenges in the regeneration of urban areas. Out

of the three types of innovation hubs, only the traditional science parks enjoy support from the government, resulting in higher financial stability than any of the other two models, which hampers their financial stability. Sibanda (2021) further emphasised the growth of tech hubs in Africa with the major drive to develop science and technology parks (STPs) to potentially help the countries' transition from resource based to knowledge-based economies.

STPs are defined by the International Association of Science Parks (IASP) as "an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated business and knowledge-based institutions" (Comins & Kraemer-Mbula, 2016). There are ten IASP-registered STPs in Africa, two based in South Africa, namely The Innovation Hub (TIH) and the Vaal University of Technology: VUT Southern Gauteng Science Park (Comins & Kraemer-Mbula, 2016).

Incubators are considered as organisations that nurture and promote entrepreneurial ideas, guiding them from initial concept through to commercialisation (Lose et al., 2016). The common purpose of the hubs is to facilitate the growth of new businesses for regional economic growth and development. Sibanda (2021) argues that given the numerous challenges posed by the low technological base and research capacity. There is also a low level of tech companies that would benefit from STP structures in Africa compared to developed countries, which are headquarters for the multinationals operating in Africa, where they undertake their R&D activities. Hence, STPs in Africa should focus more on supporting frugal innovation, adaptations based on technology transfer, and high-tech innovations to address those challenges effectively. He further

explains that based on the local context, STPs stand an opportunity to be inclusive in their approach through various instruments to promote the development of endogenous innovations that can be easily diffused in society. He motivates that there is a stronger value proposition for establishing incubators as a precursor for the STPs to better support the growing number of youth entrepreneurs in various technology sectors.

In his book, Sibanda (2021) highlights that the TIH is an example of an STP that infuses the traditional model with the emerging models of tech hubs. This is done through the portfolio of innovation support programmes, “underpinned by a philosophy of inclusiveness and endogenous innovation, with a focus meeting immanent needs defined by industry, communities and local government “. The successful mix of innovation stimulation and networking initiatives coupled with intensive incubation programmes and enterprise development focus implemented by TIH enable STPs to better respond to host communities in building strong innovation ecosystems.

A narrow definition of a New technology-based firm (NTBF) is considered to be an independently owned business that has been in existence for 25 years or less with high technological risk, as it is based on the exploitation of an invention or a technological innovation (Storey & Tether, 1998). The study of NTBF is essential as they are regarded as economic game changers in that they embrace continuous technological changes and play a key role in creating and commercialising new products, processes, and technologies in our societies. Particularly in South Africa, they are considered a key role player in addressing political issues such as inequality that emerged during the apartheid era and redressed through the black economic empowerment (BEE) policies (Ndabeni, 2008). As a result, they are a source of new employment, contributing towards the gross domestic product (GDP) and instrumental

in creating new industries such as personal computers, genetic engineering, machine vision and robotics (Almus & Nerlinger, 1999).

NTBFs are said to go through various growth stages, as described by several models. These models describe organisational growth as predictable patterns that unfold over certain time intervals based on the organisations' challenges (Kazanjian, 1988). Abernathy and Utterback (1978) examined the technology life cycle model, emphasising different innovation and technology development rates. The technology life cycle influences the development stages that the NTBFs go through regarding product development. The type of activity in the various stages influences the funding opportunities available to the NTBF. It is perhaps worthwhile to consider access to capital as one of the factors that influence the performance of NTBFs through the development stages.

The NTBF faces technological and commercial uncertainty, which is challenging during its developmental stages. The technology becomes more attractive and easier to adopt depending on how favourable the characteristics are, resulting in rapid diffusion. According to Fichman (2000), spreading technology across a population of organisations is classified as a diffusion process. As technology possesses characteristics and attributes that make it unique, it also affects its diffusion rate. These attributes are characterised as compatibility, complexity and trialability, to name a few. Technology diffusion is sector-dependent; hence, there is no one-size-fits-all approach to the diffusion process. Geroski (2006) suggested that the diffusion process follows the S-curve, where the diffusion rate rises slowly as early adopters take up the technology, followed by a period of rapid absorption and then satiation.

Almus and Nerlinger (1999) looked at the factors that influenced the growth of NTBFs, where he performed a growth regression statistical model. The model indicated strong correlations between firm-specific, founder-specific and external characteristics and the growth rate of a firm. Firm-specific characteristics like the innovativeness of the firm, fast-track growth rate, and founder characteristics like their human capital also contribute to the firm's growth. External characteristics such as the type of industry and geographical location also influence the growth rate of the NTBFs. Rosenbusch et al. (2011) looked at the relationship between innovation and the performance of SMEs, where he found that innovation orientation and innovation activities create value for new and established SMEs.

In South Africa, emerging technology incubators are considered a form of new venture creation that is still evolving to ensure the survival and growth of NTBFs. They facilitate the relationship between small to medium micro enterprises (SMMEs), universities, the government, and the private sector, creating better entrepreneurship conditions. They achieve this by providing integrated services and resources to NTBFs, such as research and development, physical facilities, networking platforms, etc (Masutha, 2015; Ndabeni, 2008). It is unclear how the incubators ensure the growth of NTBFs through the development stages based on the firm’s needs. The innovation process in an NTBF is managed through the innovation funnel from ideation to commercialisation. Throughout the funnel, various resources are needed to navigate from ideation to concept launch in the market.

Thus, this study will help better inform the technology-based incubators about the type of support needed by technology start-ups as they progress through the development stages. It will also contribute to the literature as limited studies are looking at the growth

of NTBFs in the South African context. It may also help inform policies to ensure growth promotion for NTBFs.

It appears that entrepreneurs first determine the growth of a firm, as they use their cognitive ability to identify growth opportunities and then formulate strategies necessary for growth (Wright & Stigliani, 2013). According to Schumpeter, entrepreneurs are agents of change that disrupt the economic equilibrium cycle (Hagedoorn, 1996b). They possess technological know-how, enabling them to introduce new products, services, processes, and combinations, ultimately driving innovation essential for high-growth business development.

This study will focus on the longest-running science park and the first IASP-accredited Science and Technology Park, The Innovation Hub (TIH) in South Africa, where we seek to understand how their incubation and accelerator programmes, particularly the eKasiLab programme, have stimulated inclusive innovation through its interventions in supporting NTBFs based in township communities.

1.1 PURPOSE OF THE STUDY

The purpose of the study is to investigate, through the inclusive innovation framework, how TIH has enabled the growth of NTBFs in township communities of South Africa through the eKasiLabs initiative and to establish if TIH can be characterised as an innovation ecosystem or system in contributing to the academic debate regarding the characteristics of an innovation ecosystem versus that of an innovation system.

1.2 CONTEXT OF THE STUDY

Africa has the youngest population in the world; approximately 10.3 million persons aged between 15-35 years in South Africa remain unemployed. Some of the

unemployed youths do not have any training or education to build their skill set. South Africa's youth continue to bear the burden of unemployment for the first quarter of 2022. The unemployment rate for those aged 15-24 was 63.9% and 42.1% for those aged between 25-34 years, as seen in Appendix F.

The potential solution to address the high unemployment rate of the youth is through entrepreneurship. South African tech startups are a reasonable contributor to employment in the country, with 23 as an average number of employees per startup (Africa, 2022). Research has shown that entrepreneurial-oriented countries have achieved high GDP growth. Mthanti and Ojah (2017) look at how countries like Singapore and China have explored marketplace opportunities by diversifying their industrial base through innovativeness, pro-activeness, and risk-taking. Technological advancements drive the economy as all industry revolutions result from new technological developments that improve production processes, resulting in new businesses. The fourth industrial revolution is said to affect all sectors of the economy; the kind of skill set required for this revolution is brain power, as this knowledge economy requires intellect. Hence, innovation in this regime will be driven by entrepreneurs with technological know-how, so they can create new jobs, processes, and industries (Hagedoom, 1996a).

Technology and business hubs have been developed in South Africa, and economic development facilities have been considered for incubating and accelerating NTBFs. Various other hubs in SA incubate and accelerate entrepreneurs in developing and commercialising their ideas that the government, private sector, and foreign investment support. Approximately 200 private and public incubator and accelerator programmes are available to startups in SA, with a high concentration in Cape Town and Johannesburg (Africa, 2022; Cassim, 2001). The hubs benefit various players in

their network, enabling interaction between start-ups, government, corporations and the R&D community. These hubs focus on developing entrepreneurs to build successful businesses and help facilitate the commercialisation of university research. Tenant companies benefit from reduced risk, time to market, and improved business skills. Ndabeni (2008) points out that new ventures in developing and developed countries fail, and only a select few survive and grow. Hence, the key objectives of the hubs are to promote economic growth, sustainable employment, technology innovation and technology transfer. While the hubs are said to be creating a conducive environment for the development of NTBFs, it is not clear how they support the firms to ensure their survival and growth through the development stages.

The hubs either incubate or accelerate the development of NTBFs, depending on the level of development of the NTBF, where incubators support early-stage businesses in refining their ideas into early working prototype versions of a product or service in a given time frame. In contrast, accelerators are for NTBFs that seek to commercialize their minimal viable product (MVP). In these hubs, entrepreneurs gain access to certain resources such as office space, networks, knowledge, and funding.

The business hubs are characterised based on the sponsor and investors; the four distinct types are:

- For-profit property development incubation hubs.
- Non-profit development corporation incubators.
- Academic incubators; and
- Business development for-profit seed capital incubators.

According to Carayannis and Von Zedtwitz (2005) the archetype view of business incubators, can be classified into five types namely:

- Regional business incubators (RBIs).
- University-based technology incubators (UBTIs).
- Independent private incubators (IPIs).
- Corporate private incubators (CPIs).
- Virtual incubators (VIs).

This archetype views the business incubators as defined per the sponsor's mandates and objectives, which aligns with the incubators' SA landscape. This is the category of the business hubs that will be studied in this report, where their mandates and objectives will be captured to inform their approach to inclusiveness.

TIH was initially conceptualised as a single location that could potentially develop an indigenous high-tech sector. Its project proposal submitted by the council for scientific and industrial research (CSIR) and the University of Pretoria (UP) was approved by the Gauteng Provincial Government and launched in 2000.

Despite the initial teething issues in getting the key stakeholders on board, the TIH grew organically in the number of tenants that occupied the space, and pilot programmes were implemented, attracting various players from industry, academia, government, and the international community.

Due to political leadership changes at the provincial level, the momentum of the growth and development of TIH was adversely affected as it could no longer enjoy the support from the local government in developing its infrastructure to potentially lease to industry. This impacted the sustainability of TIH's business model and affected its management, resulting in TIH not having executive leadership.

The lack of government support led TIH to deviate from its original traditional science park mandate and become closer to a commercial office park. With new management, the TIH was restored as a key driver of innovation in the region and facilitated various activities through partnerships in developing a pipeline of companies. Some of the programmes included hosting localised programmes such as the following:

Gauteng Accelerator Programme (GAP) is a programme that incubates mobile, green technologies, bioscience, and health innovations solutions for service delivery. This programme was in alignment with the host provincial goals.

Open Innovation Solutions Exchange Platform (OISE)- a virtual platform connecting innovators with solution seekers.

eKasiLabs- Expansion of TIH activities outside the science park to encourage up-scale community innovation.

The root of the history of townships in South Africa is the economic demand for labour, resulting in communities with spatial links to the economic city centres (Mahajan, 2014). This of the society was a result of the political and economic subordination of black people. The apartheid government coined the concept of a township in SA in its urban planning and housing development policies. A township is defined as "a *dormitory town built at a distance from economic activity as well as from white residential areas, with rows of uniform houses, historically lacking services and infrastructure such as tarred roads, sanitation, water and electricity.*" The essence of township formation was to disown black South Africans' land and force them into the labour force as suppliers for local labour were in demand in the mining sector and to discourage any entrepreneurial activity by the black community in the agricultural sector. Entrepreneurial activities by black South Africans were further discouraged as

they were prohibited from brewing and distributing traditional African beer. Not only did the townships have limited-service delivery, but they also had less economic infrastructure to promote local economic development. Limited categories of business activity were allowed in urban townships, such as general shops, butcheries, etc. These trading restrictions led to the emergence of informal activity, resulting in spaza shops, street trading, shebeens and the taxi industry. The townships' spatial design continued post-apartheid, limiting business-stimulating infrastructure such as two-phase electricity not conducive for light industrial usage, lack of retail space, etc., stifling local economic development for sustainable communities. Over the years, there has been an influx into township communities due to population growth, and migration from rural and neighbouring countries seeking economic opportunities.

TIH has implemented programmes to address some challenges in stimulating entrepreneurial activity in townships. eKasiLabs were created to take co-creation and innovation facilities to township communities, giving access to services and facilities offered at TIH. Additional support programmes were tailored to inculcate an entrepreneurial culture in these communities. The overall objectives of eKasiLabs are:

- Establishing high-impact projects in the township that develop entrepreneurs.
- Promoting the township's economic landscape
- Partner with entrepreneurs in private and public sectors to bring about opportunities.
- Empower small businesses and local traders through TIH resources and partners.
- Exposure of brands, businesses, and products to external market
- Development of the entrepreneurs' skills through training

- Create platforms for entrepreneurs to network and create bigger opportunities.

The first eKasiLab was launched in 2015 in the icon township of Soweto in partnership with the local municipality. By 2018, ten eKasiLabs had been launched across the Gauteng province, as shown in Figure 1, through various partnerships with local municipalities, local government agencies, and higher education institutions. In early March 2018, the eKasiLabs as a collective were incubating more than 200 start-up companies, with 24% of their ideas commercialised from revenue and funding perspectives. The eKasiLabs programme was implemented as a response to align all programmes of TIH to the provincial strategic direction to transform, modernise and reindustrialise (TMR) the economy of Gauteng, with an emphasis on Township Economy Revitalisation (TER) in 2014.

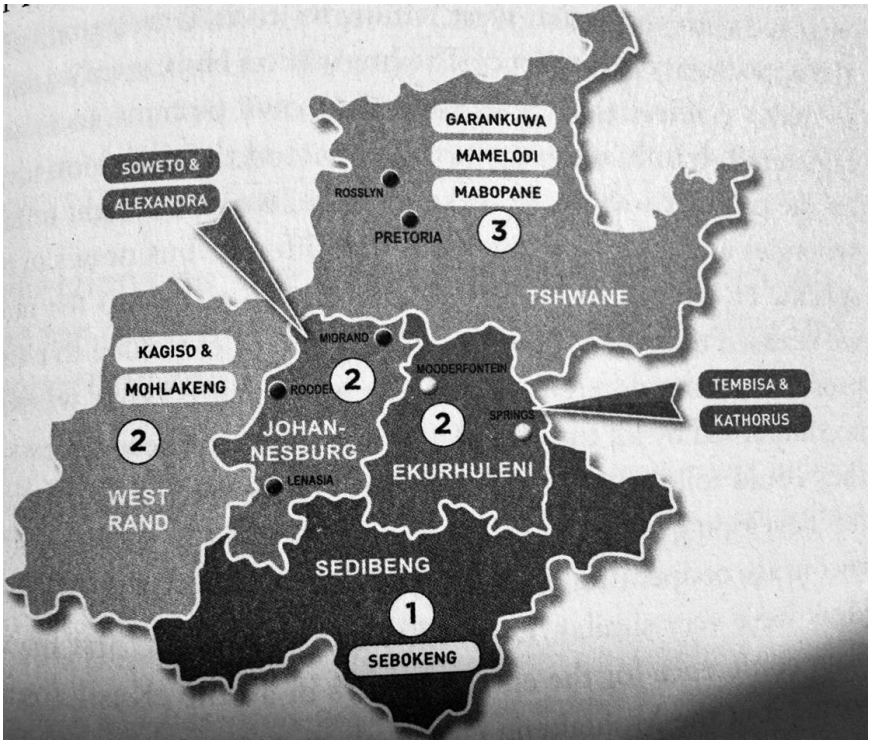


Figure 1: Footprint of eKasiLabs around the Gauteng Province (Sibanda, 2021).

The goal was to develop localised innovation ecosystems in the townships through a collaborative effort with various local industry, academic, and government entities. This programme saw increased partnership interest from corporates and the international community, yielding technical support through mentorship and market linkages. The progress made by the eKasiLabs in its pilot phase led to the local government expanding the programme into other townships in the region. This localised approach in developing innovation centres to promote systemic interaction of the various institutions in activating social capital to enhance systemic innovation capacity can be classified as the regional system of innovation (Cooke et al., 1997).

In implementing programmes like eKasiLabs, understanding socio-economic and political complexities in the townships and their impact on the development of the innovation and entrepreneurship ecosystem is critical. These township-based innovation centres provided an opportunity for entrepreneurs in marginalised communities, giving them access to the resources of the science park they would not otherwise have access to because of geographical location.

This study looks at how TIH, through implementing the eKasiLabs programme, provided benefits for the NTFs based in township communities through the programme's intention, consumption, impact, process, structure, and post-structure perspective. Furthermore, in acknowledgement of an existing debate in the peer-reviewed literature, the study seeks to establish whether TIH is best characterised as an innovation ecosystem or innovation system.

1.3 PROBLEM STATEMENT

Entrepreneurship is the engine of growth and represents a stream of innovations. It enables economic development, increases the overall prosperity and well-being of

regions, and alleviates poverty by solving unemployment problems, providing innovative products, and creating a competitive environment (Beliaeva et al., 2020). There is an ongoing entrepreneurial revolution through start-ups, small-medium and micro-enterprises (SMMEs). Beliaeva et al. (2020) highlight that a single firm does not have all the required resources to develop and commercialise a complex value proposition. Hence, innovation ecosystems are critical in assisting entrepreneurial and innovative firms by supporting the diversity of actors that form the ecosystem. Foster and Heeks (2013) looked at inclusive innovation through the lens of diffusing new technology to low-income consumers in the case of Kenya. They made a critical observation that the key actors facilitating new technology diffusion in the form of demand-side microenterprises embedded in the poor communities are not generally recognised or included in typical system of innovation cases. This could result from the large informal sector in most African countries, influencing the context in which innovation occurs in developing countries (Mendi & Mudida, 2018). Similarly, in SA, micro-enterprises operate in both formal and informal sectors with the informal firms growing to account for 70% of the SMME sector, whereas 31% of SMMEs account for the formal firms (Mulibana & Rena, 2021; Vacu-Ngqila & Ho, 2023). Although the majority of the economic activities take place in incorporated entities (Mulibana & Rena, 2021), the SMME sector is also considered to be the backbone of the country's economy and a critical driver of innovation, contributing 40% of gross domestic product and 47% workforce over the years (Vacu-Ngqila & Ho, 2023). Qomoyi et al. (2024) adopted the system of innovation approach to understand the innovation obstacles amongst SMMEs in SA, where they highlight that poor government policies, poor infrastructure, and inefficient use of public procurement to foster innovation in SMMEs as some of the key obstacles. To address these challenges, they propose that the

government take a more active role in fostering SMME growth and involvement in innovation. This can be achieved by improving access to institutional resources and connecting SMMEs with research institutions, alongside providing incentives to support innovation within these enterprises.

The NSI perspective subsumes the Triple Helix innovation model and looks at the dynamics of interactions between three institutional spheres of government, university, and industry in regional innovation (Cai & Etzkowitz, 2020). The latter analytical framework is limited and faces challenges in the global context when the innovation systems are internationally connected or when considering the actors outside the three institutions in the innovation analysis, such as civil society. Cassiolato and Lastres (1999) highlight limited attempts at using the NSIs in analysing developing countries given their macroeconomic, political, institutional, and financial challenges. The analysis of NSI in such countries should focus more on the local innovation systems. Social responsibility has become a norm in innovation activities through sustainable development in the environment and economic dimensions in addressing the sustainable development goals (SDGs) (Carayannis & Campbell, 2009). The concept of the innovation ecosystem has been debated over time due to the various existing ecosystem models (Clarysse et al., 2014; Jackson, 2011). Recently, comprehensive studies show that there is some level of consensus regarding the distinct value co-creation found in ecosystems (Cai et al., 2020; Granstrand & Holgersson, 2020; Klimas & Czakon, 2022; Smorodinskaya et al., 2017; Zheng & Cai, 2022). Considering social structures as essential participants within the ecosystem adds a dynamic and inclusive dimension to its characteristics. According to Smorodinskaya et al. (2017), innovation ecosystems can be treated as both business networks and communities

meant for innovation in various forms and scales. They can function as regional innovation hubs, nation-wide innovation communities, local inter-firm networks etc.

Comins and Kraemer-Mbula (2016) investigated various initiatives in Southern Africa that are attempting to promote and foster innovative businesses in the region. These initiatives range from traditional science packs to co-creation spaces in developing tech companies to drive socio-economic development. In this study, the focus will be The Innovation Hub, which was established as a traditional science park, but overtime has evolved through its diverse portfolio of innovation support programmes, underpinned by a philosophy of inclusiveness and endogenous innovation, with a focus on meeting imminent needs defined by industry, communities and local government (Sibanda, 2021). Through the concept of the inclusive innovation ladder (Foster & Heeks, 2013), the study seeks to understand what inclusion means for hubs in SA. Furthermore, the study wants to establish if the hubs can be considered as an innovation ecosystem in alignment through the typological criteria of innovation ecosystems as described by (Klimas & Czakon, 2022; Zheng & Cai, 2022).

New technology-based firms face many challenges as they navigate through the development stages. There is not enough literature to help assist the existing support structures for NTBFs in ensuring their success and growth. Township-based businesses face even greater challenges. The historical backdrop of the township economy presents substantial obstacles, such as inadequate infrastructure for tech business growth. Furthermore, the apartheid legacy has undermined social capital, with the suppression of entrepreneurship and reliance on forced labour during that period leaving lasting repercussions. The unemployment challenges in the country require entrepreneurial activity that can absorb the unemployed youth and create sustainable communities. eKasiLabs plays a critical role in creating an environment

that enables township-based entrepreneurs to access resources for growing their businesses, and the study seeks to measure how the TIH used the process of inclusive innovation through the eKasiLabs programme.

1.4 SIGNIFICANCE OF THE STUDY

Africa has seen an increase in the establishment of technology hubs, with more than 600 hubs in the form of incubators, accelerators and co-working sites (Norbrook et al., 2020). South Africa has approximately 80 active technology hubs (Shapshak, 2019). Tech hubs are perceived as an environment that provides business networking opportunities, giving entrepreneurs access to potential investors and funders. Vibrant tech hub cities like California house Silicon Valley's most notable tech hub, home to giant technology companies like Google, Apple and Facebook. They have an exceedingly relevant skill set absorbing new technology development through proactive higher education institutions, investment by local government, ease of knowledge flow and exchange, and a driven work ethic culture (McNeil, 2021).

It is important to note that Silicon Valley was not an overnight success. It took several years to get it to the current state, and the environmental context differs from that of the African context. As much as Africa aspires to have successful tech hubs, localising the tech hub model is critical.

The various pertinent issues in South Africa due to inequality and rural poverty have given rise to studies seeking to find alternatives to address these social challenges from governance level Moleka (2024), sectorial level Bowman and Chisoro (2024) and technology consumption Harsh et al. (2018). A common thread in these contributions (Bowman & Chisoro, 2024; Harsh et al., 2018; Moleka, 2024) is the strong evidence that inclusive innovation can create solutions tailored to the needs of marginalised

communities, promoting more equitable socio-economic outcomes across national, sectoral, and technological levels. Bowman and Chisoro (2024) argue that an inclusive sectorial system of innovation (ISSI) depends on institutions coordinating innovation-related activities through sector-specific combinations of actors and institutions. These collaborations are established to bridge the capability gaps and facilitate broad technology diffusion, ultimately benefiting small firms in the agriculture sector. Research on inclusive innovation has primarily focused on developing and diffusing products and services for low-income consumers (Foster & Heeks, 2013; Harsh et al., 2018). There is a growing need to deepen understanding of how innovation systems can assist in tackling inequalities and poverty by expanding the economic participation of small and new firms (Andersen & Johnson, 2015; Bowman & Chisoro, 2024). Through the eKasiLabs programme, TIH, as a traditional science park, has contextualised the approach to inclusively supporting innovation. We seek to unpack the inclusiveness of the TIH hub programme further to assist in informing the models of technology hubs currently developed in Africa with respect to building an inclusive innovation ecosystem that supports entrepreneurs from marginalised communities.

The systemic structure of innovation is described from a national perspective where the government plays the central role as a coordinator in organising the various actors contributing to innovation activities as a national innovation system (Midgley & Lindhult, 2017; Onsongo & Schot, 2017). The regional concentration of actors participating in innovation activities in building innovative capability for regional competitive advantage is classified as a regional system of innovation (Pekkarinen & Harmaakorpi, 2006). These systems have three critical actors in government, research institutions, and industry that contribute to innovation activities, with their interactions explained through the triple helix model of innovation (Cai & Etzkowitz, 2020; Torkkeli

et al., 2007). There are limitations to the NSI model in analysing the systemic structure of innovation in developing countries, given their macroeconomic, political, institutional and financial challenges (Cassiolato & Lastres, 1999; Viotti, 2002). Since the adoption of the concept of the NSI in SA in 1996, fragmentation amongst the relevant actors remains one of the challenges (DST, 2019). The concept of the innovation ecosystem, although widely debated in the literature by Clarysse et al. (2014), as is illustrated in the literature review section in Chapter 2, is derived from the NSI concept (Cai et al., 2020). The two concepts are compared comprehensively, illustrating that the innovation ecosystem can be derived from the NSI concept (Zheng & Cai, 2022). In this report, the concept of innovation ecosystem understood as a subset of the NSI will be used to analyse the characteristics of the systemic structure of TIH eKasiLabs, and hopefully illustrate that the innovation ecosystem approach is most appropriate in creating a conducive environment for new technology firms based on marginalised communities. This will hopefully contribute to the literature on the systemic structure of innovation in developing countries, like South Africa.

1.5 ASSUMPTIONS

Qualitative data collection can be done using various methods, such as semi-structured in-depth interviews, among the familiar strategies (DiCicco-Bloom & Crabtree, 2006). Such interviews are useful for exploring participants' experiences, understandings, and opinions on a particular topic in greater detail than would be impossible through a questionnaire or survey (Wakelin et al., 2024). They are only conducted once for an individual or group, take between 30 to several hours to complete, and are often the sole data source for a qualitative research project. The interviewees' sample must be relatively similar and share key traits related to the research question (DiCicco-Bloom & Crabtree, 2006). One of the key assumptions of

the study is that the managers (previous executive manager, current eKasiLab managers) that were interviewed are similar in that they have historical institutional knowledge as they have been with the organisation during the inception states of the eKasiLab programme.

Kaman and Othman (2016) share their experience of gathering data from multiple sources of information and converging them to form themes that lead to a more valid, reliable and diverse construction of realities. There are different ways to achieve triangulation:

- Data triangulation
- Methodological triangulation
- Investigator triangulation
- Theory triangulation.

In his experience, Kaman and Othman (2016) highlight learnings he derived from (Yin, 2009) on case studies as they are designed to focus on a particular issue or feature within its real-life context.

The information shared by managers was cross-examined with the beneficiaries (entrepreneurs who were part of the programme) to validate the information from the beneficiary's perspective.

Secondary sources included a published book (Sibanda, 2021), by the previous CEO, who was in a leadership position during the conceptualisation and implementation of the eKasiLab programme. Primary sources, which included the previous implementation managers, also shared a detailed experience of the implementation

process. The information was used to validate some insights shared by the interviewed managers and fill in gaps where applicable.

1.6 DEFINITION OF KEY TERMS

Inclusive Innovation – is the innovation that is intended for previously marginalised groups in various levels.

Innovation ecosystem- co-innovation networks with actors that rely on a common vision and joint obligations in creating a conducive environment for companies and territories to master innovation-led growth and benefit from rapid technological changes.

Innovation system- a system of structure that emerges from a broad network of dynamically linked actors within an institutional context and process in generating new knowledge resulting in innovation.

New Technology based firm (NTBF)- is considered to be an independently owned business that has existed for 25 years or less with high technological risk, as it is based on the exploitation of an invention or a technological innovation Storey and Tether (1998).

Technology capability - refers to the technological knowledge, trade secrets, and technical know-how achieved through R&D and other tech-based intellectual property (IP). In addition to tacit knowledge and skills, the firm's quality control capability plays a huge role in competitive advantage for new businesses.

Social capital- a form of social network that enables the NTBFs to leverage a set of tangible or virtual resources through partnership-based and sponsorship-based linkages.

1.7 RESEARCH QUESTIONS

I. How does the TIH eKasiLab programme align with the levels of the inclusive innovation ladder?

II. How does the TIH eKasiLab programme support township-based NTFs during their early development stages?

III. What are the structure and nature of the process of the TIH eKasiLab programme in relation to an innovation ecosystem?

1.8 OUTLINE AND STRUCTURE OF THE REPORT

There are six distinct chapters in this research report, as outlined in Figure 2 below, that visually outline the report sections.

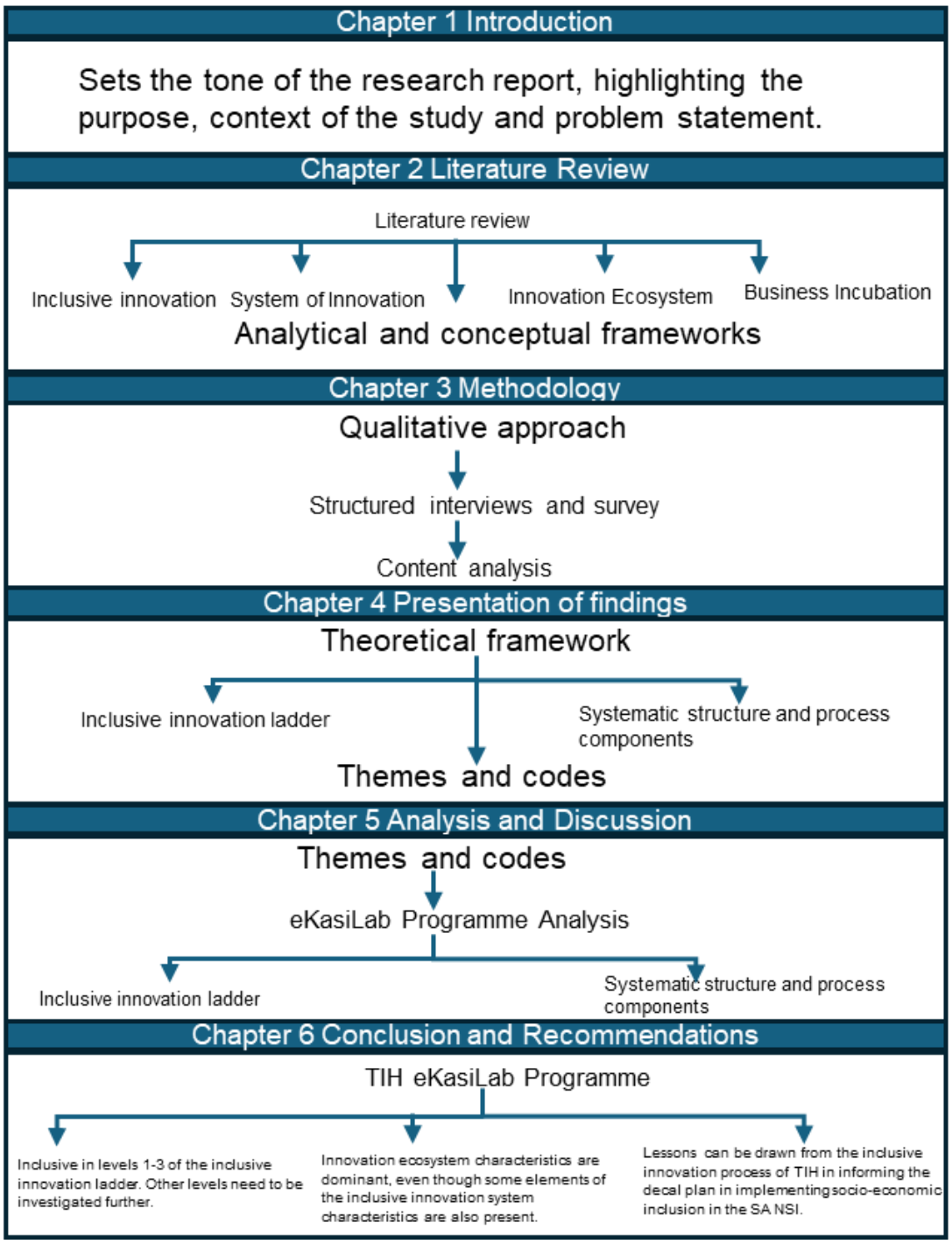


Figure 2: Visual outline of the research report.

CHAPTER 2: LITERATURE REVIEW

2.1 INCLUSIVE INNOVATION

According to Heeks et al. (2014) , inequality innovation focuses on improving the welfare of higher-income consumers, not marginalised consumers. It also focuses on improving the productivity of formal but not informal producers and focuses solely on economic development rather than social development needs. This mainstream innovation has been challenged, and a search for alternatives has been conducted to identify new innovation models for development. These alternatives have seen a significant involvement of the private sector and the global value chains in innovation for the poor using new technologies in information and communication technologies used to bridge the gap in some instances.

Foster and Heeks (2013) give a different view of the ladder of innovation, as shown in Figure 3. The different levels are further unpacked as follows:

Level 1- Intention: an innovation is inclusive if that innovation intends to address the needs or wants of the excluded group.

Level 2- Consumption: an innovation is inclusive if adopted and used by the excluded group.

Level 3-Impact: an innovation is inclusive if it positively impacts the livelihoods of the excluded group.

Level 4-Process: an innovation is inclusive if the excluded group is involved in the development of the innovation.

Level 5-Structure: an innovation is inclusive if created within an inclusive structure.

Level 6-Post Structure: an innovation is inclusive if created within a frame of knowledge and discourse that is itself inclusive.

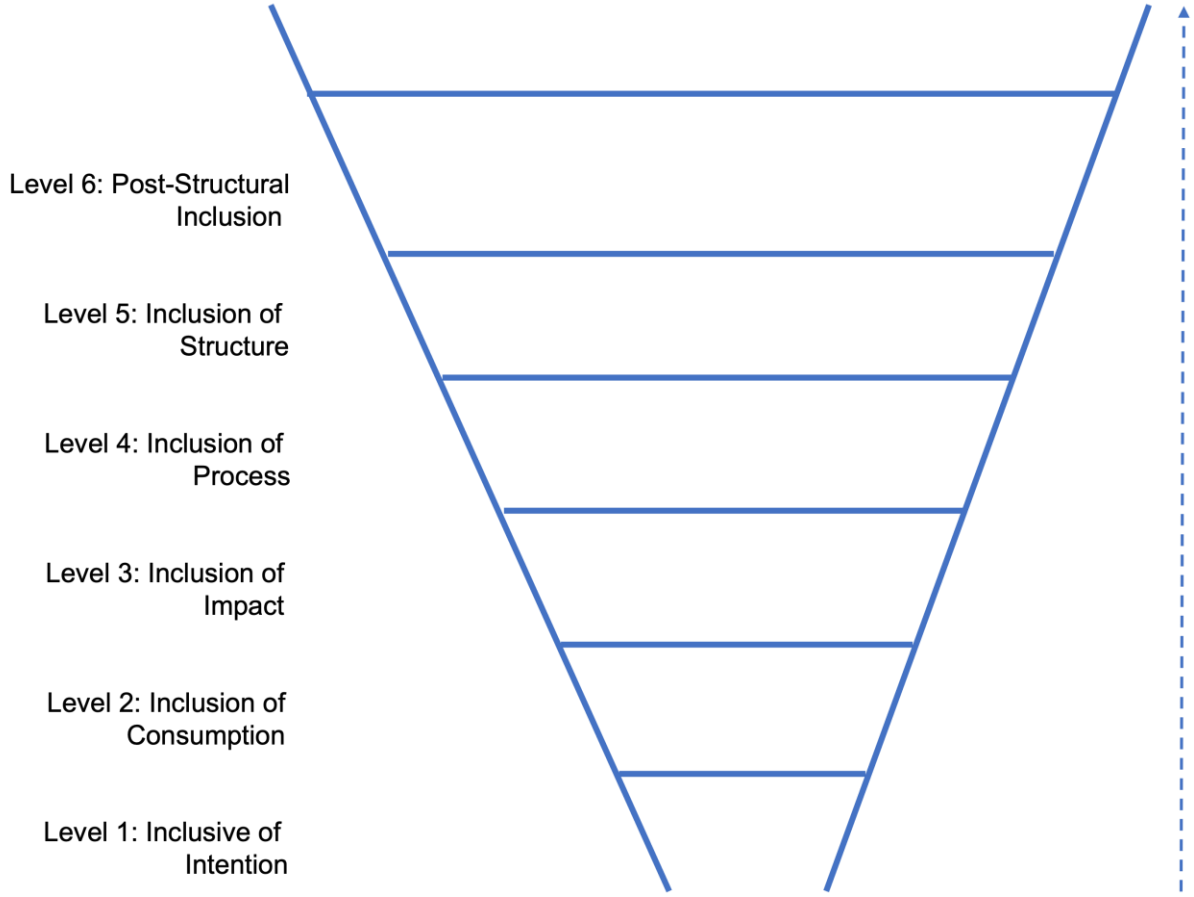


Figure 3: Illustration of the inclusive innovation ladder adopted from (Heeks et al., 2014) .

The classification of inclusiveness of the innovation can be placed at any of the levels; it does not necessarily need to cover all the levels on the ladder. Foster and Heeks (2013) references various innovation models such as innovation platforms, cluster innovation, user-producer interactions, grassroots innovation and frugal innovation, all placed at different levels of the inclusive innovation ladder. Systems of innovation are also shown to be an appropriate framework for the conceptualisation of inclusive

innovation. In their paper, Foster and Heeks (2013) compares conventional and inclusive innovation systems by examining the structural characteristics of actors, learning, relations, and institutions. They make a crucial observation that micro-enterprises embedded in poor communities are key actors in innovation systems, yet they are often overlooked or not included in typical cases of such systems.

Onsongo and Schot (2017) demonstrates the inclusive innovation ladder in the case of M-Pesa, illustrating that the M-Pesa solution is inclusive throughout all the ladder levels. The solution intended to include the marginalised in the financial system. The solution was inclusive consumption, as its accessible services enabled mass product diffusion, deepening the financial sector in Kenya. The service, in its nature, being the circulation of money, led to the expansion of the local economy and opened employment opportunities, improving the livelihoods of the marginalised and achieving an impact on inclusion. Localising its business model enabled an inclusive innovation process in the design, development, and distribution phases. The pervasive product expansion of M-Pesa influenced the financial service structure to be more inclusive from a policy level to incumbent actors orienting their corporate strategies to capture the base of the pyramid market feeding into their sustainable development agendas. These inclusive structural changes are an on-going process by the relevant actors.

Swaans et al. (2014) look at the inclusive innovation platforms (IPs) through the lens of agriculture in India and Mozambique. He looks at the formation and functioning of IPs as an inclusive innovation system, bringing different types of stakeholders together in addressing issues of mutual concern and interest with a specific focus on the marginalised poor. The concept of multi-stakeholder platforms in the agricultural sector dates to the early 1990s, and it has since been broadened to bringing stakeholders in various sectors from different levels of innovation systems, leveraging diversity in

capacity. As such, IPs enable and orchestrate co-evolution between technological development and social and institutional changes. IPs are based on innovation system thinking (Lundvall et al., 2009), where innovation can be stimulated by learning emerging from relevant networks of actors such as strategic alliances and innovation networks concerted on some mutually agreed institutional arrangements. In IPs, this arrangement includes the poor more explicitly as beneficiaries and active participants in the innovation process.

IPs are considered a way of operationalising inclusive innovation by facilitating interaction and learning among different actors, enabling the reshaping of relations and institutions. There is a strong fit between the principles of inclusive innovation as per the inclusive ladder and key elements of IPs as illustrated in Figure 4.

	Inclusive systems of innovation	IPs
Scope	Development as socio-economic inclusion	Bring relevant actors together to address a (development) issue of common interest, with a specific focus on marginalized groups
Innovation	Incremental innovation with a focus on diffusion processes (local needs oriented, demand- and context-driven, non-technical innovation, reverse innovation)	Stimulate demand- and context-driven innovation (technological, organisational, and institutional) through joint problem solving, making use of diversity among IP members
Actors	Main focus on low-income producers and/or consumers; non-traditional, less formal, demand-side innovators, chain of intermediaries, linking supply and demand	Main focus on poor producers; relevant actors are invited based on scoping and analysis; membership not fixed, but dynamic, based on need; usually intermediaries facilitate and coordinate the platform
Learning	Contextualized (supply, demand, other); learning by interacting and using and doing (learning about diffusion and use; learning about wider social processes including non-instrumental processes; survival and utility-maximization as guides)	Contextualized learning through communication and information exchange among actors and by trying out; learning based on systematic and iterative process of action, monitoring, reflection, and adaptation
Relations	Necessity (but also limitation) of informal, loose, but socialized relations	Linkages established through interactions between members of the platform and other informal/formal actors necessary to achieve the overall objective; interactions are usually facilitated and coordinated
Institutions	Complex institutional terrain of informal and formal; indirect impact of core, formal institutional forces; importance (including potential negative impact) of informal institutions at local level	Key institutional constraints and opportunities are jointly identified and addressed; institutions can be informal and formal

Figure 4: Key elements of IPs through the lens of innovation system characteristics (Swaans et al., 2014).

There are three steps in establishing IPs: scoping, analysis and planning (Swaans et al., 2014). Where scoping gives more insights into the platform's topic or areas of focus, the platform, the regional placement of the platform, the type of stakeholders, and the organisation and governance of the platform. The analysis focuses on capacity, skills, knowledge gaps, and platform opportunities. Planning looks at the development action plans informed by the scope and analysis. Key parameters for IP functioning include participation, commitment and ownership, and resource mobilisation from the various stakeholders.

Heeks et al. (2014) convincingly place the innovation platforms model at inclusive level 5 (Structure), as the structural model seeks to include the marginalised. The platforms are considered as sub-structures within a wider system.

Voeten and Naudé (2013) touches on the cluster innovation model, which is innovation enabled by the interactive process amongst the various actors at the cluster level. This innovation process is informally coordinated, with the cluster providing extra context through cooperation, trust, and information. Enabling learning and shared risk-taking in the joint process of innovation.

Grassroots innovation is described as a movement and network of academics, activists, and practitioners exploring alternative forms of knowledge creation and processes for innovation. The main aim of grassroots innovation is to foster inclusion of the marginalised as a process, an outcome, or to produce structural change at the policy level. This is done through ‘harnessing local ingenuity directed towards local development (Fressoli et al., 2014). Smith and Stirling (2018) highlights how grassroots innovation contributes to sustainable development through guiding innovation to support social justice and environmental resilience. This aligns with Pansera and Sarkar (2016), who bring to the fore that resource-scarce entrepreneurs offer the underserved, providing environmentally friendly solutions with low overall ownership costs and using locally available materials. Similar to frugal innovation, that is described as a response to limitations in resources (financial, material, or institutional) by minimising the use of resources in development, production, and delivery, dramatically lowering the costs of products and services (Hossain, 2018; Pansera & Sarkar, 2016).

Harsh et al. (2018) investigate the connections between inclusive innovation levels and three approaches to enhancing equality through emerging technology frameworks. They focus on the inclusiveness of nanotechnology innovation policy, its development, and its effects on marginalised communities in South Africa. Inclusive innovation is also viewed from a policy perspective in its ability to fight inequality and social exclusion. Foster and Heeks (2015) highlights that new government policies should focus on reducing barriers and introducing new measures to foster inclusive innovation in fostering formal innovation systems to focus on the marginalised and address structural blockages to stimulate low-income actors to adapt, diffuse, and use innovations.

The informal actors are delinked from the innovation systems, while the marginalised areas are full of inventors and adapters and are being cut off from formal institutions. This was further illustrated by, where M-Pesa (Onsongo & Schot, 2017), through its inclusive innovation process, tapped into small businesses in low-income urban areas to penetrate the market as they interact intimately with potential users. These localised players often lack the critical input resources such as new ideas, capital, skills, and access to feed their innovation into the broader support circuits.

Persistent infrastructure challenges limit the scaling of innovations to marginalised groups throughout the whole value chain. The sub-structure development in the M-Pesa case (Onsongo & Schot, 2017) incentivised other actors in the financial space to geographically expand their infrastructure and create more diverse inclusive products in servicing the marginalised groups. Low-income earners lack capability in knowledge and skills, limiting their ability to use innovations effectively.

The sub-structure required to support inclusive innovation in the form of institutions, including markets and policies, is absent. The penetration of M-Pesa in Kenya induced the development of inclusive structures at the policy level, leading to reviews of the Banking Act, implementation of the Microfinance Act and drafting of the National Payment System regulations in creating a conducive environment for wider inclusive financial services and products (Onsongo & Schot, 2017).

Some of the recommendations made to improve the policy involve orienting the formal innovation system towards the poor (Foster & Heeks, 2015), where policy can play a critical role in improving the system networks and linkages within inclusive innovation ecosystems.

Inclusive innovation systems are said to include a set of new actors and relations that are often poorly understood by policymakers, where there is a central role by informal and grassroots innovators. Foster and Heeks (2013) refers to them as the key innofusion actors that are not generally recognised or a part of typical systems of innovation cases. Where innofusion refers to the diffusion of new technology solutions by low-income consumers, these innofusion actors are said to better understand the context of their community from customs and cultural perspectives, which unlock the local markets, improving the chances of new technology diffusion.

2.2 SYSTEM OF INNOVATION

Midgley and Lindhult (2017) unpack the different meanings of systemic innovation. He traces the concept of systemic innovation back to 1986 when it was highlighted that “business innovations require collaborations across organisational boundaries to yield the necessary synergies”. They argue that this is the widely used understanding of systemic innovation to date. They further uncovered four uses of systemic innovation:

- Innovation is systemic in that it results from the different contributory innovations and organisations organised together into a whole system where one organisation needs to act as a central coordinator.
- Systemic innovation refers to regional policy systems that support innovation. This type of systemic innovation is at the policy framework level at the national or regional scale, where the government plays a central role as a coordinator or facilitator in creating enablers and constraints for innovation. This is also illustrated by Onsongo and Schot (2017), who states that the central bank of Kenya shielded M-Pesa development and roll-out, regardless of the pushback and opposition from the incumbent commercial banks.
- Sustainability-oriented systemic innovation, where society is viewed as a system that contains the economy and its innovative sub-systems. The multiple innovations are targeted at moving society beyond the economic value of preserving the environment for future generations.
- The least use the meaning of systemic innovation as a process to support people's thinking regarding systems where a system is not viewed as a real-world thing but as a way of thinking in the context of action to create change when innovating.

A technological change in the current industrial regime is regarded as a crucial factor in economic growth and development. Technological change depends on research and development (R&D) and many other related activities such as education, training, production engineering, quality control, etc. (Freeman, 1995). The systemic interaction of these activities gives rise to the National System of Innovation (NSI) concept, which analyses the domestic technology development policies and the economics of technology change.

Niosi et al. (1993) look at the concept of NSI as defined by various economics scholars, and he defines NSI as “a system of interacting of private and public firms (large or small), universities and government agencies aiming at the production of science and technology within national borders. Interaction among these units may be technical, commercial, legal, social, and financial, in as much as the goal of the interaction is the development, protection, and financing. Alternatively, regulation of the new science and technology.” On the other hand Lundvall et al. (2009) defines the national innovation system as an “open, evolving, and complex system that encompasses relationships within and between organisations, institutions and socio-economic structures which determine the rate and direction of innovation and competence-building emanating from processes of science-based and experience-based learning”. Mariana (2011) “the network of institutions in the public and private sectors whose activity and interactions initiate, import, modify and diffuse new technologies.”

Cassiolato and Lastres (1999) notes that the application of National Systems of Innovation (NSIs) in the analysis of developing countries has been limited, primarily due to the challenges posed by their macroeconomic, political, institutional, and financial environment t. The analysis of NSI in such countries should focus more on the local innovation systems. This aligns with Viotti (2002), who suggests that technological change is a learning process rather than innovation in late industrialising economies. Innovation-led technological changes are said to be a privilege to industrialized countries. Hence, the NSI approach in emerging economies could result in significant shortcomings as it would undermine the nature, pace, and direction of technical change, resulting in inappropriate policy prescriptions. Rather, a national learning system (NLS) should be used to analyse the late industrialisation of

economies. He defines learning as a process of technological change through the absorption of already existing technologies, and it is characterized by diffusion (technology imports) and incremental innovation (domestic technological improvements).

The learning process is categorised into two types. The first, a passive learning strategy, focuses solely on absorbing technological capabilities for production without further enhancement. Brazil serves as an example of a country characterised by this passive approach. In contrast, Korea exemplifies an active learning strategy, focusing on mastering and improving the absorbed technologies. It is recommended that the analysis of National Learning Systems (NLS) should centre on the activities, institutions, and relationships associated with learning rather than just on innovation.

Cassiolato and Lastres (1999) notes that multinational enterprises (MNEs) conduct limited technological development activities in host countries due to their focus on investing in their home countries. This limited internal R&D by these firms leads to weak connections with government-owned industrial research institutions and universities in the host countries. This poses a threat to developing NSI in developing countries that largely rely on foreign direct investment (FDI), such as the countries in the African continent. South Africa has previously attempted to use the Motor Industry Development Programme, which was one of the successful instruments for attracting inward FDI in the manufacturing sector. Wentzel and Steyn (2014) in their study compared the manufacturing incentive schemes from SA, Singapore, and Malaysia that promoted specific investment, encouraged capital assets investment, and reduced the investor fiscal burden. He highlighted similarities and lessons that could be learned from the other countries.

The incentives vary in tax-deductible percentages offered by the various governments.

These incentives motivated multinational automotive companies to invest in manufacturing plants, machinery, and infrastructure, including the development of industrial buildings. Encourage innovation in renewable energy generation and research and development (R&D) through the deductions for capital expenses incurred for R&D purposes. Employee training was also encouraged through annual deductions of certain amounts per employee based on a leadership agreement. There were some recommendations in some of the incentives to promote the transfer of foreign technology and know-how through royalties and interest payments to non-residences. Despite South Africa's great potential in attracting FDI, it is seen to be attracting less due to several constraints that hinder FDI, such as skills shortages, exchange controls, crime, extensive labour legislation, and low growth rates. Malikane (2015) looked at the vicious cycle of stagnation African firms face due to direct and indirect inputs such as the lack of basic infrastructure (lack of reliable water and electricity supply), weak institutional environment, i.e. corruption, and poor legal environment. The extremely challenging business environment experienced by African firms driving up marginal and average costs could be the reason behind the lack of FDI.

2.3 REGIONAL SYSTEM OF INNOVATION

Innovation is not linear and cannot be considered the property of science and technology-based firms; it is dynamic and considered a basis of competitiveness in all kinds of economic activities. Pekkarinen and Harmaakorpi (2006) highlight that traditional innovation policies promote science and technology policies by believing that the push for science affects the radical innovation process. The source of

innovation is said to be embedded in the interaction of the different network actors, such as users, producers, and related developmental organisations. The heterogeneous group of various networks, including universities and technology centres in regional innovation systems, and their cooperation in the innovation process, where collective learning is a critical success factor, have the innovative capability to build regional competitive advantage. Torkkeli et al. (2007) define the regional innovation system as central to interconnecting private and public interests, formal institutions, and other organisations to enhance knowledge generation, use, and dissemination.

Theoretically, the dynamics of interactions between three institutional spheres of government, university and industry in regional innovation are understood through the triple helix model of innovation (Cai & Etzkowitz, 2020). This analytical framework is limited and faces challenges in the global context when the innovation systems are internationally connected or when considering the actors outside the three institutions in the innovation analysis, such as civil society. The triple helix model has evolved over given the roles the various actors play in the context of the environment, there are three types of the model, namely: the static model, where the government controls both the academia and industry, leading the development projects and providing resources for new initiatives (Cai & Etzkowitz, 2020; Torkkeli et al., 2007). The Laissez-faire model is where the three actors are separate and independent of each other and interact modestly across boundaries. In contrast, the balanced model fosters a flexible, overlapping structure where these actors interact more dynamically, often sharing roles and responsibilities to encourage a more integrated and collaborative system. For instance, companies perform their economic activity in producing goods and services, research, and provide training at high levels (Carayannis & Campbell,

2009). The intersections of the sphere create the most favourable environments for innovation. The model requires coordination through innovation or an agency that has the respect of all the key players. Social responsibility has become a norm in innovation activities through sustainable development in the environment and economic dimensions in addressing the sustainable development goals (SDGs). This requires the involvement of civil society in the analysis of the dynamics in regional innovation through the Triple Helix model, which has been perceived as Quadruple Helix (Carayannis & Campbell, 2009).

Torkkeli et al. (2007) highlight that the next generation Triple Helix model includes new actors, such as brokers and different types of intermediaries, that would lead to effective business models within the Triple Helix environment. He explores integrating the idea of an open innovation model and an innovation system at a regional level as a platform for cooperation and innovation development for small, medium-sized enterprises (SMEs), the Regional Open Innovation System. Such a system is envisioned to contribute to wide collaboration and an effective regional innovation process, including funding instruments, business development support, and information sharing amongst the various regional players, accelerating economic growth. They define open innovation as “the use of purposeful inflows and outflows of knowledge to precipitate internal innovation and expand the markets to enable external use of innovation.” It is one where innovation is an open and collaborative activity where companies share knowledge and technologies. Clarysse et al. (2014) look at the advantages of innovative start-ups based in geographical hotspots centred around leading universities and public research organisations. These start-ups benefit from the flow of tacit knowledge between companies and personnel mobility, while universities and public research organisations are central to advancing technological

innovation within such an ecosystem. The start-ups in the business ecosystem benefit from the resources and information in navigating the constantly changing competitive environment.

Smorodinskaya et al. (2017) suggest that in the 1990s, national or regional innovation systems were seen as static structures regulated by government bodies, as opposed to the dynamic and agile collaborative structures of the innovation ecosystems that enjoy self-governance as a prerequisite for interactive innovation.

2.4 INNOVATION ECOSYSTEM

The concept of the innovation ecosystem is widely debated in literature (Clarysse et al., 2014), with the most widely used definition of an innovation ecosystem defined as the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution (Granstrand & Holgersson, 2020). Jackson (2011) defines an innovation ecosystem as a model of the economic dynamics of the complex relationships among the various actors whose functional goal is to enable technology development and innovation. Two distinct but largely separated economies characterise the ecosystem: the research economy, which is largely driven by fundamental research, and the commercial economy, driven by the marketplace.

To achieve an equilibrium state in the innovation ecosystem, the resources invested in the research economy by any of the actors within the system need to be replenished by innovation-induced profit increases in the commercial economy. Given the commercialisation process's challenges, reaching a state of equilibrium in the innovation ecosystem is challenging.

Clarysse et al. (2014) look at the formation of knowledge and business ecosystems from a policy perspective. In that policy, makers take the initiative to stimulate the

knowledge ecosystem, assuming they will lead to a business ecosystem. The customer-centric business ecosystem is often led by large companies centred around their value proposition without geographical restrictions, as the value networks can be globally dispersed. Compared to the knowledge ecosystem, which focuses on knowledge generation, a given geography may be clustered with universities and public research institutions that play a critical role in facilitating knowledge transfer through various mechanisms. These institutions act as engines of regional economic development and technological innovation. This perspective is supported by de Vasconcelos Gomes et al. (2018), who conducted a systemic literature review from 1993 to 2016. They clarified the difference between the business ecosystem and innovation ecosystem concepts, emphasising that business ecosystems are concerned with value capture, while innovation ecosystems are focused on value creation. This is in alignment with Cai et al. (2020), who state that the notion of innovation ecosystem evolved from the concept of the business ecosystem, while the business ecosystem focuses on creating customer value and the knowledge ecosystem focuses on new knowledge generation and technologies; innovation integrates the exploration of both ecosystems, with a focus in value co-creation. The concept of innovation ecosystem is still regarded as confusing given that there are a variety of its meaning in literature, with varying types, leading to inconsistencies in the use of the phrase ‘ecosystem’. When the innovation ecosystem is compared to the NSI concept, they are insufficiently differentiated. Clarysse et al. (2014) argue that the innovation ecosystem is identical to the innovation system. Zheng and Cai (2022) give a comprehensive review in comparing innovation systems and innovation ecosystems through a consistent comparative lens that helped synergise the various studies conceptualising innovation ecosystems, resulting in identifying unique characteristics

of innovation ecosystems. They indicate that the transformative innovation policy that integrates sustainability transitions into innovation systems foster innovation ecosystems.

Key research gaps in policy analysis for innovation ecosystems include a lack of consensus on critical focus areas for understanding these ecosystems and limited systemic frameworks for assessing policy's role in their development. These gaps highlight the need for cohesive approaches to define and measure the impact of policy interventions within innovation ecosystems. Through a comprehensive literature review, Zheng and Cai (2022) compared the innovation system with innovation ecosystem. The comparison was done through the main components of the innovation system as a lens through which new features of the innovation ecosystem were identified, as the concept of the innovation ecosystem evolved from the concept of the innovation system. Their synthesis of the literature in the comparison exercise is summarised in Figure 5 below.

Dimensions	Main Characteristics
Innovation genes (innovation dynamics)	• Generated innovations are sustainable or socially responsible. • Both technological innovation and social innovation are fostered. • Participants in a place-based innovation gene, with its enhanced adaptive ability, are increasingly interconnected with their counterparts in other innovation genes. • Actors in collaborations or interactions develop co-innovation networks in which indirect relations between actors become increasingly important [2,46,48,53,61,62,66].
Social structure	• Social structures are being transformed in the shift from a knowledge economy to a knowledge society or from industry 4.0 to industry 5.0 [5]. • Sustainable innovation is fostered by a knowledge society or knowledge democracy in which there is a strong civil society that is characterised by a media- and culture-based public. 'On the one hand, public reality is being constructed and communicated by the media and media system. On the other hand, the public is also influenced by culture and values' (pp. 218–219) [59].
Natural environment	• Sustainable innovation must be framed in the context of both civil society and the natural environment. • Due to growing environmental concerns, actors participating in innovation processes tend to take on global responsibilities through cross-border collaborations. • Sustainable innovation helps to avoid or resolve environmental challenges [53,72].
Co-evolution/co-creation relations between innovation genes, social structures and the environment	• Innovation genes, social structure and the environment influence one another in the processes of value co-creation [15,74] and co-evolution [59]. • In co-evolutionary processes, key actors in innovation ecosystems need to constantly adjust to adapt to environmental changes and create value [26].

Figure 5: Synthesis of literature of unique characteristics of innovation ecosystems from the perspective of the neo-Triple Helix model (Zheng & Cai, 2022).

As in the innovation system, where the interaction between the actors is analysed through the evolving Triple Helix model, the interaction between the actors in the innovation ecosystem is analysed through the neo-Triple Helix model. This neo-Triple Helix model integrates the Triple Helix, Quadruple Helix, and Quintuple Helix models. This integration of the various models enables the analysis of the innovation dynamics and the sustainable development dynamics of the innovation ecosystem. As the Triple Helix explains, innovation dynamics are the characteristics of innovation systems, which are the interactions between the three main actors (university, government, and industry). The Quadruple and Quintuple Helix models explain the interaction between the innovation genes, social structures and the environment in sustainable development dynamics in an innovation ecosystem.

Smorodinskaya et al. (2017) clarify the innovation ecosystem concept from a collaboration and value co-creation perspective. They highlight that the nature of non-linear innovation and digital technologies requires an innovative environment enabling value co-creation through collaboration. The co-creation concepts consider the frequency of interaction and the quality of relationships between companies and their customers or among other companies in knowledge creation, sharing and transfer. The collaboration aspect speaks to the networked actors relying on a common vision, strategy, common identity, and joint obligations to co-create innovations. Such ecosystems are said to emerge during collaboration among networked actors and cannot be established as system-like organisations, as ecosystems are tailored to interactive co-creation of values, while systems are not.

The “Eco” emphasises innovation's non-linear nature and collaboration's crucial role in producing innovation for sustainable development in non-linear environments. Innovation ecosystems can be treated as business networks and communities meant for innovation in various forms and scales. They can function as regional innovation hubs, nation-wide innovation communities, local inter-firm networks etc. Cai et al. (2020) define innovation ecosystems as “co-innovation networks, in which actors from organisations concerned with the functions of knowledge production, wealth creation and norm control interact with each other in forming co-evolution and interdependent relations (both direct or indirect) in cross-geographical contexts, and, through which new ideas and approaches from various internal and external sources are integrated into a platform to generate shared values for the sustainable transformation of the society.”

A study by Klimas and Czakon (2022) identified two conceptual challenges related to defining innovation ecosystems: delineation and topology. Their empirical study

verifies that innovation co-creation relationships in co-creating value based on innovation delineate the innovation ecosystem from the other ecosystems, such as the knowledge and business ecosystems. They further synthesise the typological criteria of innovation ecosystems into five categories: lifecycle, structure, innovation focus, scope, and performance, further summarised in Table 1 below.

Table 1: the typological criteria of innovation ecosystem (Klimas & Czakon, 2022).

Typology Criteria	Description
Life cycle	The nature of how the innovation ecosystem comes into existence (i.e intentional vs emergent) and what life cycle it can be found (i.e emerging, developmental, mature, etc.)
Structure	From the actor's perspective, the innovation ecosystem can be symmetric or asymmetrical, centralised or decentralised. A co-creation relationship can be ego and eco-centric. The governance mechanisms could be orchestration/hierarchy, collective coordination or self-coordination.
Innovation focus within the innovation ecosystem	This refers to the scope of innovation adopted within the ecosystem, which could be microscopic, middlescopic or macroscopic. The ecosystem's actors target the innovation type in terms of disruptive, radical, incremental, social, and path-breaking innovations. The intensity of cooperation across the co-innovation process (i.e., innovation process benefiting from co-discovery, co-development, co-deployment, etc.)
Scope	Innovation ecosystem activity, be it technological (high-tech, medium-tech or low-tech), spatial refers to the geographical range of both activity and outputs (i.e., city-based/district-limited, local, regional, international, or global),

	and physical refers to where the innovation ecosystem operates from, i.e., cyberspace, virtual and real world, where the innovation ecosystem leverages the dynamics of digital entrepreneurship.
Performance	Categorised into three: innovation performance, which measures how successful/strong, unsuccessful/ weak and promising; economic performance, which measures profitability/health; and strategic performance, looking at the sustainability of the ecosystem.

Recently, Zheng and Cai (2022) investigated the role of public policy in transforming innovation systems into innovation ecosystems, where they closely looked at the characteristics that distinguish innovation ecosystems from innovation systems by synthesising the studies comparing the two systems using a comparative lens. They looked at various dimensions in comparing the systems from the varying theories' key components in literature in terms of collaboration and co-creation values, economic growth, etc. This comparison was summarised in Table 2 to focus on the scope, innovation focus, actors, learning, relations, and institution characteristics of the innovation system for this research to establish the characteristics of the TIH eKasiLab programme.

de Vasconcelos Gomes et al. (2018) conducted a systemic literature review from 1993 to 2016 to clarify the difference between the business ecosystem and innovation ecosystem concepts, highlighting that business ecosystems relate to value capture while innovation ecosystem relates to value creation.

2.5 INNOVATION ECOSYSTEMS AND NEW TECHNOLOGY-BASED FIRMS IN MARGINALISED COMMUNITIES

The research on inclusive innovation has mostly focused on the consumption of technology by low-income consumers (Bowman & Chisoro, 2024; Foster & Heeks, 2013; Harsh et al., 2018; Lashitew et al., 2019). The diffusion of technologies in the marginalised community relies on the microenterprises embedded within these communities, often overlooked in typical innovation systems (Foster & Heeks, 2013). Zahra and Nambisan (2011) give a global view of the innovation ecosystem, highlighting how incumbent firms establish and sustain these ecosystems, allowing new ventures and smaller companies to contribute their innovations and discoveries. A notable example dates back to the early 1980s with Intel's microprocessor ecosystem. The advancements in technology products and services have driven the growth of innovation ecosystems, exemplified by companies like Apple and Safaricom. Through their platform-based ecosystems, they have enabled value creation, stimulated learning, and fueled entrepreneurial activities in new ventures. These ventures develop complementary products and services, such as applications and enterprise software modules, gaining entry into the global marketplace.

Adesida et al. (2021) give an account of Africa’s challenged innovation ecosystems, highlighting numerous systemic weaknesses such as limited economic and socio-economic infrastructure, lack of skills, innovation capacity, and entrepreneurial education and culture. The COVID-19 pandemic further illustrated the limited digital infrastructure, particularly in marginalised communities, critical for innovation ecosystems in exploiting opportunities in the digital economy. These challenges hinder the growth of startups and SMEs in scaling their business for growth (Sheriff & Muffatto, 2015).

The Central University of Technology (CUT) in the Free State shared some strategies they adopted to build a thriving innovation and entrepreneurship ecosystem (De Jager et al., 2017). Through their efforts, they implemented various support mechanisms structured to nurture startups and assist them in transitioning from ideation to market-ready products and services. CUT is driving regional economic development and empowers local entrepreneurs. Through their efforts, their innovation ecosystem has positively supported and empowered the Free State region's SMEs. They have seen business development and growth, enhanced innovation capabilities, market expansion, job creation and increased resilience. The systemic challenges in limited financial resources, the regulatory environment, and the lack of skilled mentors remain a stumbling block that stifles the creation of a conducive environment for startups and small businesses to thrive. They emphasise that addressing these systemic challenges can help strengthen the ecosystem.

These systemic challenges are not only peculiar to Africa; Ubreziova et al. (2020) highlight similar challenges in Eastern Europe and illustrate that access to available entrepreneurial support in the form of incubators and accelerators is a geographical privilege as rural SMEs are underserved. There are various interventions in strengthening their innovation ecosystem that unlock grant funding and access to technical assistance for SMEs. Through targeted rural innovation support programs in the agricultural sector, rural-based SMEs have been seen to improve their product quality and access international markets.

2.6 BUSINESS INCUBATION

An increase in innovation in the market has given rise to companies set up to test business models developed around new ideas, typically proposed by a few co-

founders or team members known as Startups (Reisdorfer-Leite et al., 2020). For the purpose of this study, NTBFs will be viewed as tech-startups. Mhlongo and Mzyece (2023) give a detailed account of the perceived value of active technology-based incubators in South Africa that support the development of fin-tech startups. He highlights the substantial growth of 51 technology-based incubators in the country.

There are various academic definitions of business incubators dating back from 1987, where Campbell and Allen (1987) highlights that incubators are a growth industry set up to assist in the growth and development of new enterprises. In the early 2000s, Lalkaka (2001) highlights how the incubation spaces evolved from providing facilities for carefully selected entrepreneurs to complementing the space with skills development programmes and providing entrepreneurs with other resources, including seed capital. In contextualising business incubation in SA, Buys and Mbewana (2007) indicates that Cassim (2001) gives the first full account of incubation initiatives in SA. They define business incubators as organisations that provide protected environments for business start-ups characterised by the strongly correlated eight factors, namely:

- Access to science and technology expertise and facilities
- Availability of funding
- Quality of entrepreneurs
- Stakeholder support
- Supportive government policies
- Competent and motivated management
- Financial stability
- Networking

Around 2015, the SA government, through the Department of Trade and Industry (DTI), launched an incubator establishment handbook as a national guide to establishing business incubators in the country, see Appendix K. In its content is the national definition of an incubator as a physical or virtual facility that assists with developing early-stage SMEs, providing temporary business support services critical to helping SMEs navigate early-stage business challenges. Comins and Kraemer-Mbula (2016) brings innovation in the context of incubation, describing the business incubator as an organisation by specialised professionals aimed at increasing the wealth of its community by increasing the culture of innovation and the competitiveness of its associated business and knowledge-based institutions.

2.7 GROWTH STAGES

Entrepreneurship is the engine of growth and represents a stream of innovations (Mehmood et al., 2019). It enables economic development, increases the overall prosperity and well-being of regions, and alleviates poverty by solving unemployment problems, providing innovative products, and creating a competitive environment. Joseph Schumpeter's entrepreneurship model is dynamic and associated with innovative new products and processes. At the heart of Schumpeterian entrepreneurship is innovation, which is the key to the economic development of any company, region of the country or country itself. Schumpeter described innovation as a process of taking a new idea and executing it. It pertains to every aspect of business: process, products, organisation, etc. There is an ongoing entrepreneurial revolution through start-ups, small-medium and micro-enterprises (SMMEs).

Beliaeva et al. (2020) highlight that a single firm lacks the required resources to develop and commercialise a complex value proposition. Hence, innovation

ecosystems are critical in assisting entrepreneurial and innovative firms by supporting the diversity of actors that form the ecosystem. In their paper Beliaeva et al. (2020), focus on digital entrepreneurship, where they look at the development of digital businesses and the strategic partnerships that need to be forged to assist them in navigating through their development stages. The three main areas identified are related to:

I. Funding agencies and investors: from the R&D stage, where the firms benefit from cluster governance in unlocking financial resources via edicts or competitions. Attract investors through innovative product development and leveraging industry actors to generate fast revenues.
II. Knowledge-based actors- key partners to complement the firm's internal tangible and intangible assets should be identified from their innovation ecosystem.
III. Social capital and networking- a broader network enables access to experts with various knowledge domains that may respond to the entrepreneur's needs. Key organisations, amongst other partners in the innovation ecosystem, can facilitate this networking.

Kazanjian (1988) studied the growth pattern of two manufacturers of computer-based office products located in different geographical areas. He highlighted that problems faced at a given time are strongly associated with a venture's position in a particular growth stage. His model is said to hold for NTBFs and only explains internally generated growth, not by acquisition or merger. The four-stage model is summarised below. It is important to note that the NTBFs need varying resources as they advance through the different stages:

Stage 1: Conception and development- all ventures are said to go through this stage where the focus is on the development of the product or technology (invention). At this stage, proprietary technology attracts funds; seed funding is crucial as resources are required to build a prototype.

Stage 2: Commercialisation- Production-related start-up, where the main focus is product development for commercialisation. This may require a product development team and a market research team.

Stage 3: Growth- subject to technically feasible product and technology diffusion. The NTBF requires an efficient and effective task system to ensure the product is produced and functions as promised. A robust marketing team is also essential to drive sufficient sales. Achieving this may necessitate additional human capital and financial resources.

Stage 4: Stability- This is a new stage associated with a slow growth rate where the firm needs to maintain its market position by focusing on the second-generation product. This might require a strong research and development team and associated resources.

During the early stages of development, NTBFs have high technological risk as they are still conceptualising their ideas and developing their prototype that will be a differentiator in the market. According to the technology life cycle model (Abernathy & Utterback, 1978) , technology goes through three distinct stages over time: fluid, transition, and specific. Where the technical improvement characterises the stages, this implies that the frequency of product innovation is high during the fluid phase and decreases steadily, giving rise to the frequency of process innovation that dominates the transition stage. Product and process innovation frequency is low at the specific

stage as the processes are optimised and the product matures. One can imagine that this is a resource-intensive process from technological capability and financial and resource capital perspectives. The rate of innovation changes over time, changing the commercial and technological uncertainty faced by the firm. At high uncertainty (fluid phase), investment risks are high, as there is no tangible asset to hold onto as collateral, and neither banks nor financial directors have an appetite for such a risk. At the fluid phase, the entrepreneur must take a risk and invest in their own business through their personal funds such as savings, mortgages or from family and friends as they face various obstacles should they consider raising funds through the capital market.

Various activities characterise the different development stages. According to Prakke (1988), stage 1 is the conception and development, where R&D activities are dominant as the product is being development. This stage is marked by a high rate of product innovation and a failure rate of 70%. Social capital through sponsorship-based linkages is crucial at this stage, and most firms would be sitting in incubators or science parks to leverage the infrastructure in such spaces to get a head start. The commercialisation stage 2 is the start-up phase, where there is further product and process development, and the entrepreneur needs to be pro-active in establishing the market base to break even. Social capital through sponsorship-based linkages is crucial at this stage, as venture capital might still be scarce due to asymmetry between the managing team and the business. Process optimisation activities dominate Stage 3 growth to ensure the development of second-generation products; driving sales is another of the dominant activities in a quest to increase the market share. Process innovation is key to protecting technological exclusiveness through product design optimisation. Venture capitalists and other capital organisations are most likely to

invest at this stage, as financial resources are required to drive marketing campaigns and human capital to assist in production. Social capital linkages can assist the NTBFs by providing necessary resources. The last stage 4, stability, is also known as the maturity stage, where the firms explore future growth through continuous innovation and exploiting economies of scale. They require more financial resources to scale. The product is developed at this stage, and various avenues exist for raising capital. Partnership-based linkages are also beneficial.

The developmental stages of an NTBF, as described by Kazanjian (1988) and the dominant activities in each stage, as described by Prakke (1988), as well as the technology life cycle model described by Abernathy and Utterback (1978) are combined in this study to provide a deeper understanding of the journey of NTBF from inception to maturity. These developmental stages have remained relevant in studying entrepreneurial ecosystems (Autio et al., 2014; Cao & Shi, 2021).

2.8 FACTORS CONTRIBUTING TOWARDS GROWTH STAGES

A firm's transition from one stage to the other is induced by an organisational learning cycle that occurs when the firm responds to the varying challenges in each stage. As a result, the firm must have institutionalised structures and processes that were not previously required to transition through stages. The firm must be flexible to change as they might be altered as the organisational needs change per growth stage. He summarised the factors that influence the growth of the NTBF:

I. Organisational systems- which speak to business administration systems.
II. Sales and Marketing- technology diffusion that meets sales targets and market penetration.

III. People- the capability and talent of the organisational team

IV. Production- mass production and development of a network of reliable supply and distribution partners

V. Strategic Position- development of a unique solution in the form of a product or technology application (innovativeness of the solution)

VI. External relation- Securing financial resources and support.

The three dominant factors in all the development stages are factors (ii), (iii) and (v). The sales and marketing challenge is dominant in stages three, the people challenge is dominant in stages 1 and 3, and the strategic position challenge is dominant in stages 1 and 4. Most of these challenges can be addressed by supporting the innovation ecosystem of which the NTBF is a part.

2.8.1 PEOPLE

Some of these factors are supported by other scholars, such as Garnsey et al. (2006), who defined growth as an output of a cumulative interaction process between the firm's productive base and market opportunities driven by the team members through their knowledge and competence. This aligns with the 3rd factor in the growth stages defined by (Kazanjian & Drazin, 1989). She emphasised that an entrepreneurial mindset is key in recognising market opportunities and organising resources to match up the opportunities. Colombo and Grilli (2010) emphasised that there is a positive indirect effect of the founder's human capital on the firm's founders as they stimulate two factors that directly impact the firm's growth. He argues that NTBFs founded by high intellect individuals have an advantage in attracting venture capital (VC) in the early development stages. They have strong technological capabilities to sustain their competitive advantage.

Lee et al. (2001) looked at the three significant internal attributes of an NTBF: entrepreneurial orientation, technological capabilities, and financial resources, which affect the firm's performance through the developmental stages.

2.8.2 ENTREPRENEURIAL ORIENTATION AND TECHNOLOGICAL CAPABILITIES

Entrepreneurial orientation (EO) is characterized by innovativeness, risk-taking propensity and pro-activeness. Mthanti and Ojah (2017) looked at the EO and its influence in achieving economic growth at a macro level. Innovativeness refers to the firm's tendency to engage in research and development activities, new idea generation, and experimentation to yield new products/ services, market penetration, and manufacturing processes. To achieve a strategic position, as in Kazanjian factor (v), it is essential to be innovative as a firm for competitive advantage and to pursue a blue ocean strategy (Mauborgne, 2014) that creates ample opportunity for rapid and profitable growth (Covin et al., 2006). Risk-taking behaviour can be illustrated by the firm's willingness to incur costly and risky resources for an uncertain and novel business. Pro-activeness is defined as the firm's approach to market opportunities, resulting in a mover advantage when introducing new products ahead of competition in emergent markets. Combining the technical feasibility and economic demand requires an entrepreneurial mindset. Other studies have revealed that there is a large correlation between EO and firm performance (Rauch et al., 2009).

Technological capabilities refer to the technological knowledge, trade secrets, and technical know-how achieved through R&D and other tech-based intellectual property (IP). In addition to tacit knowledge and skills, the firm's quality control capability plays a huge role in competitive advantage for new businesses.

2.8.3 FINANCIAL RESOURCES

The absence of liquid assets or credit for innovators in the early stages of their venture presents a challenge in securing financial investment, including loans. This makes it difficult for the NTBF to develop its technology, market research, and advertising. The uncertainty of their technology-based product is highly risky for investors to buy into it. Abernathy and Utterback (1978), (Garnsey et al., 2006), Autio et al. (2014), and Cao and Shi (2021) looked at the technology life cycle model that emphasises there are different rates of innovation and technology development. The technology life cycle influences the development stages that the NTBFs go through regarding product development. The type of activity in the various stages influences the funding opportunities available to the NTBF. High uncertainty and risk result in a lack of funding.

2.8.4 SOCIAL CAPITAL

In addition to EO, social capital is in the form of social networks that enable the NTBFs to leverage tangible or virtual resources through partnership-based and sponsorship-based linkages. Partnership-based linkages are linkages between an NTBF and an external entity through a collaborative or corporative relationship. Examples of such external entities vary from other technology-based firms, resource-supplying organisations, universities, research institutes, venture associations, and informal entrepreneurs' networks. Such strategic alliances help NTBF to secure a stable source of resources and supplies, gain market power and increase their survival chance. Collaboration with universities and research institutes opens a pipeline of talent to join the venture and development of knowledge through R&D, which could have been an expensive exercise for the venture to embark on alone.

Sponsorship-based linkages are as important to the NTBFs as this unilateral relationship enables NTBFs to receive support from external entities without expected rewards. Such partnership and sponsorship-based linkages are supported in South Africa through enterprise supplier development (ESD). In an effort to address the injustices of apartheid, the Broad-Based Black Economic Empowerment (BBBEE) policy (Shava, 2016) aims to help new firms access resources and markets through established companies that benefit from government tax relief, thereby advancing economic transformation..

Ndlovu (2016) looked at the survival, R&D propensity and technological capability as factors impacting the innovation performance of new technology firms in South Africa. His study found a positive relationship between technological capability and innovation performance (turnover). He also found that there is also a positive relationship between technology adaptation and innovation performance. Factors such as R&D investments, survival, marketing, and new product development for emergent markets did not contribute to the innovation performance of the NTBFs in South Africa. These factors that did not contribute to the firms' innovation performance were mostly activities that were not explored due to a lack of resources and capabilities.

2.9 THE CONCEPTUAL RELATIONSHIP BETWEEN INCLUSIVE INNOVATION AND INNOVATION ECOSYSTEM

The concept of NSI results from various actors' coordinated, systemic interaction, enabling innovation (Mariana, 2011). The NSI applies in developed countries and mainstream innovation that serves middle- and high-end-income consumers (Heeks et al., 2014). The NSI is limited in its focus on the interaction dynamics between three

types of institutional spheres of government, universities, and industry, as described by the triple helix model (Cai & Etzkowitz, 2020).

Developing countries like South Africa, which have systemic challenges (Cassiolato & Lastres, 1999), struggle to implement the concept of the NSI (DSI, 2020). The NSI emphasises the type of actors that contribute to innovation activities through the triple helix model. The innovation ecosystem approach, though derived from the concept of NSI (Zheng & Cai, 2022), the Quadruple and Quintuple Helix models explains how the interaction between innovation drivers, social structures, and the environment shapes sustainable development within an innovation ecosystem.

Generally, the innovation system framework forms the foundation and benchmark of the conceptualisation of an innovation ecosystem perspective (Zheng & Cai, 2022), an inclusive system of innovation (Foster & Heeks, 2013), as well as inclusive platforms (Swaans et al., 2014) in the operationalisation of inclusive innovation as illustrated in Figure 6. The extent of inclusion of the excluded group concerning innovation is outlined by the levels of the inclusion innovation ladder, which requires inclusion in intent, consumption, impact, process, structure, and post structure. Hence, the various models of inclusion do not represent true inclusive innovation systemic structure as they are limited to a specific step of the inclusive ladder (Foster & Heeks, 2013).

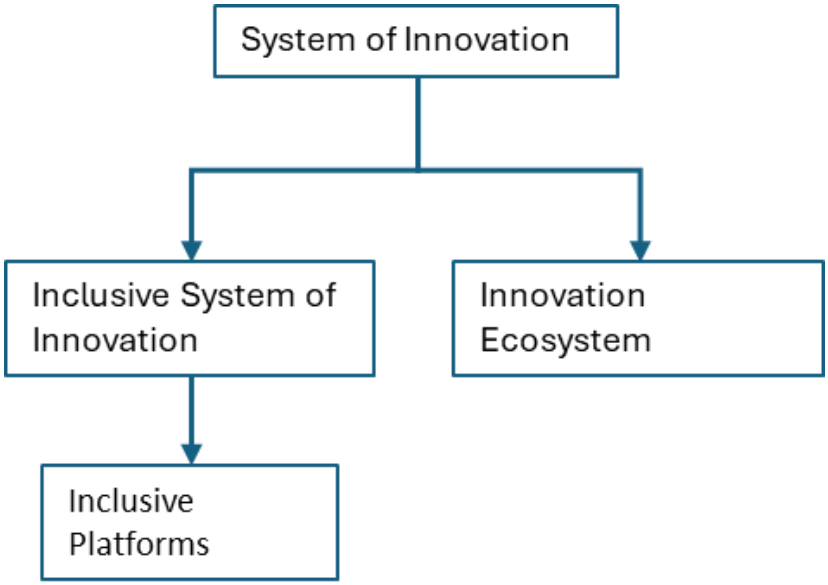


Figure 6: Flowchart of how the innovation system characteristics shape the structural and process components of the other systemic innovation models.

The contrast amongst the various structure and process components of the conventional system of innovation, inclusive systems of innovation, innovation ecosystem and innovation platforms will be explored in this study as the characteristics of TIH eKasiLab surface. The distinct characteristics of the innovation ecosystem are in the co-creation interaction actors because of networking and collaborative dialogue amongst the various. This contrasts with the innovation systems often perceived as special infrastructure government projects (Zheng & Cai, 2022). In contrast, the inclusive innovation system has a micro-level focus with the socio-economic inclusion lens (Foster & Heeks, 2013).

2.10 ANALYTICAL FRAMEWORK

As a traditional science park, TIH has various programmes that support regional innovation and Provincial strategies, such as the Maxum Business Incubator, which focuses on early-stage and start-up small and medium enterprises, supporting them with value-added services at no cost and enhancing business life cycle support services, including legal, marketing and accounting, amongst other incubated

offerings. Through the process of inclusive innovation, TIH, through the eKasiLabs programme, decentralised expanding its services to reach underserved townships through collaboration with various regional partners, providing accessibility and re-industrialising the marginalised communities through skills and enterprise development through the growth stages. Innovation ecosystems can be treated as business networks and communities meant for innovation in various forms and scales. They can function as regional innovation hubs, nationwide innovation communities, local inter-firm networks etc. The characteristics of the TIH eKasiLabs as an inclusive innovation ecosystem will be evaluated using the inclusive innovation system framework that will be used to analyse the characteristics of the eKasiLabs if they align with the innovation ecosystem. The innovation ladder will be used to evaluate the inclusive nature of the eKasiLabs programme.

The type of system analysis of TIH eKasilabs will be evaluated by focusing on the characteristics in Table 2, informed by drawing the parallels between the systemic characteristics of the innovation systems and innovation ecosystem. The innovation ecosystem brings value creation to centre stage and has been used in entrepreneurship (de Vasconcelos Gomes et al., 2018), making them relevant to the context of analysing the eKasiLab programme in supporting entrepreneurs.

Table 2: Structure and process components of the innovation systems and innovation ecosystem.

Characteristics	**Innovation Systems**	**Innovation ecosystem**
Scope	Technology developments in individual firms drive linear models of innovation (technology push and demand pull).	Co-creation of innovation by networks developed by actors and interactions. Within a generated ecosystem of linkages and assets.
Innovation focus	To develop an R&D and national innovation system by supporting its agents and infrastructure elements without a collaborative view and its innovation synergy effects	Both technological and social innovation-focused. Promoting localised ecosystems across the economy and through facilitated interactions and collaboration within and between networks enhances their innovation synergy effects.
Actors	Actors form the main networks of industries, government and universities.	Networked collaborative actors with a common vision and strategy and joined obligation in value co-creation. With actors from central and

		peripheral networks in local and geographical contexts. Citizens are emerging as key actors.
Learning	An institutionalised context that encourages learning and innovation	Learning from customers between companies leads to a constant and balanced conception of ideas, knowledge and technology amongst the different communities and networks.
Relations	As per the Triple Helix innovation model, the primary innovation actors have a reciprocal relationship for value creation in the development of innovation systems.	The co-creation relationship amongst the actors, interdependent and indirect relations in a cross-geographical context in the sustainable transition of society
Institutions	As informed by the triple helix model, universities, industries, and government are the primary institutions in innovation systems.	Broad consideration of institutions from social and environmental structures.

Furthermore, the inclusive ladder informs the inclusiveness of the eKasiLabs programme in supporting the township-based startups in their development phase.

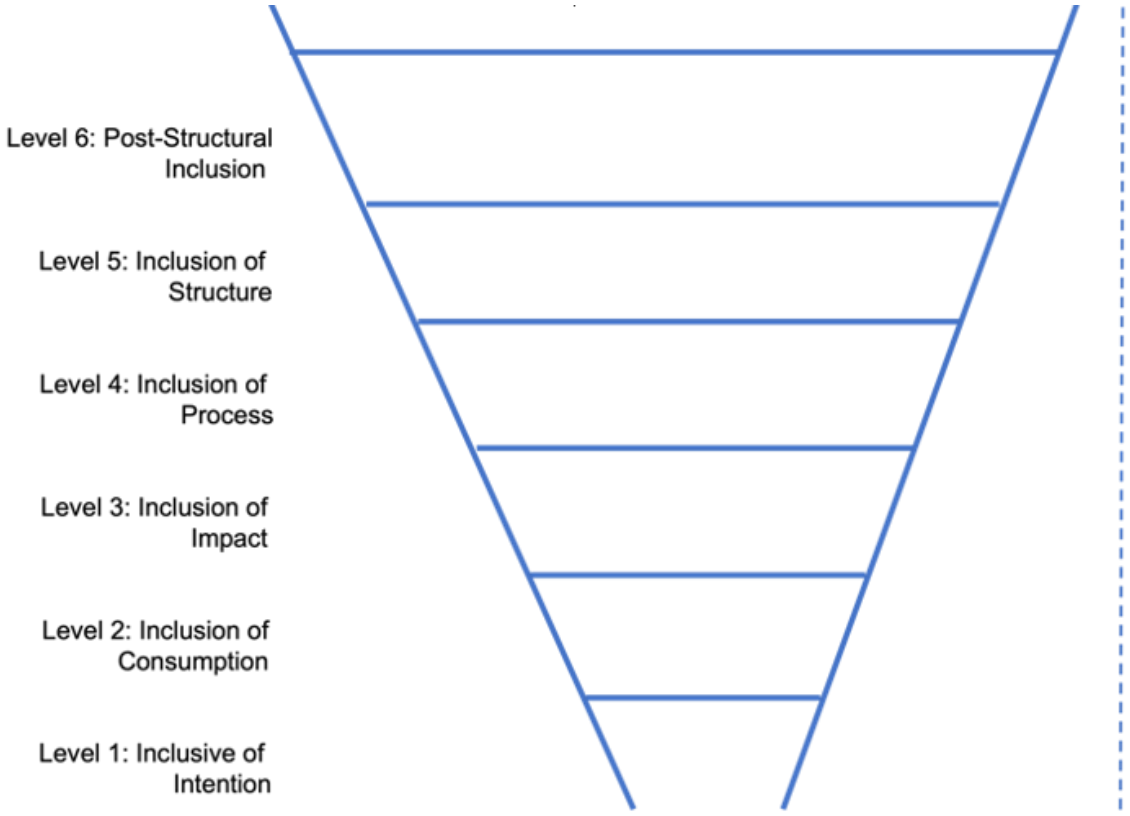


Figure 7: Analytical framework of the study in analysing the inclusiveness of TIH eKasiLabs programme.

2.11 CONCEPTUAL FRAMEWORK

In this study, we will investigate the inclusiveness of the TIH eKasiLab programme in assisting township-based entrepreneurs navigate the development stages of their NTFs. The study will zoom into how the hub's programmes, through inclusive innovation, promoted the growth of the NTFs based in township communities by providing access to:

- finance,
- technical and business advisory,
- facilities and training,
- local and international social capital,
- market access

as part of the programme's resources and support to entrepreneurs.

The assumption is that these factors influence the performance of the NTBF throughout the development stages in varying impacts. As illustrated in the analytical framework in section 2.10, the key theories that underpin the conceptual framework are inclusive innovation in understanding how the eKasiLab programme supports entrepreneurs in township economies through their innovation ecosystem as an extension of TIH, a national science park in township communities.

CHAPTER 3: RESEARCH STRATEGY AND METHODOLOGY

3.1 INTRODUCTION

This research employs an exploratory case study strategy to investigate the systemic structure of the Technology Innovation Hub (TIH) and the inclusiveness of its eKasiLab programme. Given the complexity and limited prior research on this topic, an exploratory approach is essential for uncovering new insights and understanding the nuances of how the eKasiLab programme operates within its specific context.

The primary objective of this study is to delve deeply into the interactions and experiences of participants with the eKasiLab programme. By conducting in-depth interviews with key informants, the research aims to gather rich, qualitative data that reveals the programme's impact on inclusivity and its effectiveness in supporting NTF based in township communities. The broad research questions guiding this study are designed to explore the multifaceted nature of the programme and its contextual relevance.

The case study method is particularly suited for this research as it allows for a comprehensive examination of the eKasiLab programme within its real-life setting. The study will utilize qualitative methods such as interviews and content analysis to identify emerging themes and patterns from the data. This approach aligns with the interpretivist paradigm, which emphasises understanding subjective experiences and constructing knowledge based on participants' perspectives.

The scope of the research is focused on the eKasiLab programme and its role within the TIH, with an acknowledgement of the study's limitations in terms of generalisability.

However, the exploratory nature of the case study is intended to provide valuable insights and contribute to a deeper understanding of the programme's inclusiveness and operational dynamics.

In summary, this introduction outlines the rationale for using an exploratory case study approach and provides an overview of the methodological framework. The findings from this study are expected to offer new perspectives and inform future research on innovation ecosystems and inclusivity.

3.2 RESEARCH PARADIGM

Interpretivism is the most appropriate research paradigm for this explorative case study, which seeks to gain a comprehensive understanding of the systemic structure of the Technology Innovation Hub (TIH) and the inclusiveness of its eKasiLab programme. This paradigm is particularly suited for exploring the complex, context-dependent nature of how individuals and groups interact with and perceive the eKasiLab programme.

The study employs in-depth interviews as the primary data collection method, engaging key informants who provide rich, detailed accounts of their personal experiences with the eKasiLab programme. These informants, drawn from various roles and contexts, offer diverse perspectives on how the programme operates and its impact on inclusivity. Their narratives help uncover the nuanced ways the programme is perceived and utilised within different community settings.

In line with interpretivism principles, analysing the data collected through these interviews involves a rigorous content analysis. This process allows for identifying and

interpreting emerging themes that reflect the informants' subjective experiences and insights. These themes are not predetermined but arise organically from the data, enabling a deeper exploration of the research questions outlined in section 1.7. This approach ensures that the study captures the complex and multifaceted nature of the TIH eKasiLab programme, providing a richer, more contextualised understanding of its inclusiveness and effectiveness within the innovation ecosystem.

3.3 RESEARCH DESIGN

To derive a closer and more in-depth understanding of TIH's eKasiLab programme, exploratory case study research that adopts qualitative research techniques was used. The participants were purposefully selected, given their institutional knowledge of the inception and implementation of the eKasiLab programme, as managers. The insights gathered from the managers will enable an in-depth understanding of how the programme assisted NTBFs in the marginalised communities of Gauteng through inclusive innovation and establish the systemic characteristics of the TIH eKasiLab programme.

The other participants were selected as beneficiaries based on their first-hand experience of the programme. To give insights on their experience regarding how their township-based NTFs were supported in the eKasiLabs programme to progress through the development stages.

Virtual interviews were conducted with the selected managers, and the beneficiaries were given a digital questionnaire to complete. This allowed for the data to be gathered through various lenses to explore the inclusiveness of the eKasiLab programme.

In this case study, a total of four eKasiLab managers were interviewed virtually to gather insights and inform the study's inquiry. The homogenous sample of the

eKasiLab managers was chosen to give insights into the eKasiLab programme. Each manager looks after a maximum of two eKasiLabs and has been in their management position for a minimum of three years and a maximum of six years.

A heterogeneous sample of the eKasiLab programme beneficiaries was selected, as the entrepreneurs were at different development stages when the joined the eKasiLab programme. Some businesses were in the ideation phase, whilst others had been operational for a minimum of a few months and a maximum of over ten years. The businesses are in various sectors, such as agro-processing, waste management, media and education, etc., with varying business models. A total of 49 entrepreneurs were sent the questionnaire, and a few emails were no longer active; only ten responded to the survey. As a secondary source, Sibanda (2021) was used to crystallise the data from the field study.

3.4 DATA COLLECTION

A structured interview approach was used to gather data from the eKasiLab managers. The participants received the same type of questions developed in advance. This approach is an excellent instrument in qualitative descriptive studies like this one. The data was recorded through a video recording with the virtual platform. As seen in Appendix C and Google form, another software otter was used to transcribe notes during the interviews to collate the information for analysis. The survey used to engage with the eKasiLabs beneficiaries was distributed through email, and the google form was used to record the participants' responses.

3.4.1 STUDY AREA AND CASES

The eKasiLabs are based in five township communities in the Gauteng province: Tshwane, Erkurhuleni, Sedibeng, West Rand, and Johannesburg. TIH’s website only

had the contact details of the entrepreneurs based in Soweto, Mohlakeng, and Alexandra. A total of 49 emails were sent to the beneficiaries, 22% of which were invalid, and only 16% responded.

The respondents confirmed they attended eKasiLabs based in Soweto, Alexandra, Sedibeng, West Rand and Erkurhuleni. The sectors that the entrepreneurs are in are agro-processing, waste management, beauty products, media, waste management and manufacturing. 60% considered themselves a tech startup; some had already been operational for ten years with products when they joined the programme, while some had just been operational for a few months with just ideas. This is further illustrated in Table 3.

Table 3: List of participants that were reached out to for the survey and those who responded

eKasiLab	**No. of respondents reached out to**	**Nonresponsive inactive email accounts**	**Responses**
Soweto	19	5	3
Sebokeng	7	1	0
Mohlakeng	14	5	3
Alexander	9	0	2

Five active eKasiLab managers were contacted for participation, but only three were available for virtual interview sessions. Unable to attend a virtual interview, one manager was provided with the interview questions via a Google form. In addition to the data gathered from these four managers, a former executive manager also participated in a virtual interview. The managers interviewed oversee eKasiLabs across the Gauteng province, with most having held their positions for over two years, typically managing up to two eKasiLabs at a time as illustrated in Table 4. The former executive manager brought extensive institutional knowledge, having been with TIH for seven years and playing a key role in conceptualising and implementing the eKasiLab programme.

Table 4: Outline of the demographics of the management respondents

Respondent	**eKasiLab**	**Number of years in a management position**	**Interview Date**	**Interview Length**
Manager A (M1)	Soweto Kagiso Danie Van Zyl	6 years	20 July 2023	00:28:41
Manager B (M2)	Garankuwa Mabopane	6 years	17 July 2023	Completed an interview question through a questionnaire as he could not make

				time for a virtual interview.
Manager C (M3)	Diepsloot Alexander Kathorus	3 years	26 July 2023	00:34:19
Manager D (M4)	Sebokeng Mohlakeng Sharpville	6 years	26 July 2023	00:20:56
Manager E (ME)	Previous Executive Management	7.5 years	3 July 2023	00:27:30

3.4.2 PRIMARY AND SECONDARY DATA COLLECTION

The primary data was collected in two ways: through a questionnaire sent to the beneficiaries of the eKasiLab programme and through virtual interviews with the eKasiLab managers and previous executives.

3.4.3 INTERVIEWS

After permission was granted, the TIH staff and beneficiaries were engaged. Interviews were scheduled with the managers through emails and follow-up phone calls. The availability of the managers and previous executives was limited, and the interviews were scheduled to last 30 minutes. The questions were prepared prior to

the interview sessions. Upon confirmation of availability, calendar invites were sent, and virtual sessions were scheduled on the digital platform. The interviews were recorded through the digital platform and the digital note-taker. After the interviews, the recordings will be reviewed, and information will be recorded for processing.

The beneficiaries were reached through the email addresses that were available from TIH's website, but the lack of response prompted telephone calls to some of the respondents to encourage participation. The questionnaire was administered through google forms, which enabled the data collection. Using digital tools to administer the interviews and questionnaires enabled an efficient data collection, storage, and processing process.

3.4.4 SECONDARY DATA COLLECTION

Sibanda (2021) did a brilliant job sharing his experience managing TIH during his tenure when the eKasiLab programme was conceptualised and implemented. In his book, he has contributions from other key stakeholders who were part of the conceptualisation and implementation process of the programme. He also shares insights contributed by the first beneficiaries of the programme, who have seen tremendous growth in their business due to the support they could unlock through the programme. This information source enabled me to complement the primary data as the primary data collection had limitations in the lack of responses from the beneficiaries and the availability of managers for interviews.

3.5 DATA ANALYSIS APPROACH

Content analysis was the data analysis technique that was used in this study. The use of this technique enabled the data that was collected from the primary and secondary sources to be analysed and interpreted systematically.

In the data analysis, different software was utilised to enhance the research findings' validity, credibility, and accuracy. A detailed analysis of the interview scripts will be conducted, where notes from both during and after the interview will be reviewed, and the notes from Otter, the transcribing software, will be collated through Google form. The data was further sorted and typed out in word documents per respondent. These individual responses were analysed using the NVIVO software, where the analytical tools informed the containers created to sort the responses based on the codes and themes aligned with theoretical frameworks. Using this software, the transcripts from the interviews had to be cleaned, and individual transcripts were created from recorded audio and transcribed notes for each participant as input to the software. The themes were informed by the theoretical frameworks of the inclusive innovation ladder and the systemic characteristics in the structure and process of the innovation system. Then, each transcript was analysed in alignment with the themes, and new codes emerged based on the significant information from the transcript. Tables 5, 6, and 7 of themes and codes were generated, as shown in Chapter 4. This content analysis is recommended in the case when the themes and codes are related to the theoretical framework (Adu, 2019).

3.6 LIMITATIONS

Access to participants was one of the major limitations of the study as the eKasiLab managers are occupied, given that they overlook more than one eKasiLab. They were difficult to access and find time with, and they also indicated interview fatigue as various studies have been conducted on eKasiLab by other academics that have required their participation.

The managers were contacted through emails and follow-up phone calls, and WhatsApp messages were used to encourage their participation. They kept postponing or cancelling but eventually participated in the virtual individual interviews. Similarly, given the time frames, the entrepreneurs could only be reached digitally, and some were not responding to emails to encourage their participation; follow-up phone calls were made; only 8 of the entrepreneurs out of the 49 and 15 who had called responded to the survey. The limitation of the study is that it will be looking at a handful of NTBFs that were incubated under the eKasiLabs programme.

Using digital tools to conduct interviews and administer the questionnaire also had challenges in poor connectivity in some instances and incomplete responses on the questionnaire. The secondary data sources were useful in complementing the primary data sources.

3.7 ETHICAL CONSIDERATIONS

The research instruments were approved by the ethics committee, and personal information such as names, racial profiles, companies, and gender have been withheld in this report. Other profiling data is used to provide a general description of the participants, in accordance with the University of Witwatersrand’s ethics policies.

3.8 CONCLUSION

The exploratory case study approach allowed for a comprehensive investigation of the TIH eKasiLab programme, focusing on understanding its real-life context through detailed analysis of both primary and secondary data sources. By adopting this approach, the study was able to delve deeply into the programme's operations, interactions, and impacts as experienced by participants.

The study systematically identified and categorised patterns and themes within the data using content analysis. This methodical analysis provided a structured framework for uncovering significant insights from the collected data, ensuring the findings were detailed and systematically organised.

The detailed findings and insights derived from this analysis will be presented in Chapter 4. This chapter will provide an in-depth account of the data and highlight the key patterns and themes identified. Subsequently, Chapter 5 will discuss these findings in greater detail, offering interpretations and exploring their implications concerning the research questions and objectives of the study.

CHAPTER 4: PRESENTATION OF FINDING

4.1 BRIEF INTRODUCTION

This section presents the key results and findings from the study, focusing on the in-depth analysis of the TIH eKasiLab programme. The research aimed to explore the programme's structure, its alignment with the innovation ecosystem, and its inclusive support for township-based NTFs as they progress through the development stages. The data was collected through virtual interviews, questionnaire responses, and secondary sources and has been systematically analysed to address the research questions guiding this study.

The findings are organised around the three primary research questions:

i. How does the TIH eKasiLab programme align with the levels of the inclusive innovation ladder?
ii. How does the TIH eKasiLab programme support township-based NTFs during their early development stages?
iii. What are the structure and nature of the process of the TIH eKasiLab programme in relation to an innovation ecosystem?

The chapter is structured first to provide an overview of the demographic and contextual information of the participants, followed by a detailed presentation of the findings related to each research question. The Themes and patterns from the data are discussed in depth, providing a comprehensive understanding of the TIH eKasiLab programme’s effectiveness and challenges.

These results are critical for understanding how the eKasiLab programme contributes to the broader goals of fostering innovation and inclusivity within the township context.

The insights gained will be further analysed and discussed in the subsequent chapter, where their implications concerning the theoretical framework and existing literature will be explored.

4.2 PRESENTATION OF FINDINGS AND DATA RESULTS

The questionnaire was carefully organised into three distinct sections, each designed to capture specific aspects of the entrepreneurs' experiences and perspectives.

- Section One focused on obtaining comprehensive details about the business profiles of the participating entrepreneurs. This section aimed to understand the background, nature, and scope of their businesses, providing a foundational context for the study.
- Section Two was crafted to delve into the systemic structure of the eKasiLab programme, as viewed from the entrepreneurs' perspectives. This section sought to uncover how the entrepreneurs perceive the organisation, processes, and support mechanisms within the programme, offering insights into its operational dynamics.
- Section Three, the final section, concentrated on evaluating the impact of the eKasiLab programme on the entrepreneurs' businesses. It aimed to capture the entrepreneurs' experiences and the tangible outcomes they have observed from participating in the programme.

The questions posed in each section, along with the corresponding responses from the entrepreneurs, are systematically presented in Table 5 and Table 6.

4.2.1 PRESENTATION RESPONSES FROM THE QUESTIONNAIRE BY ENTREPRENEURS

Table 5 below represents the entrepreneurs' responses to the questionnaire designed to evaluate the business profiles, the systemic structure of TIH eKasiLab as perceived by the entrepreneurs and the impact that the programme has had on the growth of their businesses.

Table 5: Entrepreneur responses to the questionnaire on their business profiles and systemic structure

	Business Profile			Systemic questions				
Respondents	**Which sector is your business in?**	**Do you consider your business as a tech-start start-up?**	**How long had your business been operational when you joined eKasiLab**	**Did you join the eKasiLab programme in your community?**	**Why did you join the eKasiLab programme instead of other programmes?**	**Does the eKasiLabs programme connect you to other support through its innovation partners? Elaborate**	**In which eKasiLab are you attending and why?**	**How does the eKasiLabs programme address your needs as a township-based startup?**
1: B1	Agri processing	No	10 years	Yes	Proximity and collaboration	We are engaged in collaborative sessions and engagements	Soweto	
2: B2	Education Solutions	Yes	4 years	Yes	I was attracted to the fact that they are part of the Innovation Hub	Yes. Through the workshops that they conduct.	Randfontein	I am able to interact with people who think similarly.
3: B3	Recycling	No	2 years	Yes	It was the only program that wanted to support new business innovations	Yes...IP Lawyers, SABS consultants for certification and accredited testing	Soweto, it's closer to my residence	It helps me understand my market even more through their regular workshops.
4: B4	Recreational	Yes	Few months	Yes	It had a better track record compared to others	No	Alexander, it's the closest	It allows me to focus my attention on my target market and to study market behaviour well.
5: B5	Manufacturing	No	3 years	Yes	I was invited	Yes, they connect you with mentors who know the way.	Alexandra	Getting mentorship to advise
6: B6	Media	Yes	2 years	Yes	It was close by and easily accessible. It was attractive to local start-ups.	Yes, it does through partnerships with SEDA, NEF and other stakeholders.	Mohlakeng. It's based on my location	It gives me access to relevant resources to pursue my business goals.

7: B7	Waste Management	Yes	10 years	Yes	It was the closest branch I could access	No		
8: B8	Waste management	No	7 years	Yes	I wanted to expand my business knowledge	Yes	Soweto and I's next business operation	To accelerate business growth

Table 6: Detailed responses of the entrepreneurs regarding the impact that the programme has in their business development

	Impact of programme							
Respondents	**Why do you think the eKasiLabs programme exists?***	**When you joined the eKasiLab programme, what kind of support did you expect to receive?**	**Did you receive the support you needed in 1.4? Please elaborate. ***	**What resources are you able to access through part of the eKasiLab programme? ***	**How has the eKasiLabs programme helped your business grow? (Do you have more clients? More revenue? Launched product in the market, etc?)**	**Has the eKasiLabs programme improved livelihoods in your community? If so, How?**	**Share experience of the programme**	**Anything you would like to change about the programme?**
1: B1	Assist township entrepreneurs	Incubation	We were incubated for a 1 year	Networking and financial interventions	We have gained new clientele and launched new products in the market.	our product is better in the known community	GREAT FUN	
2: B2	To assist budding entrepreneurs in industry areas that promote innovation.	Funding	No, my business offering is digital, so I have to finish at least a sample solution to be considered for funding.	Free internet and office space.	The programme has not assisted me in this regard. I need to go out and look for clients.	I am happy that other entrepreneurs in our space have received funding and are growing their businesses. That gives me hope, and I am sure other community members will benefit, directly or indirectly.	It is a great programme, but there is room for improvement.	

3: B3	It supports business innovations that would otherwise not receive this kind of support.	Business Mentorship	Yes, I worked with a mentor who helped me to draft a marketing plan to support my business plan.	Business Mentors who have experience in my field, a boardroom for meetings, and an office with wifi	It has allowed me to file IP registration, which I could not do alone for business innovation.	Not yet		Bring in more stakeholders like CSD IT support staff to host training sessions for us because, most often, documentation from CSD can hinder us from getting Ekasi Lab funding.
4: B4	To assist township entrepreneurs with the necessary support for their businesses in order for their businesses to thrive.	Mentorship and funding	Yes, but not entirely	Mentorship	It has helped me to understand how to position my services to my target market.	I have not grown my business to the level of being able to employ others yet.	It is a highly needed service by entrepreneurs, but it needs to be executed much more effectively to see better results for many more successful entrepreneurs.	Make more follow up with your entrepreneurs in order to monitor their step-by-step growth so that they can be given support at the level where they are
5: B5	To help entrepreneurs thrive and assist them in formalizing their business hustle and becoming mainstream businesses.	Funding	I have received funding.		Yes, I have grown over the years; I have a product and am supplying it to retail.	Yes, a lot of people are now able to run businesses when they are struggling.	There were good and bad times, but overall, we did it.	Get mentors who are passionate about entrepreneurship.
6: B6	To empower innovative township start-ups	Infrastructure, Access to markets, funding	Not entirely; I received co-working space and access to information, that is all. At that time, BOD could not grasp a digital company as an innovative start-up. EkasiLab is more focused on innovative products than innovative services.	Working and meeting space	I have better knowledge of my business ecosystem. I have increased my networking capabilities.	Yes, my business has grown enough to empower others in my community.	The programme should be more visible as people in my community are not well informed about it in their front yard. Partnerships with local entrepreneurs can assist to benefit both parties.	It should be more entrepreneurship-driven. Leading entrepreneurs should form part of an advisory committee in each community.
7: B7	To assist business	Training	Yes	Not much	NOT yer	Not yet	No	Nothing

8: B8	To assist small businesses	Mentorship and acceleration	Yes financially support	Financial support, business seminar	Have more clients		They have a good mentorship programme.	To increase funding for business

When the entrepreneurs were asked if there was a feedback mechanism in place to give them an opportunity to suggest changes in the programme as a form of including them in the programme development, 63% of them indicated that there is no clear feedback mechanism in place. Only 38% said their suggestions were implemented, as illustrated in Figure 8 (a) and (b), respectively.

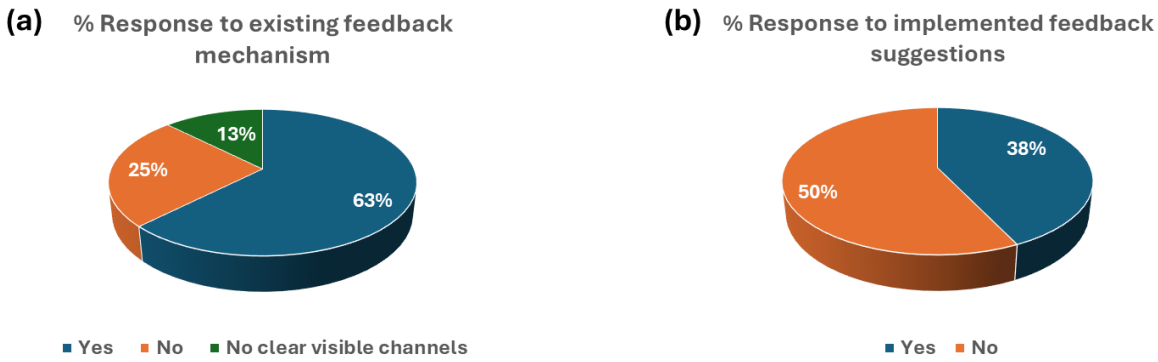


Figure 8: Entrepreneurs' response regarding their involvement in the process of informing the eKasiLab programme through a feedback mechanism: (a) establishing if there is a feedback mechanism in place and (b) if the suggestions have been implemented.

4.2.2 PRESENTATION RESPONSES FROM PREVIOUS EXECUTIVE MANAGEMENT OF TIH

The Table 7 below represents the responses of the previous executive manager of TIH from the interview session of structured questions regarding the programme's impact on its beneficiaries, the NTBFs and the systemic structure of TIH. The responses from the active managers can be reviewed in Appendix B, C, and D.

Table 7: Responses from the previous EM of TIH on the impact of the eKasiLab programme

	Impact of the eKasiLab programme from a manager perspective	
	What was the intention of the eKasiLab programme? (To address the needs of the township tech based-startups)	**How has the programme impacted the participants?**
1: EM	The idea was, you know, if you look at the legacy of apartheid, is that many youths were excluded, in essence, from participating in the economy. A young man from Soweto from Garankuwa would need to take about two or three taxes just to be able to get to the Innovation Hub. And so when we created the eKasiLabs, it was taking innovation to the people. That was, in essence, our slogan, eKasiLabs, taking innovation to the people. And the idea was that you needed to create environments in the townships like close to where these young people lived. environments similar to the one you have with the main innovation hub campus in Pretoria. Furthermore, that was the basis of it: why don't you take innovation to the people, create the environment start to help start the ideation process at a local level, where you are actually asking young people to identify problems in their society and start to solve them come up with ways of solving those particular problems, and hopefully in a way that allows them to earn some money out of solving the problems. So that was, in essence, the philosophy behind the eKasiLabs. Okay	Yeah, I think I'll be in it by the time I leave; we have two years after setting it up. I think we had over 300 entrepreneurs. It is a startup out of the townships. So you know, first of all, suddenly they have access to bandwidth, and they have access to mentorship. There were possibilities, you know, suddenly, because we had created about eight of them around Gauteng at the time. There was almost a marketplace as well, and in certain cases, they could start to buy from each other so you could have a graphic designer in the system in one eKasiLab, and that graphic designer could start to provide services to accompany in Garankua you know, two different polls. So, I think the employment creation, you know, happened as a result of the companies and starting to get through the revenue stage in our understanding was that most of the companies, most of the innovations of the startups would not create a lot of jobs. However, if you had one creating anything between three and five jobs, you would actually be better off not doing anything. We also added a program to the eKasiLabs, which was code tribe. We then started to instil new skills in the communities' software development, but software development with a cause because they were focused on coming out of the program with either a portfolio of projects that could show to your prospective employer or come out of the program with a with an innovation that becomes the basis of their startup.

Table 8: Responses from the previous EM on the systemic structure of TIH

	Systemic structure-related responses by the previous EM			
	What was the purpose of the development of the TIH eKasiLab?	**What is the innovation focus of TIH eKasiLabs?**	**As the eKasiLab manager, have you been able to forge relationships with other entities in the local area or nationally to assist the entrepreneurs in the development of their business (access to market, technical support etc.?)? If so, please elaborate.**	**What brought the actors on board?**

1: EM	I think it's development if you go back in time; it was set up at a time when it was the rise of the ICT industry, and at the time Gauteng, was the, you know, they're moving towards what they called a smart province. So they are establishing things like blue IQ, which was meant to take advantage of the fact that Gauteng had all these research institutes and accounted for a significant in-progress part of the, you know, the patent output in the knowledge output is in South Africa. So, the establishment of the Innovation Hub was, in essence, to create an ecosystem that contributes to the social and economic development of the province through technology and ICT.	Yeah, so it was really a provincial creature. Bearing in mind that it was set up by the provincial government, not the national government. Thus, in that particular regard, it was really on how the extent to which you can contribute to growing the economy of the province and, therefore, I guess, the needs of the economy, value creation, for the Gauteng economy, a pathway of technologies coming out of the universities and the CSIR to be able to make their way into the market.	When I joined in 2011, there was no working relationship between the CSIR, the Innovation Hub and the University of Pretoria, but I came from a national innovation system. At the time that I joined the Innovation Hub, I was actually still sitting on the board of the CSIR. So that helped to bring us closer. At the very least, I will start to build a bridge between the Innovation Hub and the CSIR based on that relationship. Cheryl Hillary was the Vice Chancellor of UP and is somebody that I worked with from the time she was DVC for research at UCT. So again, on the back of that relationship, we started to build a stronger relationship between the University of Pretoria and the Innovation Hub.	Well, I guess I'm in the main thing, the Innovation Hub, being an intermediary, or a Science Park, the value that it brings to the system to any ecosystem. It obviously has to facilitate the flow of knowledge from universities or research institutions into the marketplace. And you recall that the innovation habit also includes resident companies, which are commercial companies that are based at the Innovation Hub. Also included, Sappy included Began. So, part of the forecast was how we create value for these companies. In such a way, you can fulfil your own mandate as a science park. And that is the approach that we took in developing the strategy to just figure out, okay, the university is what do they want to, you know, they the IPI act that says that must commercialize, how do we position ourselves and so that's that became the backbone or the basis on setting up different programs, including the competitions that we ran because those competitions provide value to the institutions.

	What support did the tenant companies give entrepreneurs?	**Type of relationships amongst tenants in the innovation hub**	**What kind of support do the eKasiLabs get from the main Innovation Hub?***	**What type of relationship does the eKasiLab have with the host community?***

1: EM	Not so much on ESD think they; in fact, we provided value to them by running an internship program where internship programs we could place young people with them in these was from the Coach lab program that we ran. Invariably, we also did events, and in the events invited, in particular engagement, the events that were able to meet with other companies within the Innovation Hub ecosystem. Later on, we ran what you call the Open Innovation Program. That created opportunities for the companies to collaborate. So, it was always based on what value we could create. And not all companies participated, by the way. The Cisco deal came in towards the end of my tenure, but it was something that we had been working on for some time. So, one of the things perhaps learning is that it takes time to build trust. It takes time for the private sector to engage with government institutions. It's more really about value, mutual value creation, and mutual interests. So, in the cases where mutual interest exists, we can build that. So, for example, SAPPY you could support SAPPY on their open innovation, search for some solutions, and accordingly, SAPPY was also able to work with us wherever we needed things. You would be much more open to you know, to, you know, to engage. Okay, so I mean, we had a deal with what? A German company eventually joined T Systems. So T Systems engaged with us, and eventually, we set up a program with T systems where they put up their banners advertising themselves, and they sponsored the incubation incubation space that was co-branded; our entrepreneurs benefited from that.	I think they varied; for example, in T systems, we did not do much co-creation with them. Although the idea was that they would, you know, sniff from time to time concerning just one signal, okay. The idea was that they could access entrepreneurs, and maybe something of value could come out of that. I think we ran a couple of hackathons with them. That becomes more of a co-creation in a kind of relationship. Cisco, again, is more empowering. They gave us access to their tools with the hope, again, that the entrepreneurs who create something that can then be hosted on the Cisco platform, and I think we also, through the M lab, you know, a program that was more co-creation where you bring onboard companies like, you know, whether it was Microsoft and others to then provide value. So it varied in the idea I think within around innovation is that you ideally, what you want to do is you want to bring on board actors, and the more they interact, the more likely that is likely to be engagement and over some time that could be you know, co-creation, on the understanding that the innovation hub itself could not have created IP. The Innovation Hub hosted the various stakeholders and entrepreneurs because it did not have the capacity to engage in the innovation process itself.	I mean, the key things were the same high-speed bandwidth, the same mentors mentoring the entrepreneurs in Pretoria, the main campus was the same that we deployed, and mentors that were not prepared to go into the townships. We excluded them from mentorship because we would build one ecosystem. We then started to put up a Fab Lab in Pretoria. We put up a Fab Lab in Soweto and a Fab Lab in Garankuwa. So that they have the same access. So, the idea was to have these mini innovation hubs without spending much money on building structures. However, we would rather utilize the structures made available by the TVETs or the municipalities.	Or the design stage? The main consulting con people that were consulted were obviously the municipalities, particularly in the case where we are using that utilizing their infrastructure and their local economic development focal points. The TVET colleges, we also some of the people that we consulted with, and also I mean, we ran Startup Weekends in the lead up to setting up the eKasilabs in that also then highlighted where, you know, for example, you know, where were example for example, where these eKasilab were could be located, so that, you know, one could did not have to take more than one taxi to get to the ekasilab

4.2.3 THEMES THAT EMERGED REGARDING THE INCLUSIVENESS OF THE EKASILAB PROGRAMME FROM BOTH PRIMARY DATA SOURCES

I. How does the TIH eKasiLab programme align with the levels of the inclusive innovation ladder?

This question investigates the programme's inclusiveness, assessing how it meets the various stages of the inclusive innovation ladder. The findings highlight the extent to which the eKasiLab programme fosters inclusive practices and reaches as it interacts with NTBFs in marginalised communities.

The themes that emerged from the entrepreneur responses are summarised in Table 9, and those that emerged from the manager responses are summarised in Table 10. The inclusion of impact also addresses the research question:

II. How does the TIH eKasiLab programme support township-based NTFs during their early development stages?

This focuses on the programme's impact on township-based NTBFs, particularly in their formative stages. The insights highlight resources, mentorship, and support structures the eKasiLab programme provides to these emerging businesses. B9 and B10 insights are from the secondary data in Table 9 as synthesised from the raw data in Table 6.

4.2.4 RESULT PERTAINING THE RESEARCH QUESTIONS ON SYSTEMIC CHARACTERISTICS OF THE eKasiLab PROGRAMME

The research question:

III. What are the structure and nature of the process of the TIH eKasiLab programme in relation to an innovation ecosystem?

This question explores the organisational and operational structure of the eKasiLab programme, examining how it functions within the broader innovation ecosystem. The analysis provides insights into the programme's role, processes, and interactions within this ecosystem.

The valuable insights on the characteristics of the systemic structure of the programme were obtained from the managers, more especially the previous executive manager as seen in the raw data in Table 8, in alignment with the manager's responses in Appendix B to Appendix D, as they possess historical knowledge on the inception and implementation of the programme. The entrepreneurs could mostly validate their interaction with some of the actors within the TIH ecosystem. The questions were focused on various system elements as per the theoretical framework, as seen in the questionnaire in Appendix A.

The scope of TIH eKasiLab was to tap into the economic corridors of the Gauteng province to unlock the innovation potential in township communities. The innovation focus was to cultivate the culture of innovation in township communities by creating a conducive environment for the growth and development of township-based technology

businesses. The actors that are part of TIH eKasiLab were brought by the TIH as the intermediary; as a government initiative, local municipalities form part of the critical actors as increasing TIH footprint into township communities was tapping into their territory and local academic institutions in the form of technical and vocational education and training (TVET) colleges were also identified as critical actors in collaboration and partnering to ensure the success of the programme. As the intermediary, TIH also tapped into its existing network of industry players hosted at the main campus to support the entrepreneurial programmes.

The actors had individual relationships with the intermediary innovation hub. The relationships vary from partner to partner, and the most valuable partnerships are said to be based on mutual value and interest. The previous executive manager, EM, elaborated that the TIH would create programmes for mutual benefit, “And we then ran what you call the Open Innovation Program. Moreover, that created opportunities for the companies to at least collaborate.” Such value co-created programmes would include SAPPY in their open innovation challenge search for some solutions, which gave entrepreneurs a platform to showcase their value propositions. Another one was with T systems, where “they engaged with us and eventually, we set up a program with T systems where they put up their banners advertising themselves, and they sponsored the incubation space that was co-branded in our entrepreneurs benefited from that”. “Cisco, again, more empowering. They gave us access to their tools with the hope that the entrepreneurs who create something can then be hosted on the Cisco platform”. As the eKasiLabs were established, the key performance area of the managers was to engage other partners to get support for the development of the entrepreneurs in addition to the support obtained from the main innovation hub.

As the eKasiLab programme is the extension of the main innovation hub, the formal local and international institutions that had co-created entrepreneurial programmes, such as Sappy, T-Systems and Cisco, were some of the institutions that formed part of the players in the programme. In addition to the local formal institutions such as the TVET colleges and depending on the economic activities around the location of the eKasiLab, managers forge relationships with local institutions.

Various learning opportunities were presented through the rollout process of the eKasiLab programme, from consulting and involving representatives from host communities in the form of counsellors as the political environment varied per community. This led to contextualised learning. In the process of attracting other institutional support from external organisations, it was established that for the private sector to make any support commitment, it was important for the private company to trust, which requires time to build. This is an indication that there was ongoing learning through interaction with relevant actors. When the entrepreneurs were asked if a platform was available to them to suggest changes regarding the programme, 50% responded yes, and only 33% indicated that they had seen their suggested changes implemented, as seen in Figure 8. As the managers were asked if there are changes they would like to implement, they all expressed where they perceived challenges in the programme: from lack of resources in servicing disadvantaged communities to work overload as they manage multiple eKasiLab programmes in various communities, which limits their time spent on each entrepreneurial needs for growth, and their need to attract other players cohabiting in the facilities where the eKasiLabs are for easy access for the entrepreneurs. They had ideas on what could be done differently, which indicated learning by doing in the programme's implementation process.

The detailed responses to the questionnaire are in Appendix B-D. The entrepreneurs were also asked questions about the innovation focus and the support they receive from the partners of TIH. As seen in Figure 9, 88% indicated that the innovation focus is local needs-oriented and context-driven. In trying to establish the kind of relations that the actors within the TIH eKasiLab programme network had, the entrepreneurs were asked if they had been connected to other actors within the network. Most indicated they had been connected and received various interventions in their business developments.

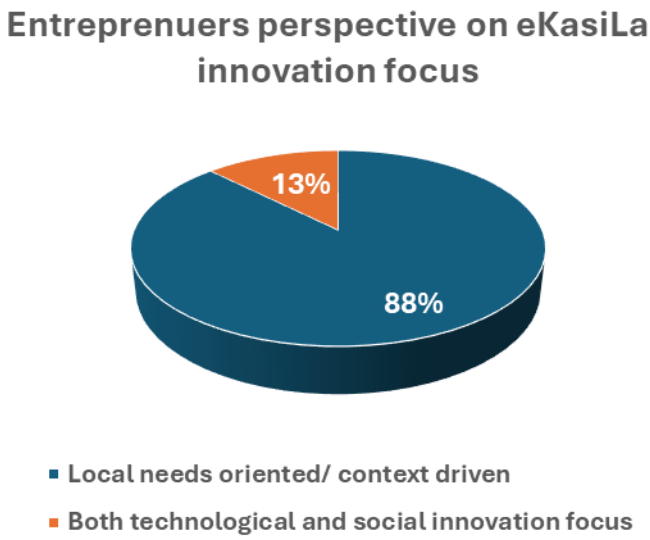


Figure 9: Entrepreneurs perspectives on eKasiLab innovation focus

Table 9: Themes that emerged from the entrepreneurs as beneficiaries regarding the inclusiveness of the eKasiLab programme

Participants \Themes	**B: Inclusion of consumption**	**C: Inclusion of impact**	**D: Inclusion of intention**
1: B1	Proximity to residential area: Proximity and collaboration	Business growth in terms of market and revenue: We have gained new clientele and launched new products in the market.	Creating access to innovation platform for the marginalised: Assist township entrepreneurs.
2: B10	Proximity to residential area: Proximity	Business growth in terms of market and revenue: 12 jobs were created, world-class technology products developed through the help of major industrial firms like CSIR, access to real clients like TUT and listing in supplier database Livelihood improvement: Yes, through employment opportunities created by the business	Creating access to innovation platform for the marginalised: To assist township-based entrepreneurs in developing their enterprises into a world-class manufacturing enterprise.
3: B2	Accessible to the excluded group: Free internet and office space.	Business growth in terms of market and revenue: entrepreneurs in our space have received funding and are growing their businesses	Creating access to innovation platform for the marginalised: To assist budding entrepreneurs in industry areas that promote innovation.
4: B3	Proximity to the residential area: it's closer to my residence	Empowerment of the excluded group: It allowed me to file IP registration, which is something I could not do alone for business innovation	Creating access to innovation platform for the marginalised: to support business innovations that would otherwise not receive this kind of support

5: B4	Proximity to residential area: it's the closest	Empowerment of the excluded group: It has helped me to understand how to position my services to my target market	Creating access to innovation platforms for the marginalised: To assist township entrepreneurs with the necessary support for their businesses in order for them to thrive.
6: B5	Proximity to the residential area: It is in my community.	Business growth in terms of market and revenue: I have grown over the years. I have a product, and I am supplying it to retail companies.	Creating access to innovation platforms for the marginalised: To help entrepreneurs thrive and assist them in formalizing their business hustle and becoming mainstream businesses.
7: B6	Accessible to excluded group: It was close by and easily accessible. It was attractive to local start-ups. Proximity to residential area: It's based in my location.	Empowerment of the excluded group: To empower innovative township start-ups Business growth in terms of market and revenue: I have better knowledge of my business ecosystem. I have increased my networking capabilities. Livelihood improvement: my business has grown enough to empower others in my community.	Creating access to innovation platform for the marginalised: To empower innovative township start-ups.
8: B7	Proximity to residential area: Proximity to residential area	NOT yet	Creating access to innovation platform for the marginalised: To assist business.
9: B8	Proximity to residential area: Is next to my business operation	Business growth in terms of market and revenue: We Have more clients	Creating access to innovation platform for the marginalised: To assist small businesses
10: B9	Proximity to residential area: Proximity	Business growth in terms of market and revenue: The business has been able to diversify its product range and create employment	Creating access to innovation platforms for the marginalised: To assist township-based entrepreneurs who do not have the financial muscle to outsource services and guide them in starting new companies.

Table 10: Themes that emerged from the manager's responses regarding the inclusion of the eKasiLab programme

Participants **\Themes**	**B: Inclusion of** **consumption**	**C: Inclusion of impact**	**D: Inclusion of intention**	**E: Inclusion of process**	**F: Inclusion of structure**	**G: Post-structure**
1: EM	**Accessible to the excluded group:** access to bandwidth, and they have access to mentorship.	**Livelihood improvement:** We created about eight of them around Gauteng at the time. There was almost a marketplace; in certain cases, they could start buying from each other. Employment creation, you know, happened as a result of the companies starting to get through the revenue stage, Instil new skills in the community software development	**Creating access to an innovation platform for the marginalised** was taking innovation to the people.	**Consultations with host community:** -the municipalities, particularly in the case where we are using that utilizing their infrastructure -The TVET colleges were also some of the people that we consulted with -We ran Startup Weekends in the lead-up to setting up the eKasilabs	**Improved community economic activity:** There was almost a marketplace as well, and in certain cases, they could start to buy from each other **Inclusive organisational culture:** mentors unprepared to go into the townships. We excluded them from mentorship because we would build one ecosystem.	**Provisional Programme expansion influenced by programme success:** Gauteng was the, you know, they are moving towards what they called a smart province

M1		**Empowerment of the excluded group:** somebody who came up with an idea that now left, you know, a market with clients who have been generating income. **Livelihood improvement:** I see the differences between Soweto and Kagiso. Soweto is a classic Chase because, you know, there's a lot of development happening in this area; there was a lot of attention and concentration in terms of support in this area. So in Soweto, you know we, we just fall within one of the development programs that are here, but once you start to shift, then you go to Kagiso, so you go to Deni Van Nzyl, you then get to see the reliance on the program and to assist these businesses to all these business people to prosper. We have also developed additional programs that have nothing to do with our KPIs but support community initiatives, for example.	**Inclusion of marginalised to the mainstream economy:** ensure that the people in the townships are also included, you know, in the activities of the mainstream economy		**Resource Limitations** We've got limited resources to assist everybody else. Thus, we could be better resourced to ensure that, you know, we've got a greater impact on the entrepreneurs, and some of our offerings could also be restructured.	**Inclusive discourse in influencing policy:** really, it was driving the mandate of the township modernisation and revitalisation strategy, so it followed a guideline that the government gave to sort of introduce that and ensure that the people in the townships are also included, you know, in the activities of the mainstream economy.
3: M3	**Accessible to the excluded group:** Residents of the catchment township, They are located within reach of beneficiaries and accessible even by public transport. We facilitate introductions should they need to use facilities at Main Hub and handle all arrangements (bookings, use of machines, etc.)	**Livelihood improvement:** We offer training outside the incubated companies and invite them when we have activation/information-sharing days.	**Creating access to innovation platform for the marginalised:** Cultivate innovation in townships and drive SMME development through training.			

4: **M4**	Accessible to excluded group: let's go to the people in the township	Empowerment of the excluded group: township based businesses are flourishing		Insuring active participation of excluded groups: when we got there, we actually spoke to the community first.	**Administration challenges** the admin part is done at TIH, where sometimes we find it because sometimes you can't move. After all, there are issues there. So yeah, I would say some challenges with this. There are a lot of challenges. So when it suits other people, we are the Innovation Hub; when it doesn't suit them, we are not. If possible, you would establish your own little account that you know for a fact that whenever that happens, a CEO or general manager will know it is eKasiLab budget that doesn't go to somebody else's because our budget is there whenever we need it. **Resource limitations** The time spent with entrepreneurs doesn’t enable us to make an impact. Difficult for entrepreneurs to grow their businesses. One manager is responsible for cohorts in various eKasiLabs, which makes it difficult for them to focus on individuals to achieve their varying growth paths.	

Table 11: Themes emerging from the manager's responses on the systemic characteristics of the TIH eKasiLab programme

	A: Actors	B: Innovation focus	C: Institutions	D: Learning	E: Relations	F: Scope
1: EM	**Facilitation and coordination of the platform by intermediaries:** Innovation Hub, being an intermediary, or a Science Park, the value that it brings to the system to any ecosystem	**Strategies employed for both technological and social innovation**: to create an ecosystem that contributes to the province's social-economic development through technology and ICT. **Localisation of innovation for local economic growth**: value creation for the Gauteng economy, a pathway of technologies coming out of the universities and the CSIR to be able to make their way into the market Create the environment start to help start the ideation process at a local level.	**Local Institutional importance**: it was set up by the provincial government Utilize the structures made available to us by the TVETs or the municipalities.	**Ongoing Learning**: One of the things perhaps learning is that it takes time to build trust. **Contextualized Learning:** So one of the things perhaps learning is that it takes time to build trust amongst the actors to eventually collaborate	**Formation of networks through coordinated interactions**: It's more really about value, mutual value creation, and mutual interests. ****validation by B3** and B10 Co-creation type of relationship: I think we ran a couple of hackathons with them. That becomes more of a co-creation in a kind of relationship. Cisco, again, is more empowering.	
2: M1	**Low-income Producers:** low income small scale **Inviting relevant actors based on thorough scoping and analysis:** you sort of partner with a municipality or a college, and they give you space, and you can have a program.	**Strategies employed for both technological and social innovation**: We had a mandate to say, you know, we must drive technology and innovation in the townships; that was the mandate **Strategies to stimulate demand for innovation**: you must capacitate the environment to be able to	**Local Institutional importance**: forge relationships with local institutions where the entrepreneurs can be referred for additional support.	**Contextual Learning**: So, growing the eKasiLab from the third one in Alexandria, we sort of needed to understand that you need to engage extensively. **Learning by doing:** we need to invest a little bit more. The need is greater so we can be better resourced and have a greater impact on these startups or the	**Formation of networks through coordinated interactions**: The duties of an area innovation manager are to recruit resources, and you do that through stakeholders. **Interactions between platform members and other formal or informal actors, coordinated by the platform:** everything that happens at the innovation has happened that	**Socio-economic Inclusion:** identify economic corridors and then try to fill in the eKasiLab into the different economic corridors,

		absorb the technology that you are talking about, and we then had to sort of redirect our focus to capacity building		communities we are supporting.	the eKasiLab technical support would come from the main innovation hub	
3: M3	**Joint obligations among actors for value co-creation:** for various forms of support from product development and testing, validation of innovations, training and financial support Joint obligations among actors for value co-creation. We also partner with various institutions when these have development initiatives that can be implemented from our venues - sometimes with our expert contribution (for example, we provide business skills training if a partner brings a technical skill initiative. **Identifying and engaging poor producers as the main actors:** Residents of the catchment township with ideas (at prototype level) or start-ups seeking assistance with compliance and formal market readiness.	**Promoting innovation tailored to the specific context:** Cultivate innovation is townships, drive SMME development through training, IP support and hot-desking, and nurture entrepreneurship.	**An institution with social impact through entrepreneurial support**: We work with TIA, TUT, SMU, ARC, SEDA, NYDA and GEP for various forms of support from product development and testing, validation of innovations, training and financial support	**Learning by doing**: We should strive to have other players (GEP, SEDA, NYDA) and ourselves sharing facilities so that we become one-stop locations.		
4: M4	**Joint obligations among actors for value co-creation**: funding is ring-fenced through the provincial government	**Promoting innovation tailored to the specific context**: Cultivate innovation is townships.	**An institution with social impact through entrepreneurial support:** Also, we have TIA funds a big grant with that one	**Learning by doing**: One manager is responsible for cohorts in various eKasiLabs, which makes it difficult for them to focus on individuals to achieve their varying growth paths.	**Relationships contributing to the sustainable transition of society:** When we came to Alex, we had a memorandum of agreement with a central Johannesburg college that is a TVET as far away from where we sit in that so, and then they had allocated a space we were supposed to have developed a lab	**Marginalised group focus:** we don't have products produced from eKasi, you know, so we're trying to bring those products to take, come forward.

					Formation of networks through coordinated interactions: go out on a slip to go and forge the relationship between different stakeholders	

CHAPTER 5: ANALYSIS AND DISCUSSION OF RESEARCH FINDINGS

5.1 INTRODUCTION

In the previous chapter, the research findings were presented based on virtual interviews conducted with management and a questionnaire completed by entrepreneurs. In this study, the book by Sibanda (2021) has been utilised as a secondary data source, offering valuable context and theoretical perspectives that complement the primary data collected. The book explores the eKasiLab programme, featuring detailed accounts and shared experiences from former managers and entrepreneurs.

As a secondary data source, it offers pre-analysed and published insights that serve as a foundation for cross-verifying and enriching the findings obtained from primary sources like interviews and questionnaires. By integrating this book into the triangulation process, the research enhances the robustness of its conclusions. Comparing the book's content with primary data allows for the identification of consistencies, discrepancies, and additional insights, contributing to a more comprehensive understanding of the research topic. This approach supports the validity of the findings and helps contextualise the results within broader theoretical and historical frameworks.

5.2 DISCUSSION PERTAINING THE INCLUSIVENESS OF THE EKASILAB PROGRAMME

According to the Gini index, South Africa had the highest inequality income distribution in 2021 globally, with a GINI score of 63 (Dyvik, 2024), where the score measures the income inequality in a country; the closer the score is to zero, the more equally distributed the income. Inequality is inherently problematic and holds back social and economic development in the long run (Stiglitz, 2012). It is suggested that mainstream innovation is associated with increasing inequality, while reduced inequality is associated with inclusive innovation(Cozzens, 2008; Lazonick & Mazzucato, 2013). There has been a growth in intellectual output on inclusive innovation (Heeks et al., 2014). There are a variety of new models of inclusive innovation, such as the innovation platforms as mechanisms to bring together a group of stakeholders to innovate for a particular issue of common interest (Swaans et al., 2014). The eKasiLab program was created to support township-based entrepreneurs, a marginalised group in South Africa (Ngubeni et al., 2022; Urban & Ndou, 2019), by providing resources like training, mentorship, and funding to help grow their businesses. This initiative addresses systemic challenges, such as limited access to capital and networks, and plays a vital role in promoting economic growth and social inclusion for township communities. This programme was introduced in response to local policy shifts, as Gauteng's Premier announced the township revitalisation (Sibanda, 2021). In evaluating the inclusiveness of the eKasiLab program, various aspects of inclusion were investigated as guided by the ladder of inclusive innovation in understanding how the TIH eKasiLab programme has been inclusive in its intention, consumption, impact, process, structure, and post-structure. Each level involves gradual deepening and/or broadening of the extent of inclusion of the marginalised group in relation to innovation.

There is no right or wrong focus and level, but it is critical to be aware of a potential for superficial inclusion in the text i.e. policy or research paper and which group and type of inclusion underpins that text (Heeks et al., 2014).

In this study, the various levels of the inclusive innovation ladder were inquired about through research questions directed to entrepreneurs and managers.

5.2.1 QUESTION OF INCLUSION OF INTENTION

"Taking innovation to the people…"

Establishing the intention of the eKasiLab programme as perceived by both the management and the township-based entrepreneurs as beneficiaries was critical in understanding the inclusiveness in level 1 of the inclusive innovation ladder. The management was directly asked what the intention of the eKasiLab program was, while the entrepreneurs were asked why they joined the programme. This enabled the validation of the intention of the eKasiLab as explained by the managers and experienced by the township-based entrepreneurs. The intention of the eKasiLab programme, as described by the managers, was to assist township-based entrepreneurs in developing their businesses from prototype development to commercialisation into mainstream economy participation, specific to the ICT sector as per the codes in Table 10. This was done by creating access to an innovation platform for the marginalised by taking it to them. The entrepreneur's responses in Table 9 aligned with the intention described by the managers. They further highlighted how access to the innovation platform has enabled their business "to thrive and formalised their business hustle to become mainstream businesses."

5.2.2 QUESTION OF INCLUSION OF CONSUMPTION

"Proximity to residential areas…"

To establish if the eKasiLabs were used as intended, in having the township-based entrepreneurs use the facilities and benefit from the proximity of the eKasiLab to their place of dwelling. The entrepreneurs were asked which eKasiLab they attended and why. In response to this question, 60% of the respondents explicitly indicated that they joined the eKasiLab due to its proximity to their residential area, as seen in Table 6. The managers indicated that as much as proximity was the ultimate intention of the programme, the programme provided the entrepreneurs with access to resources such as bandwidth, mentorship, and the main innovation hub infrastructure, which was initially far from reaching them, as per summarised responses in Table 10. To travel to the Pretoria Innovation Hub main campus from the East Rand, where one of the eKasiLab is situated in Katlehong, requires one to take at least 3 taxis and is also pricey given that it would not be a once-off visit for an entrepreneur that is working on developing their product without any form of compensation or stipend.

Papaioannou (2013) highlights the frugal innovation model, which is classified as one of the new inclusive innovation models focusing on minimising resource use, cost and complexity. This aligns with minimising cost, resource use, and complexity for entrepreneurs in marginalised communities by bringing them innovation platforms in the form of eKasiLab. Heeks et al. (2014) places frugal innovation in Level 1 and Level 2 of the inclusive innovation ladder.

5.2.3 QUESTION OF INCLUSION OF IMPACT

“Township-based businesses are flourishing”

The impact was examined from two angles: the direct impact on entrepreneurs and the ripple impact on the host communities. The township-based entrepreneurs were asked questions about the kind of impact the programme has had on the business

development from a market and revenue perspective as well as livelihood improvement in their communities, i.e. through employment creation by their companies. The results indicated that the entrepreneurs were empowered in various ways and helped in improving the livelihoods of their communities in some instances, as listed below derived from Table 9:

- increasing their market share, supplying to retail partners, and attaining necessary knowledge for their business growth,
- attaining networking capabilities and access to relevant networks, product development through TIH's ecosystem partnerships, IP registration
- creation of employment opportunities for their township communities
- Product diversification and access to funding.

When the management was asked about the programme's impact on the entrepreneurs and host communities. They indicated that the network of the eKasiLab also translated into a marketplace for entrepreneurs, as they would buy from each other. The training offered to the entrepreneurs has assisted in growing their businesses into flourishing businesses. They expressed having to go beyond their key performance indicators (KPIs) in servicing the host communities in creating additional programmes such as digital skills development for the youth and hosting of information sessions for the public or students of the TVET collages were most of the eKasiLabs are hosted as outlined in Table 10.

5.2.4 QUESTION OF INCLUSION OF PROCESS DISCUSSION

"An innovation is inclusive if the excluded group is involved in the development of the innovation…"

The question on the inclusion of the process was directed to the management as they would have been directly involved in the rolling out of the programme in the various township communities—their tenure as managers has had them involved in the programme from its inception stages. In addition, the previous executive manager, who was part of the interview process, was at the centre of the programme's inception. Further insight was gathered from some managers sharing their experience of being involved in the process (Sibanda, 2021). The essence of the eKasiLab programme was to bring the innovation platform to the people without spending on infrastructure development. As a result, they looked into municipalities and local higher education institutions for existing infrastructure. This required the consultation process to involve the local municipal leaders and TVET colleges, which was done by the management to get them to agree to host eKasiLab on their premises or for local municipalities to allocate facilities. There were teething challenges in infiltrating some of the communities, such as the Alexander, Ga-Rankuwa to name a few communities, due to the political climate as they would experience push back in implementing in the community by some community members “we constantly dealt with community protested, threats to burn our facility and attempts to highjack the building we operated from…” that were unhappy with the service delivery of the local municipality. This was also validated by previous implementation managers (Sibanda, 2021). This affected the very intention of the programme in bringing innovation to the township communities as these were subject to running from inner cities, far away from the residential areas of the entrepreneurs. The management indicated that before implementing in a specific community, they would host startup weekends with township-based entrepreneurs leading up to the setting up of the eKasiLabs. The summary of the manager's responses is found in Table 10. Additionally, the entrepreneurs were asked

if a feedback channel was available to make suggestions on the programme. Figure 8(a) shows that 63% of them indicated no visible channels for that to occur, while only 38% indicated that they have seen their suggestions implemented Figure 8(b).

Heeks et al. (2014) indicates that the grassroots innovation model aligns itself with Level 4 of the inclusive innovation ladder, ensuring that the innovator comes from the marginalised group involved in the early stages of the innovation lifecycle. It places the marginalised innovator at the heart of the process, as in the eKasiLab programme rollout, exploiting and further enhancing their innovation capabilities.

5.2.5 QUESTION OF INCLUSION OF STRUCTURE DISCUSSION

"An innovation is inclusive if created within a structure that is itself inclusive…"

The managers shared similar sentiments during the virtual interviews and from Sibanda (2021), where they expressed the internal scrutiny from the TIH EXCO and monitoring and evaluation (M&E) team. Some managers expressed having challenges to date with having to manage multiple eKasiLabs, limiting the time spent on individual entrepreneurs, issues around the budget of the eKasiLabs managed at the main hub, and limiting autonomy on the use of funds in Table 11. Resource limitations are another issue the managers highlighted in servicing previously disadvantaged communities, requiring more investment in basic infrastructure. These highlight some of the internal organisational challenges in implementing the programme. The previous EM highlighted that in the programme implementation, from the appointment of mentors, the mentors who were not willing to go into townships were excluded from the mentorship programme.

(Heeks et al., 2014) further emphasise that inclusive innovation models frequently challenge existing power structures. These models aim to disrupt traditional systems

by providing marginalised groups with opportunities and resources to innovate, thus fostering more equitable participation in economic and social development.

. However, these power structures are wider and are likely to continue to dominate, reproducing themselves within the practice of inclusive innovation models and potentially generating innovation without Level 5 type of structural inclusion. These insights are drawn from the work of Cullen et al. (2014), where through deductive application to innovation platforms in Ethiopia of the power cube framework, looking at three political dimensions: the shaping of the space within which inclusive innovation takes place, the forms of power-both overt and hidden-which are exercised during the inclusive innovation stakeholder selection and interaction, decision-making and implementation. The different power levels manifest within inclusive innovation initiatives such as innovation platforms and are central determinants of the outcomes of the inclusive innovation models. The lessons learned from Swaans et al. (2014), and according to Heeks et al. (2014) in analysing the model of innovation platforms from an inclusive system of innovation perspective, is that the innovation platforms model sits “relatively convincingly” at inclusive innovation Level 5 (Structure). ‘Relatively’ since multi-stakeholder innovation platforms are only sub-structures within the wider structure of national agricultural systems of innovation. ‘Convincingly’ since it is a structural model seeking to include the poor-farmers in a model applied largely in agriculture alongside other stakeholders in the innovation process.

5.2.6 QUESTION OF INCLUSION OF POST-STRUCTURE DISCUSSION

> “An innovation is inclusive if created within a frame of knowledge and discourse that is itself inclusive…”

In 2014, the Gauteng government announced the Gauteng township economy revitalisation Sibanda (2021) that seeks to build on existing government support

programmes and respond to barriers that are pronounced in township enterprises, namely:

- Lack of entrepreneurial and productivity.
- Poor understanding of the abilities and value of township enterprises.
- Limited account is taken of the characteristics and needs of township enterprises within an enabling and supportive environment, and
- Complexity and lack of coherence within township economy sectors combined with widely varying skills and knowledge bases.

The strategy was a five-year action programme aimed at the removal of these barriers with key stakeholders in national, provincial and local government, the corporate sector and other organisations, in achieving three outcomes: Create an enabling and supporting environment based on the seven strategic focus areas for township economy revitalisation; establish the social and economic value of township economy; and ensure that the township enterprises become key players in the Gauteng economy.

In response to this strategy, TIH, under the leadership of Dr McLean Sibanda, responds to this political urgency by implementing the eKasiLab programme. This was echoed by the managers interviewed when asked how the programme has influenced policy in alignment with insights from (Sibanda, 2021). Fressoli et al. (2014) explore the issue of power seen in Level 5 by understanding the framing of inclusive innovation models in the way meanings and narratives are produced from a post-structural (Level 5 of the inclusive ladder) perspective. Their results highlight two types of outcomes: “Grassroots innovation may be inserted into the innovation mainstream but possibly in the form of a scaled, de-contextualised model that betrays some notions of inclusivity.

Alternatively, grassroots innovation may mobilise and resist, still seeking to provide an alternative to conventional innovation." In both cases, mainstream innovation still dominates the innovation discourse and structures. As a result, inclusion is created at a relatively small scale for Level 5 and Level 6. UNDP (2020b) highlights that South Africa lacks instruments, platforms, or intermediaries to identify grassroots innovators within the communities and connect them to the national innovation system. They further highlight that there is no published policy for innovation for inclusive development and local innovation. This highlights some of the policy-level structural challenges in supporting inclusive innovation.

The TIH eKasiLab programme can be considered to illustrate that inclusive innovation and mainstream innovation are not separate bubbles (Fressoli et al., 2014). According to Heeks et al. (2014), they interact and influence each other, with the potential of the mainstream innovation models becoming more inclusive. In the future, emphasis should be placed more on the process of modelling the actors and means by which models of inclusive innovation are constructed and less on the models.

Heeks et al. (2014) investigated the variety of inclusive innovation models and analysed their similarities with the various levels of the inclusive innovation ladder as shown in Figure 11. The summary of the insights is drawn similar to Harsh et al. (2018), where similarities between the levels of the inclusive ladder and the three pathways to equity through emerging technologies were drawn. This highlights that the various inclusive innovation models only address a specific level of inclusiveness; to achieve overall inclusivity in innovation, the different models would need to be implemented to some degree if the ladder approach is not taken. The producers or actors in the innovation process and site of innovation are considered one of the differentiators of the various inclusive innovation models (Onsongo & Schot, 2017). Grassroots

innovation would be dominated by entrepreneurs in the informal sector community-based organisations, while frugal innovation would be dominated by Western multinationals in emerging economies.

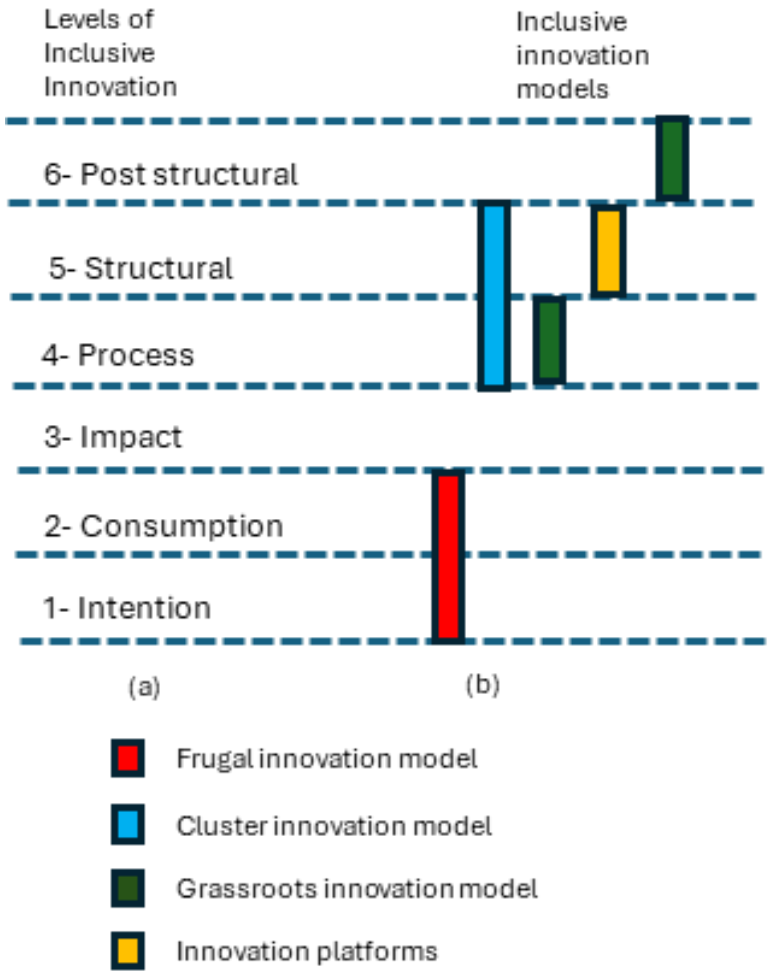


Figure 10: A comparison of (a) the inclusive innovation ladder and (b) inclusive innovation models (Heeks et al., 2014).

5.3 DISCUSSION ABOUT THE SYSTEMIC CHARACTERISTICS OF THE EKASILAB PROGRAMME

The 1996 White Paper on Science and Technology (DST, 2019) introduced the concept of the national innovation system in the SA context, which became a cornerstone of the government policy on science and technology (Manzini, 2012). The introduction of NSI in the SA context enabled an explicit causal relationship between scientific activity and economic performance. It also emphasised the need for coherence and integration in the functions and activities of the country's science and technology institutions. Since then, the white paper has been reviewed, showing significant progress in the NSI, and some persistent challenges in the fragmented STI policy across government and partnerships amongst the various NSI players, including civil society, can still be expanded. TIH was conceived as cooperation between UP and CSIR in the mainstream innovation trajectory (Sibanda, 2021). There have been various policy shifts, the transformation of the Department of Science and Technology (DST) to the Department of Science and Innovation (DSI), as well as changes in the political landscape in the placement of the Department of Higher Education and Department of Science, Technology, and Innovation under one ministry. As a result, the 2019 White Paper on Science and Technology and Innovation (DST, 2019) was introduced to leverage STI to address socio-economic challenges by being more inclusive in the NSI. In informing the decadal plan, a 10-year implementation plan for the 2019 White paper, various foresight and review reports, including the 2020 Ministerial Review of the Higher Education, Science, Technology and Innovation Institutional Landscape (HESTIIL), I participated in conducting extensive research in reviewing peer and industrialised NSIs as input to inform the findings and recommendations of the report (DSI, 2020).

In addition to the policy shift for more inclusivity in the NSI, there are various instruments that the DSI has introduced to support various innovation activities, such as the DSI eighteen technology stations. These were established to enable universities to provide technology development services to SMMEs. This is critical infrastructure for grassroots innovators, managed through the Technology Innovation Agency (TIA). The six DSI fabrication labs are small-scale production factories for prototype designs ranging from arts and crafts to engineering and architecture models. As open innovation environments, the DSI Living Labs are targeted at rural communities and are currently running in 5 provinces nationwide. As much as these interventions exist, they seldom reach their intended target market, as most grassroots innovators lack awareness of the schemes and programmes available to them. They also lack formal mentors, advisors and coaches to assist them with the complex innovation process. The TIH eKasiLab programme aims to bridge this gap through its platform. This section will explore the ecosystem analysis and discuss the results.

By examining the characteristics of the TIH eKasiLab programme, it was analysed to determine whether it could be classified as a system of innovation or an innovation ecosystem. The interactions with the managers revealed various themes, summarised in Table 11, that highlighted the characteristics of the TIH eKasiLab programme. These themes were then analysed to align them with the systemic structures.

Table 12 shows that the systemic structure of TIH shares certain characteristics with the innovation ecosystem, particularly in its actors, relationships, and institutions. However, the TIH eKasiLab structure stands out as unique compared to both the innovation system and ecosystem, especially in terms of its scope, focus, and learning activities. The scope of TIH eKasiLab emphasises integrating marginalised entrepreneurs into mainstream innovation activities, primarily promoting localised

technologies and fostering a supportive environment for township-based technology entrepreneurs.

Table 12: Comparison of the TIH eKasiLab systemic characteristics with those of the innovation system and innovation ecosystem

Characteristics	**Innovation Systems**	**Innovation ecosystem**	**Themes that emerged from the insights**	**Analysis of TIH concerning the systemic structure**
Scope	Technology developments in individual firms drive linear models of innovation (technology push and demand pull).	Co-creation of innovation by networks developed by actors and interactions. Within a generated ecosystem of linkages and assets.	Socio-economic inclusion and marginalised group focus	The scope of the eKasiLab programme was ultimately socio-economic inclusion of the marginalised groups and inclusion of the township economic corridors into the mainstream innovation activities.
Innovation focus	To develop an R&D and national innovation system by supporting its agents and infrastructure elements without a collaborative view and its innovation synergy effects	Both technological and social innovation-focused. Promoting localised ecosystems across the economy and through facilitated interactions and collaboration within and between networks enhances their innovation synergy effects.	Strategies employed for both technological and social innovation Localisation of innovation for local economic growth Strategies employed for both technological and social innovation Strategies to stimulate demand for innovation Promoting innovation tailored to the specific context	The innovation focused on promoting the localisation of technological and social innovation in township communities. Creating a conducive environment for technology entrepreneurs to ideate, develop and commercialise in the technology sector.

Actors	Actors form the main networks of industries, government and universities.	Networked collaborative actors with a common vision strategy and joined obligation in value co-creation. With actors from central and peripheral networks in local and geographical contexts. Citizens are emerging as key actors.	Facilitation and coordination of the platform by intermediaries role played by TIH Low-income Producers Inviting relevant actors based on thorough scoping and analysis Joint obligations among actors for value co-creation	With support from the provincial government as an intermediary, the Innovation Hub would coordinate the formation of partnerships with local players such as TVET and local municipalities and other entities such as TIA NYDA, all government-supported initiatives, in contributing various resources for developing township-based entrepreneurs. Also, put in resources to recruit low-income producers.
Learning	An institutionalised context that encourages learning and innovation	Learning from customers between companies leads to a constant and balanced conception of ideas, knowledge and technology amongst the different communities and networks.	Ongoing Learning Contextualized Learning Learning by doing	Through contextualised, continuous learning through implementation and interaction with the beneficiaries, 10 eKasiLabs have been successfully established in various township communities in Gauteng.
Relations	As per the Triple Helix innovation model, the primary innovation actors have a reciprocal relationship for value creation in the development of innovation systems.	The co-creation relationship amongst the actors, interdependent and indirect relations in the cross-geographical context in sustainable transition of society	Formation of networks through coordinated interactions Relationships contributing to the sustainable transition of society	The relationships are formulated through coordinated interactions mostly by the intermediary Innovation Hub, and the individual managers are also mandated to forge relationships with relevant stakeholders.
Institutions	As informed by the triple helix model, universities, industries, and government are the	Broad consideration of institutions from social and environmental structures.	Local Institutional importance	Local institutions are important due to the support they give the programme, such as infrastructure to implement it and

	primary institutions in the innovation systems.		Institution with social impact through entrepreneurial support:	financial support from local funding agencies with a social impact lens.

In Table 13, the analysis of inclusive innovation platforms reveals a high intensity in certain characteristics related to scope, actors, and relationships, whereas the inclusive innovation system shows significant intensity in learning activities. This suggests that the systemic structure of the TIH eKasiLab cannot be neatly classified into a single framework, as its characteristics span across three different systemic models: Inclusive Innovation Platforms, Inclusive Systems of Innovation, and Innovation Ecosystems. This indicates that the TIH eKasiLab integrates elements from multiple frameworks, reflecting a complex and multifaceted approach to supporting innovation.

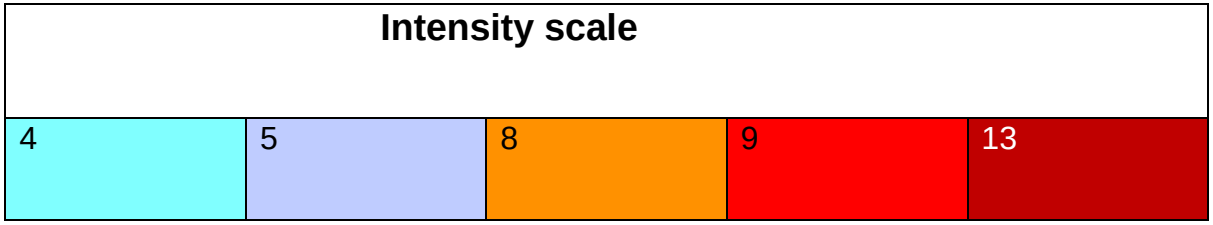
Table 13: Outlines the characteristics of the various systemic structures and process components, indicating the intensity of alignment with the characteristics of TIH eKasiLab programme

Characteristics	**Inclusive Innovation Platforms**	**Inclusive System of Innovation**	**Innovation Systems**	**Innovation ecosystem**
Scope	Bring relevant actors together to address a (development) issue of common interest, specifically focusing on marginalised groups.	Development of socioeconomic inclusion Micro-level analysis of livelihoods	Technology developments in individual firms drive linear models of innovation (technology push and demand pull).	Co-creation of innovation by networks developed by actors and interactions. Within a generated ecosystem of linkages and assets.
Innovation focus	Stimulate demand and context-driven innovation (technological, organisational and	Incremental innovation focusing on diffusion process for local needs-oriented/ context-driven	To develop an R&D and national innovation system by supporting its agents and infrastructure elements without a collaborative view	Both technological and social innovation-focused. Promoting localised ecosystems across the economy and through

	institutional) through joined problem-solving, leveraging the diversity amongst the IP members.	None-technical innovation with a focus on social systems of sales and support Reverse innovation	and its innovation synergy effects	facilitated interactions and collaboration within and between networks enhances their innovation synergy effects.
Actors	Focus on poor producers; relevant actors are invited based on scoping and analysis. The platform is facilitated and coordinated by intermediaries.	Focus on low-income producers/consumers, non-traditional, less formal, demand-side innovators. Chain of innofusion intermediaries (linking distant supply and demand)	Actors form the main networks of industries, government and universities.	Networked collaborative actors with a common vision and strategy and joined obligation in value co-creation. With actors from central and peripheral networks in local and geographical contexts. Citizens are emerging as key actors.

Learning	Contextualised learning through communication and information exchange among actors	Contextualised, learning by doing/ diffusion, use and interacting. Learning about wider social processes, including non-instrumental processes Survival and utility-maximisation as guides	An institutionalised context that encourages learning and innovation	Learning from customers between companies leads to a constant and balanced conception of ideas, knowledge and technology amongst the different communities and networks.
Relations	Linkages established through facilitated/coordinated interactions between members of the	Necessity of Informal, loose, but socialised relations	As per the Triple Helix innovation model, the primary innovation actors have a reciprocal relationship for value	The co-creation relationship amongst the actors, interdependent and indirect relations in a cross-geographical context in the

	platform and other formal/informal actors		creation in the development of innovation systems.	sustainable transition of society
Institutions	Key institutional constraints and opportunities are jointly identified and addressed. They can be formal or informal.	Complex institutional terrain of informal/formal, with the importance of informal institutions locally.	As informed by the triple helix model, universities, industries, and government are the primary institutions in innovation systems.	Broad consideration of institutions from social and environmental structures.



5.4 SUMMARY OF THE DISCUSSION

The eKasiLab programme characteristics, as described by the participants in response to the research questions, indicated that the programme is inclusive in the various levels of the inclusive innovation ladder. However, at the structural level, due to the organisational power dynamics and administration challenges that continue to be a challenge in the seamless management of the eKasiLabs as indicated by the various managers that would appreciate some level of autonomy in managing their financial resources dedicated to the programme to better address the challenges that local entrepreneurs have.

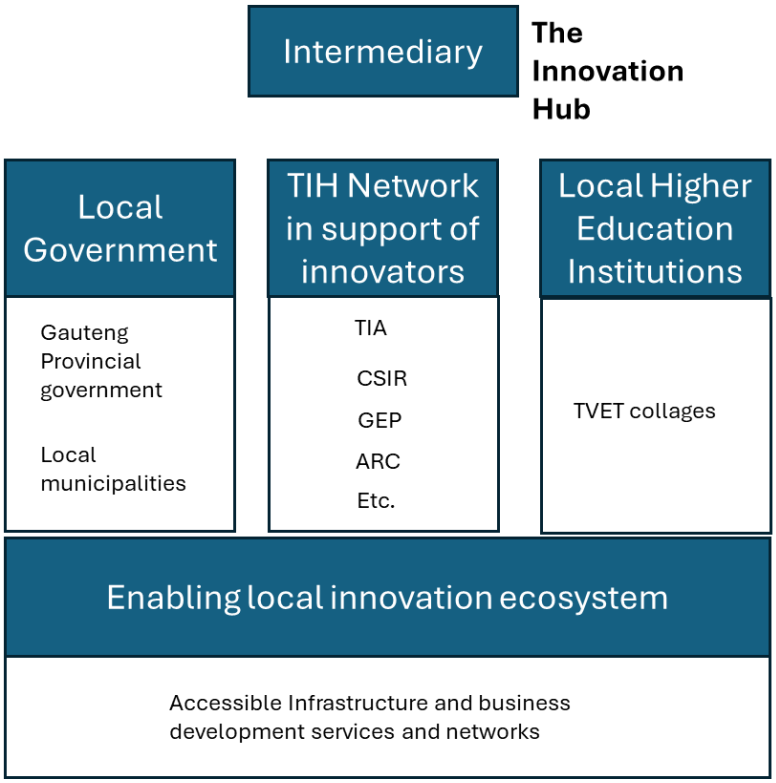


Figure 11: High level scope of TIH eKasiLab local innovation ecosystem.

Furthermore, analysing the eKasiLab programme through an ecosystem perspective provides a deeper evaluation of its structure and processes. The systemic structure of

the eKasiLab programme aligns with the innovation ecosystem in terms of its actors, relationships, and institutions. However, it distinguishes itself with an inclusive approach and contextualized learning. This alignment is evident when comparing the innovation ecosystem with the innovation system. When considering inclusive systemic structures, such as inclusive innovation platforms and systems, they better align with aspects that may be misaligned in the traditional innovation ecosystem.

In its implementation process, TIH played an intermediary role in facilitating and coordinating the various relevant actors in supporting the township-based entrepreneurs with the resources needed for their township-based businesses through its network of organisational support, as illustrated in Figure 12. The co-creation aspect of the eKasiLab ecosystem is first seen in the creation of the programme in response to local government policy and support received from local government agencies and local municipalities during implementation with long-term relationships with TVET colleges as host institutions to date, aligning in the common vision of bringing innovation to the marginalised township entrepreneurs.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The system of innovation framework (Foster & Heeks, 2013) was used to conceptualise an inclusive system of innovation by applying it in the case of mobile phone diffusion in Kenya. This framework reviews the five core systemic components of structure and process: overall scope, innovation focus, actors, learning, relations, and institutions. Innovation ecosystems are crucial for the development of new and young ventures as they increase the likelihood of NTF survival and entrepreneurship at individual, organisational, and regional levels (Klimas & Czakon, 2022). In the South African context, the NSI is still linear in nature and not contextualised, and it has its challenges from being fragmented and having policy gaps, as per the 2019 White Paper (DST, 2019). South Africa remains the country with the highest income inequality globally, with a GINI score of 63 (Dyvik, 2024). The score measures the income inequality in a country, and the closer it is to zero, the more equally distributed the income is in an attempt to contribute to addressing this challenge. Harsh et al. (2018) looked at emerging technologies' role in inclusive innovation. They highlight that inclusive innovation is critical in informing policy pathways to address inequality through leveraging technology. Heeks et al. (2014) emphasises that inclusive and conventional innovations are not separate bubbles. They interact and influence each other, and the mainstream innovation models can potentially become more inclusive. More focus should be directed towards the actors and how inclusive innovation models are constructed.

The distinction between the various structures and processes required to develop and deliver new goods and services in the form of systems of innovation has enabled unique characteristics of innovation ecosystems to emerge in comparison to NSI. Smorodinskaya et al. (2017) and Swaans et al. (2014) highlight that the clear distinction between the two is that NSIs are seen as static structures regulated by government bodies, while innovation ecosystems are considered to be dynamic and agile collaborative structures that achieve interactive innovation through self-governance. As such, the innovation ecosystem “symbolises the newly emerging, network mode of arranging business activity and economic governance, which enables companies and territories to master innovation-led growth and benefit from rapid technological changes” (Smorodinskaya et al., 2017).

Through understanding the structure and process components of the TIH eKasiLab programme and analysing its inclusive approach. The study seeks to illustrate how building an inclusive innovation ecosystem can assist in the development of the NTFs, ultimately improve the livelihoods of the people, and hopefully inspire the approach in implementing the decadal plan DSI (2020) with a socio-economic development lens.

6.2 REVIEW OF RESEARCH QUESTIONS AND RESEARCH PROPOSITIONS

The summary of the three research questions and their associated three research propositions is outlined in Table 10. The table briefly describes the research finding in validating and invalidating the research propositions.

Table 14:describes the research finding in validating and invalidating the research propositions.

Research Questions	Research Findings
1. How is the TIH eKasiLab programme inclusive in the various inclusive innovation ladders?	The Innovation Hub eKasiLab programmes were inclusive in: 1. Intention- the eKasiLab programme is intended to take the innovation platform to the township-based entrepreneurs. 2. Consumption- The programme continues to be consumed by the entrepreneurs that are in close proximity to the eKasiLabs 3. Impact- The entrepreneurs were impacted in various ways in business development and professional development (business acumen) through the training and the network opportunities, 4. Process- There was a level of consultation with the entrepreneurs through startup weekends, and community leadership was also consulted when implementing the programme in various communities. However, the broader community was not consulted, resulting in a pushback in some of the communities. In most instances, the pushback was beyond TIH eKasiLab, but it misdirected dissatisfaction with the local government on other service delivery matters. More can be done to be more inclusive in the process. 5. Structure- Internally, there were challenges at the governance level in supporting the programme, which stifled its growth. There is still room for improvement in this regard. 6. Post-Structure- As much as the programme's inception was at a local government level, it is unclear if its success influenced the national policy.
2. How did the TIH eKasiLab programme assist the township-based NTFs in their development stages	The entrepreneurs shared success in how the programme helped in their business development: • the programme assisted them in their product development, • increase in market size and revenue, • enabled critical networks and • access to funding and mentorship.
3. What are the structure and processes of the TIH eKasiLab programme?	The structure and process characteristics 1. Scope- socio-economic inclusion, which aligns more with an inclusive innovation system, involves various actors achieving the scope through local government linkages. 2. Innovation Focus- promote technology localisation and innovation by township-based entrepreneurs 3. Actors- The actors included local government, government agencies, local higher education institutions and businesses.

	4. Relations- the relationships were formulated through an intermediary, the custodian Innovation Hub; individual labs continue to maintain and forge new relationships with other relevant partners with a common vision of creating self-sustainable communities through supporting township-based innovators. 5. Learning- contextualised and continuous learning 6. Institutions- mostly local formal institutions

6.3 KEY CONCLUSIONS OF THE STUDY

The Innovation Hub was launched as a traditional science park (Comins & Kraemer-Mbula, 2016), with no focus on entrepreneurship or inclusive innovation as science parks are usually associated with universities in the TIH hub case, sandwiched between the University of Pretoria and research institutions like the case of the CSIR. Through an intentional approach in creating the innovation support programmes of TIH, contextualised to the needs of industry, communities, and local government. Programmes like eKasiLab were created in response to the local government policy. For the role of the programme, TIH had to act as an intermediary in galvanising the relevant actors to commit resources to the common vision of revitalising the township economy through supporting innovators from township communities by bringing the services of TIH to them for easy access and opportunities for further development of their businesses.

6.3.1 INCLUSIVENESS OF THE eKasiLab PROGRAMME

In evaluating the programme's inclusiveness from the managers and the beneficiaries, the inclusive innovation ladder enabled the deeper analysis moving from one step to the next. The entrepreneurs validated the intention to bring innovation to the people, as indicated by the managers, who indicated that they joined the programme due to proximity to residential areas. The intended consumers of the programme were township-based innovators; the proximity of the stations enabled the township-based innovators to tap into the resources provided by TIH, which would have been far from reach for most of them. The township-based innovators echoed the programme's impact on the growth and progress they have seen in their business through their participation in the programme. The entrepreneurs could not validate the inclusion of the beneficiaries in the implementation process, and there are currently no open

feedback channels for local innovators to contribute to improving the eKasiLab programmes and processes. Management did indicate that there were brief consultations with the entrepreneurs during the implementation stages of the programme. There are challenges within TIH governance structures in supporting the eKasiLab programme, from early implementation stages to lack of internal support and scrutiny. The managers raised concerns about the lack of autonomy in managing the programme budget, which prevented them from fully providing adequate support to the township-based entrepreneurs. It could not be validated if the eKasiLab had post-structural inclusion in influencing policy beyond the Gauteng local government.

Key learnings that can be drawn from this programme include the need for innovation inclusion to be contextualised. Understanding the context in which the interventions need to be applied can inform the rollout strategies and help identify key stakeholders for consultation and relevant actors to support the process through a collaborative approach in leveraging existing resources.

6.3.2 STRUCTURE AND PROCESS COMPONENTS OF TIH EKASILAB PROGRAMME

Investigating the programme's structure and process components through the lens of the key components of the national innovation system. The inclusive approach in the programme’s intention, consumption, and impact helped inform the structure and process in the programme’s overall innovation scope, innovation focus, and actors that were involved, through TIH as an intermediary in establishing relationships with the various institutions, in implementing the programme, contextualised learning helped in informing the rollout of the eKasiLabs. The Innovation Hub had resource limitations that led to its intermediary role in collaborating with various actors with the common vision to bring about various resources, infrastructure information, finances, etc., for

the benefit of the township-based innovators. As much as the NSI in SA is said to be fragmented DST (2019); UNDP (2020), at a local level, TIH enabled cohesion amongst the various state-owned entities from local government, higher education institutions, government agencies, and some network of industry players and research institutions, through a common vision in direct words by the previous executive manager: “to create an ecosystem in essence that contributes to the social, economic development of the province through technology and ICT. Creating an environment starts to help start the ideation process at a local level”. In analysing the activities undertaken by TIH through the eKasiLab programme, the systemic structure of the TIH eKasiLab overlaps with aspects of the innovation ecosystem, inclusive innovation platforms, and inclusive innovation systems. Certain characteristics are more pronounced in one system compared to others.

6.3.3 eKasiLab PROGRAMME SUPPORTING NTBFS IN THEIR DEVELOPMENT STAGES

The impact of the TIH eKasiLab programme on supporting township-based firms extended well beyond the business growth achieved by some beneficiaries, including revenue, market share, product diversification, and improved access to networks for technical support and financial resources. Additionally, the programme had significant spillover effects, such as addressing unemployment through the jobs created by these firms and fostering a stronger entrepreneurial culture within the host communities. These broader benefits highlight the programme's role in driving socio-economic development in the townships it serves, true to its scope and innovation focus.

6.4 RECOMMENDATIONS FOR INNOVATION ECOSYSTEM BUILDERS AND POLICY STAKEHOLDERS

There are various models and frameworks of structural and processes in informing and managing innovation strategies. From conventional National Systems of Innovation (Freeman, 1995) to National Learning Systems (Viotti, 2002), inclusive systems of innovation (Foster & Heeks, 2013), innovation platforms (Swaans et al., 2014), innovation ecosystems (Klimas & Czakon, 2022), etc. In adopting these frameworks for policy development or as interventions in addressing societal gaps, it is critical to understand the context in which these will be applied. The clear indication is that the TIH eKasiLab integrated elements from multiple frameworks reflect a complex and multifaceted approach to supporting innovation. Applying the inclusive innovation ladder to analyse the systemic structure of TIH eKasiLab might have enabled this observation to be made.

SA has legacy challenges in the apartheid era that brought issues of inequality, marginalised communities, etc. These issues need to be considered in the economic environment's development, and the inclusive lens should be considered as a constant filter in adopting models and frameworks.

It is clear from the inclusive innovation ladder that the individual steps do not utterly constitute inclusivity; it is going deeper into the steps of the ladder that enables the inclusive approach to drive economic development through inclusive innovation. The various models of inclusive innovation are limited to one or two steps of the inclusive innovation ladder; there are no clear linkages amongst the various models of inclusive innovation that would imply that by adopting one model of inclusive innovation, you have successfully progressed to the various steps of the inclusive innovation ladder.

However, the various models of inclusive innovation can assist in gradually climbing the ladder of inclusive innovation from an implementation perspective. Continuous monitoring and evaluation can assist in evaluating the progress on the level of the inclusive innovation ladder.

One of the key elements of the inclusive innovation ladder is step 1, which requires inclusion in intention; addressing how this intention will be realised in going through the various inclusive innovation ladder steps sets the tone for the further structural and process components of the system within which the innovation will take place. These structural and process components form part of the characteristics of the systemic approach in which innovation will take place, and these characteristics are critical in levels 5 and 6 of the inclusive innovation ladder. TIH, as a traditional science park, qualifies as the mainstream innovation institution amongst its network of institutions; perhaps its intermediary role in the implementation of the eKasiLab programme presents an opportunity for this inclusive innovation approach to interact and influence mainstream innovation institutions and actors to achieve level 5 and level 6 inclusion. This aligns with Heeks et al. (2014), who indicated that inclusive and mainstream innovation exist to interact and influence each other, with the potential for mainstream innovation models to become more inclusive. There should be fewer concerns with the models, rather focusing on the process of modelling in the actors and means by which inclusive innovation models are constructed.

6.5 SUGGESTIONS FOR FUTURE RESEARCH

The current policy shifts (DSI, 2020; DST, 2019), focusing on socio-economic inclusion, require an informed approach to implementing inclusive innovation nationally. Lessons can be drawn from the various inclusive innovation models

implemented in South Africa in understanding where the challenges are, what has worked and what still needs to be improved UNDP (2020). Implementing the eKasiLabs by TIH (Sibanda, 2021) can also help inform the inclusive approach supporting innovators from marginalised communities.

This study indicates that integrating characteristics from different systemic structures created a favourable environment to support township-based technology firms due to the innovation ecosystems' technological and social innovation focus that encourages collaboration amongst actors with a common vision. “Innovation ecosystem symbolises the newly emerging network mode of arranging business activity and economic governance, which enables companies and territories to master innovation-led growth and benefit from rapid technological changes” (Smorodinskaya et al., 2017). This includes the inclusive scope, actors, and relationships within innovation platforms, as well as the unique learning activities emerging from inclusive innovation systems. More studies can be done to validate this suggestion and encourage the formation of diverse systemic structures through an intermediary from mainstream innovation actors. Furthermore, the role of the intermediary in influencing the mainstream innovation actors to create an inclusive innovation model must be investigated further.

APPENDIXES

Appendix A: Interview questions used to engage the managers

Table 15: List of interview and survey questions

1. Innovation (Eco) System evaluation		
1.1	What was the purpose of the development of the TIH eKasiLabs?	(a) For socio economic inclusion (b) Co-creation of value through innovation
1.2	What is the innovation focus of the TIH eKasiLabs?	(a) Local needs oriented/context driven? (b) Both technological and social innovation focused?
1.3	Who are the targeted actors to forming part of the system?	(a) Low income producers/consumers (b) Networked collaborative actors with common vision, strategy…

1.4	What kind of relationship does the actors have?	(a) Informal, loose with social relations (b) Co-creation relationship (c) Interdependent relations in cross geographical context
1.5	What type of institutions form part of the actors in the system?	(a) Informal institutions at local level (b) Formal institutions (c) Broad consideration of institutions from social and environmental structures
2. Inclusiveness of eKasiLabs programme		
2.1	What was the intention of the eKasiLabs programme?	(a) To address the needs of the township based tech-startups?
2.2	Who are the participants in the eKasiLab programme?	
2.3	How has the programme impacted the participants?	(a) Assisted the start-ups through the development stages? (b) Improved the livelihoods of the host communities in terms of employment opportunities?
2.4	Were the township-based start-ups consulted during the design/ development of the eKasiLabs programme?	
2.5	Has the implementation of the eKasiLabs influenced the national innovation policy in any way?	

Appendix B: Detailed responses from M1

1.1 What was the purpose of the development of the TIH eKasiLab?

For socio-economic inclusion: Um, I believe it the first option to say it was economic infusion. And mainly because, you know, the concept when we came to the townships, it was exactly that to say, being a housing agency. We can be secluded, you know, to an establish area in Lynwood. When we're supposed to be servicing, helping in totality. And the program when it was established, really it was driving the mandate of the township modernisation and revitalisation strategy. And yeah, so it followed a guideline that was given by government to sort of introduce that and ensure that the people in the townships are also included, you know, in the activities of the mainstream economy.

1.2 What is the innovation focus of TIH eKasiLabs? Both technological and social innovation focused. Here Yeah, it's a tricky one. Very tricky one because I've seen both because when we came into the townships, we obviously had a structured program. We had a mandate to say, you know, we must drive in technology and innovation in the townships that was the mandate. But now when we got into the townships and you know you sort of figured out that the climate is a little bit different, you know, you must capacitate and the environment to be able to absorb and the technology that you are talking about and we then had to sort of redirect our focus to capacity building, but to what technology and innovation. So that's why I'm saying yeah, it's tricky. It's correlated.

1.3 Who are the targeted actors to forming part of the eKasiLab? Low-income producers/consumers: the first one, I'd say it's more low income, because some of the

intrapreneurs that we just have in the program, you know, they've been smooth sailing on a small scale. And in me, I've been through the program trying to capacitate them to grow bigger, good, their home plans and everything in case Yeah.

1.5 As the eKasiLab manager have you been able to forge relationships with other entities in the local area or nationally to assist the entrepreneurs in the development of their business (access to market, technical support etc?). If so please elaborate? You know, definitely like when I mentioned to you that you know, when we restructured and now, we had support of the business development offices. So, a great part of now the duties of an area innovation manager is to go and recruit resources and you do that through stakeholder and stakeholders. Within the community and just building that ecosystem. So yes, we do, you know, recruit some private sector and other public sector support for intrapreneurs to ensure that they grow. To also forge relationship with local institutions where the Entrepreneurs can be referred to for additional support.

1.6 What kind of support do the eKasiLabs get from the main Innovation Hub? I mean, everything that happens at the innovation has happened that the eKasiLab This program is just an extension into townships. But you know, in in addition to the support that we provide as employees, I think, because some of the incubators that the main innovation are specialised incubators like in bio, green and some form of technical support would come from the main innovation hub. Whereas if you look at the structure of the eKasiLab manager, so the eKasiLab support staff they are more generic business advisors, right. They're not specialists in the field. So, we would take everybody and then when there's a specialised skill that the innovation have has, they will then support the intrapreneurs at the main hub

2.3 How has the programme impacted the participants? That is quite subjective. And depending on how do I put it, it's subjective, depending on you know, the vision that the intrapreneur has had or that you're asking if the people that we've engaged in they live in a better position than when they joined the program, I'd say definitely, but to try and measure the impact is subjective based on the expectation of the entrepreneur that would have joined the program. We've had some success stories that we deem to be a success. You know, somebody that came with an idea that now left you know, with a market with clients having been generating income.

2.4 How has the programme impacted the participants? I see the differences in Soweto and Kagiso of Soweto is a classic Chase because, you know, there's a lot of development happening in this area, there was a lot of attention and concentration in terms of support in this area. So in Soweto, you know we just fall within one of the development programs that are here, but once you start to shift, then you go to Kagiso, so you go to Deni Van Nzyl you then get to see the reliance on the program and to assist these businesses to all these business people to prosper. And so, I would say in some of these areas where you know, there wasn't much support or concentration on in terms of support, then you get to see the impact that the program has, because then you get to see oh, yeah, we are, you know, this community has been hoping and praying for the state. And so yeah, so in some of the townships I'd say so.

2.5 **What type of relationship does the eKasiLab have with the host community?** No, we do engage extensively with the communities. I mean, I think, in the early stages of the program, I was fortunate, you know, to have to open the 3rd eKasiLab Alexandra I mean, there were harsh lessons when, you know, you went into these communities, and you didn't consult extensively with the community or the leaders in that community in a political context. So, growing the eKasiLab from the

third one in Alexandria, we sort of needed to understand that you need to engage extensively. So, I think since then, we form part of the community and to support community initiatives to ensure that the program is sort of welcomed, you know,

2.6 Do you continue to maintain relationships with the host community of eKasiLab facilities? If so, in what ways do you maintain the relationships? we do. We also and have developed additional programs that have got nothing to do with our KPIs, but that sort of support community initiatives for an example. And here in Soweto, we had a structured program called them the Fab Lab, which is a makerspace for our intrapreneurs but as part of engaging with the communities, I think, per school term, we then engage with school learners from different communities to you know, give them the skill and so we do we do engage with NGOs, sometimes not relevant to what we need. To do, but I think and the more we engage with them, the more marketing we also create for our programs.

2.6 **Do you think that the sites of the eKasiLabs were picked adequately? (demand in area from entrepreneur perspective/ access to resources for the entrepreneurs?). Elaborate?** Look, I think the vision of the program by scoping the economy corridors was great to see you know, they like identify economic corridors and then try fill in the eKasiLab into the different economic corridors, but I don't think the placement of some of these eKasiLab was ideal. And I'll give you context, because there were municipalities where we had identified that there's a great need for our services and you know, but we couldn't find because our model is that when you go into a community, you sort of partner with a municipality, or a college and they give you space and you can have a program. So, in those municipalities that we identified where we couldn't find space, then you would just take the next best thing that's available, you know, an example is I'll give you context, there is eKasiLab. Musa again

in the in the in the West End, and East Kagiso there is definitely so those two are in close proximity of each other. It doesn't make sense because they then is other townships in the West End, you know, that could have benefited in terms of proximity. Also in the north. There's one in Mamelodi and Grarankua, who doesn't make sense, proximity to each other. But the issue day was the places we had identified then we didn't get the support part. But some, some agree like our legs, there was a way to, you know, some agree, but some not. So we could improve on that.

2.9 What are some of the ideal changes that you wish to implement in improving the services of the eKasiLabs to the entrepreneurs? Um, challenges in servicing the intrapreneurs I think we could be better resourced. And we could be better resourced, because I think when the program came to the township, we didn't anticipate as much uptake as we got when we got here. So we've got limited resources to be able to assist everybody else. And so we could be better resourced to ensure that you know, we've got a greater impact on to the intrapreneurs and some of our offerings also, they could be restructured. For an example, I think it's not a lie. It's an open secret that you know, and servicing somebody from an advantaged background, you know, takes less resources than trying to service somebody from a disadvantaged background do you need, we need to invest a little bit more the need is greater, so we could be better resourced, and for us to be able to have a greater impact on these startups or these communities that we are supporting.

Appendix C: M3 responses with limited details as the manager responded through a tailored questionnaire similar to interview questions conducted with the managers

1.1 What was the purpose of the development of the TIH eKasiLab? For socio-economic inclusion and Co-creation of value through innovation

1.2 What is the innovation focus of TIH eKasiLabs? Local needs oriented/context driven and Both technological and social innovation focused?

1.3 Who are the targeted actors to forming part of the eKasiLab? Low-income producers/consumers

1.5 As the eKasiLab manager have you been able to forge relationships with other entities in the local area or nationally to assist the entrepreneurs in the development of their business (access to market, technical support etc?). If so please elaborate.? We work with TIA, TUT, SMU, ARC, SEDA, NYDA and GEP for various forms of support from product development and testing, validation of innovations, training and financial support

1.6 What kind of support do the eKasiLabs get from the main Innovation Hub? Operational budgets are fully funded by TIHMC

2.1 What was the intention of the eKasiLab programme? Cultivate innovation is townships, drive SMME development through training, IP support and hotdesking, and nurture entrepreneurship

2.2 Who are the participants in the eKasiLab programme? Residents of the catchment township, with ideas (at prototype level), or start-up seeking assistance with compliance and formal market readiness.

2.3 How has the programme impacted the participants? Assisted the startups through development stages and Improved livelihoods of the host communities in terms of employment opportunities?

2.4 What type of relationship does the eKasiLab have with the host community? Favourable - our target market relies on our offerings. We regularly engage with civil institutions and sometimes political reps who are usually approached by communities for socio-economic assistance

2.5 Do you continue to maintain relationships with the host community of eKasiLab facilities? If so, in what ways do you maintain the relationships? We offer training outside of the incubated companies and invite them when we have activation/information sharing days. We also partner with various institutions when these have development initiatives that can be implemented from our venues - sometimes with our expert contribution (for example we provide business skills training if a partner brings a technical skill initiative

2.6 Do you think that the sites of the eKasiLabs were picked adequately? (demand in area from entrepreneur perspective/ access to resources for the entrepreneurs?). Elaborate? Yes they were. They are located within reach of beneficiaries, and accessible even by public transport.

2.7 Are the township-based entrepreneurs able to access the other resources in the main Innovation Hub campus? IN many instances our offering is fully available at eKasiLabs. We facilitate introductions should they need to use facilities at Main Hub, and handle all arrangements (bookings, use of machines etc)

2.8 What kind of relationship do the eKasiLabs in various communities have? I don't understand this question. Relationship with whom?

2.9 What are some of the ideal changes that you wish to implement in improving the services of the eKasiLabs to the entrepreneurs? We should strive to have other players (GEP, SEDA, NYDA) and ourselves sharing facilities so that we become one-stop locations

Appendix D: Detailed responses from M4 interview

1.1 What was the purpose of the development of the TIH eKasiLab? It's for both. Basically when you look at it, it was actually to bring the sales to the people because we had the Innovation Hub at in Pretoria. So the access to the to the people was difficult. That's why we established the Innovation Hub to say, let's go to the people to the township. And let's see, because one of the questions will be we can come up with that we don't have products produced from eKasi, you know, so we're trying to bring those products to take, come forward. Don't go to Lynwood for information from wherever we're going to pay but we have an establishment that you can come and use one, we have got computers, we got access to Wi Fi, you can have meetings, got bathrooms, you got all these things and trainings and everything like and mentors. So we offer whatever value that that you could get so it's basically for both I think it's just a why it was established and for that. You we are seeing more traction actually as to as to that but they will not people. Our people just don't prefer sitting establishment and the other one will be for instance, somebody will prefer to go to Pretoria thinking that you will get this better service than we do but we are working. We are one we are one you know that they receive whatever that they got from what we can get from the Innovation Hub. The region we can get from us, though we don't have facilities like manufacturing some of them. I think one eKasiLab let's get busy with the manufacturing small manufacturing lab. It's in Mamelodi

1.2 What is the innovation focus of TIH eKasiLabs?

1.3 Who are the targeted actors to forming part of the eKasiLab? Low-income producers/consumers

1.5 As the eKasiLab manager have you been able to forge relationships with other entities in the local area or nationally to assist the entrepreneurs in the development of their business. If so, please elaborate? Yeah, basically, that is our core. Can I say Stakeholder Relations? It's one of the important things so like, for instance, when we came to Alex, we had in a memorandum of agreement with a central Johannesburg college that is a TVET as far away from where we sit in that so and then they had allocated a space we were supposed to have developed a lab, the container lab like a prefab land. So we have a good relationship even if when we do trainings, we do go and invite them, especially those TVET college students for to attend the trainings. And everything like it. And every year when we start our year, when we start the year, we'll sit down with the principal or whoever that is in charge to say, Okay, What type of information do they need? But then yeah, that relationship is good. It's ongoing. Basically, we have that relationship. That's why sometimes we had opted to do in some cases where we are situated within the, the colleges so it makes it easy, you know, for the students and the ones that wants to go into the entrepreneurship. It is they can access that kind of information. And also we invite also, like stakeholders lab would Seda that and everybody else's and whoever that we see them deem fit to, to come through. Like for instance, yeah, we have a relationship with FNB that the city of Johannesburg and yeah, those also any companies that come through then we see how we can match what match ourselves like others we've got GOATA it's a German Institute and nonprofit so where we work hand in in hand and mostly, they assist entrepreneurs in art. So, we do we do go out on a slip to go and as forge the relationship between different stakeholders and ourselves to make sure that they are entrepreneurs, they can always get what you call exposed on also get their product, market access. Okay.

1.6 What kind of support do the eKasiLabs get from the main Innovation Hub? look, you know, we like the prodigal son or what to call our stepson and you know how? Yeah, so our model is we are funded by the by the provincial government. Okay. The Innovation Hub, it's funded by the Department of Economic Development so that the establish of the eKasiLab it was the initiative of the call that the premier of Gauteng David Makura, so that money is coming. It's already funding is ringfenced through the provincial government. Okay, now, that the innovation hub in Tshwane is funded through the Department of Economic Development, so the money comes from the DED, it goes to that Gauteng development in right, ours it's stable and then all the yeah so we are able to provide more as opposed to the TIH in Pretoria have in this case, they have a budget allocated we have an interest. So for instance, each eKasiLab it has a budget each eKasiLab has got a budget of plus minus 2 million. All right. We have to learn programs and everything like that. So we find ourselves moving actually never being able to provide more. But then now the admin part is done at TIH where sometimes we find it because sometimes you can't move because there's issues there. So yeah, I would say some challenges with this. There's a lot of challenges. There's a lot of challenges. So when it when it suits other people we are the Innovation Hub when it doesn't suit them we are not. if it was possible, you would establish your own little account that you know for a fact that whenever that happens, there is a CEO or general manager will know its eKasiLab budget that goes doesn't go to somebody else's because our budget is there, whenever we need it.

2.1 What was the intention of the eKasiLab programme? (To address the needs of the township-based tech-startups)? Cultivate innovation is townships, drive

SMME development through training, IP support and hotdesking, and nurture entrepreneurship

2.2 Who are the participants in the eKasiLab programme? Residents of the catchment township, with ideas (at prototype level), or start-up seeking assistance with compliance and formal market readiness.

2.3 How has the programme impacted the participants? I'll tell you the honest truth. We did a survey some while ago and also department the Department of Economic Development it came with a positive with a positive view to say that we are actually working so within our structure within our department eKasiLab the Innovation Hub, we've got what we call a small grant say about 50,000 rand, alright. Also, we have big grant with that one is funded by TIA but it doesn't take anybody else's to business technology and whatever the case may be. Okay, we got, 14 labs now. But the other three that are not being funded as yet, so we're using the other budget. So within the 10 labs that we had, I'll see mine the two that I had that I was managing, but I'm currently in charge of Kathorus and Alex, I can give you guys that now. We funded them over 50000 and, and over and over and above that. Their businesses are flourishing, but the other one let me just give you an example. There's a company called GreenShare I came out with a prototype from the University of Johannesburg, with just a prototype to do what they want to do their energy generating their energy saving company. So they've developed a box where you are able to say when you have a solar system ne, and then you can actually use you're able to use either both the solar and you are able to see also to check it well how much usage you have done with it with electricity. So they've developed that you've put about R300,000 in that thing. So now there have been negotiations

with the with the municipality and electricity what is that stupid what's the equitable What is this the electricity company?

So then associating so they are well in a way of breaking the market. You see the very same thing that is happening in Cape Town now where they you are able to have to buy a box when you have solar system, then you can sell it to them. You can sell to the grid. So there's something of that nature that we developed from it. We paid about R300,000 so that we just praying that sooner or later than can break into the market. That's number one. Number two. That is from Alex. We have a company that they were doing a some products, that is what we call it, lactose intolerant. Lactose what for the people that are Yeah. So this this lady is already selling in Shell Ultra, when you go to Midrand. With our help also we did we gave them the R50,000 just to go and do baking these things and everything like that but then later on we went out and bought them the equipment to make sure they are capacitated to do this thing so we willing to go out with and to make sure if it goes well then the products will be in the market. Yeah.

2.4 What type of relationship does the eKasiLab have with the host community? Look, there is pockets of companies that at least the employee one or two and don't because we are we are we are only allowed to have a certain number of people. Yeah, we'll see. Yeah, you're allowed to have certain number of people in the incubator. Wait, that's coming and then they get disappointed. They get I get what I can disappear out of the way, so we then understand what those who are in are really making a mark, you know,

2.5 Do you continue to maintain relationships with the host community of eKasiLab facilities? If so, in what ways do you maintain the relationships? We've

got a relationship with the left side, we've got local councillors and the schools whatever. And they when we got there, actually we spoke to the community first. Those are the people that would want something or we call for training, whatever the case may be, or could be sent to them. Alex, we've got a relationship with counsellors. You know, Alex, yeah, but it's the same as in Diepsloot.

2.6 Do you think that the sites of the eKasiLabs were picked adequately? (demand in area from entrepreneur perspective/ access to resources for the entrepreneurs?). Elaborate? There were not there was no like I say due diligence in the picking the sites. Okay. I think more can be done could be done.

2.7 Are the township-based entrepreneurs able to access the other resources in the main Innovation Hub campus? Yes

2.8 What kind of relationship do the eKasiLabs in various communities have? We know what is happening in the various eKasiLab, all area managers meet in exhibitions to engage about the various programmes.

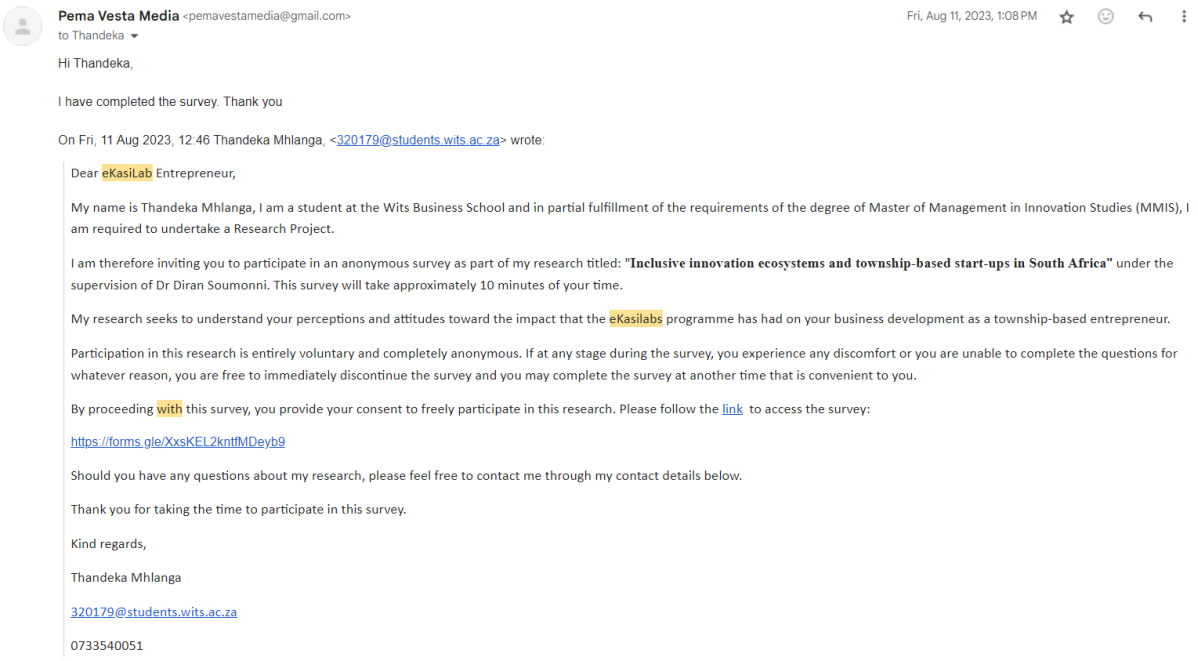
2.9 What are some of the ideal changes that you wish to implement in improving the services of the eKasiLabs to the entrepreneurs? To be honest with you, because we are a performance driven organisation. The time spent with entrepreneur doesn't enable us to make an impact. Difficult for entrepreneurs to grow in their business. One manager is responsible for cohorts in various eKasiLabs making it difficult for them to focus on individuals to achieve their varying growth paths. There were not there was no like I say due diligence in the picking this okay. Okay. I think more can be done could be done.

Appendix E: Online Survey Questions for Beneficiaries

1. Innovation (Eco) System evaluation	
1.1	Did you join the eKasiLab programme in your community?
	Why did you join the eKasiLab programme instead of other programmes?
1.2	Do you feel that the eKasiLabs programme is focused on (a) Local needs oriented/context driven? Both technological and social innovation focused?
1.3	Do you get to interact with other innovation ecosystem players through participating in the eKasiLab programme? Does the eKasiLabs programme connect you to other support through its innovation partners?
1.4	What kind of relationship does the Innovation Hub have with other innovation support partners? (a) Informal, loose with social relations (b) Co-creation relationship Interdependent relations in cross geographical context
1.5	What type of institutions form part of the actors in the system? Which type of partners have you been connected with through the eKasiLabs programme? (a) Informal institutions at local level (b) Formal institutions (c)Broad consideration of institutions from social and environmental structures (d) other-specify
2. Inclusiveness of eKasiLabs programme	
2.1	How does the eKasiLabs programme address your needs as a township based startup?

2.2	Why do you think the eKasiLabs programme exist?
2.3	How has the eKasiLabs programme assisted your business to grow? Has the eKasiLabs programme improved livelihoods in your community? If so, how?
2.4	What would you change about the eKasiLabs programme?
2.5	Has the implementation of the eKasiLabs influenced the national innovation policy in any way?

APPENDIX F: Sample email sent to the entrepreneurs for participation



Pema Vesta Media <pemavestamedia@gmail.com> Fri, Aug 11, 2023, 1:08 PM

to Thandeka

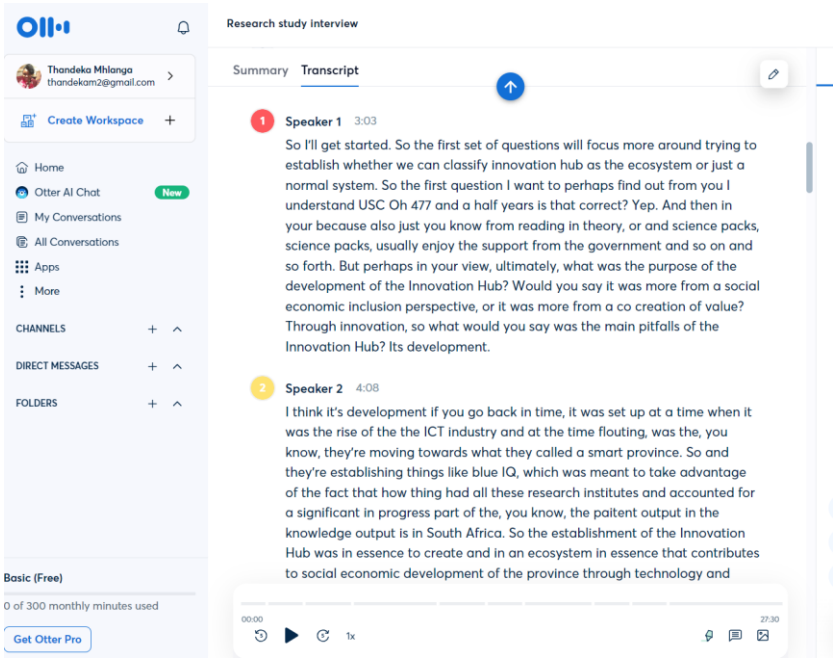
Hi Thandeka,

I have completed the survey. Thank you

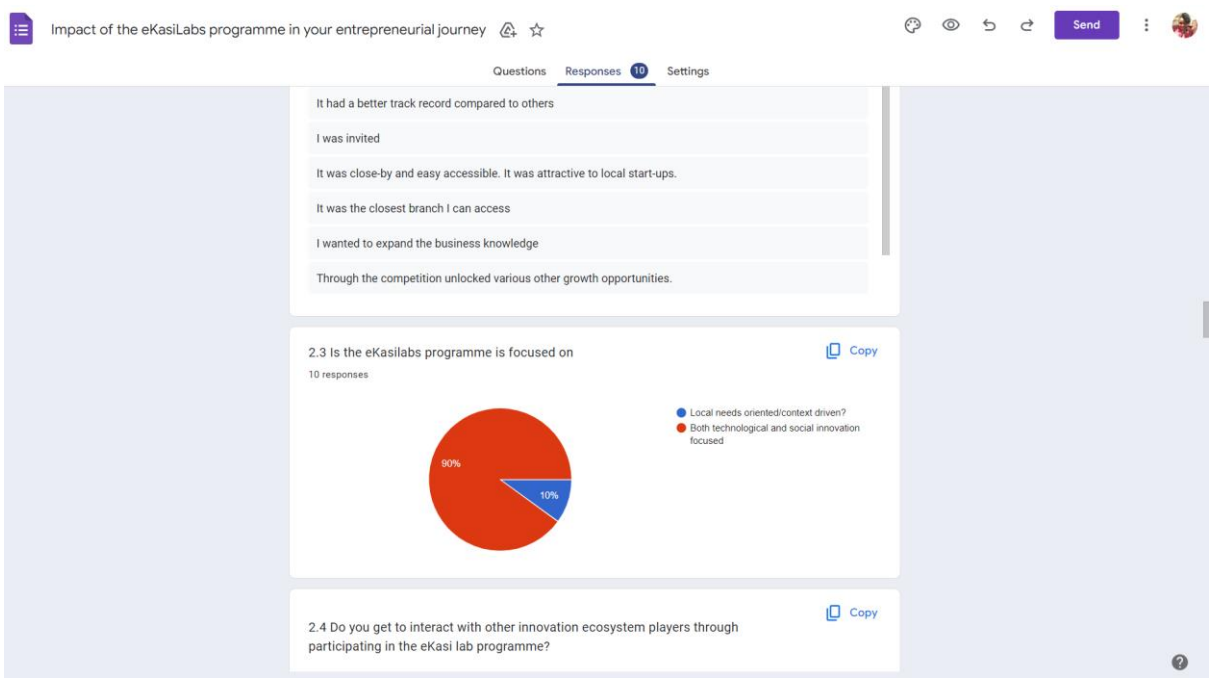
On Fri, 11 Aug 2023, 12:46 Thandeka Mhlanga, <320179@students.wits.ac.za> wrote:

> Dear eKasiLab Entrepreneur,
>
> My name is Thandeka Mhlanga, I am a student at the Wits Business School and in partial fulfillment of the requirements of the degree of Master of Management in Innovation Studies (MMIS), I am required to undertake a Research Project.
>
> I am therefore inviting you to participate in an anonymous survey as part of my research titled: **"Inclusive innovation ecosystems and township-based start-ups in South Africa"** under the supervision of Dr Diran Soumonni. This survey will take approximately 10 minutes of your time.
>
> My research seeks to understand your perceptions and attitudes toward the impact that the eKasilabs programme has had on your business development as a township-based entrepreneur.
>
> Participation in this research is entirely voluntary and completely anonymous. If at any stage during the survey, you experience any discomfort or you are unable to complete the questions for whatever reason, you are free to immediately discontinue the survey and you may complete the survey at another time that is convenient to you.
>
> By proceeding with this survey, you provide your consent to freely participate in this research. Please follow the link to access the survey:
>
> https://forms.gle/XxsKEL2kntfMDeyb9
>
> Should you have any questions about my research, please feel free to contact me through my contact details below.
>
> Thank you for taking the time to participate in this survey.
>
> Kind regards,
>
> Thandeka Mhlanga
>
> 320179@students.wits.ac.za
>
> 0733540051

Appendix G: Otter audio script platform



Appendix H: Survey collection tool through google form



Appendix I: Permission to conduct study at the innovation hub



14 June 2023

Permission to conduct research for the project title: Inclusive innovation ecosystems and township-based start-ups in South Africa.

Dear Thandeka Mhlanga

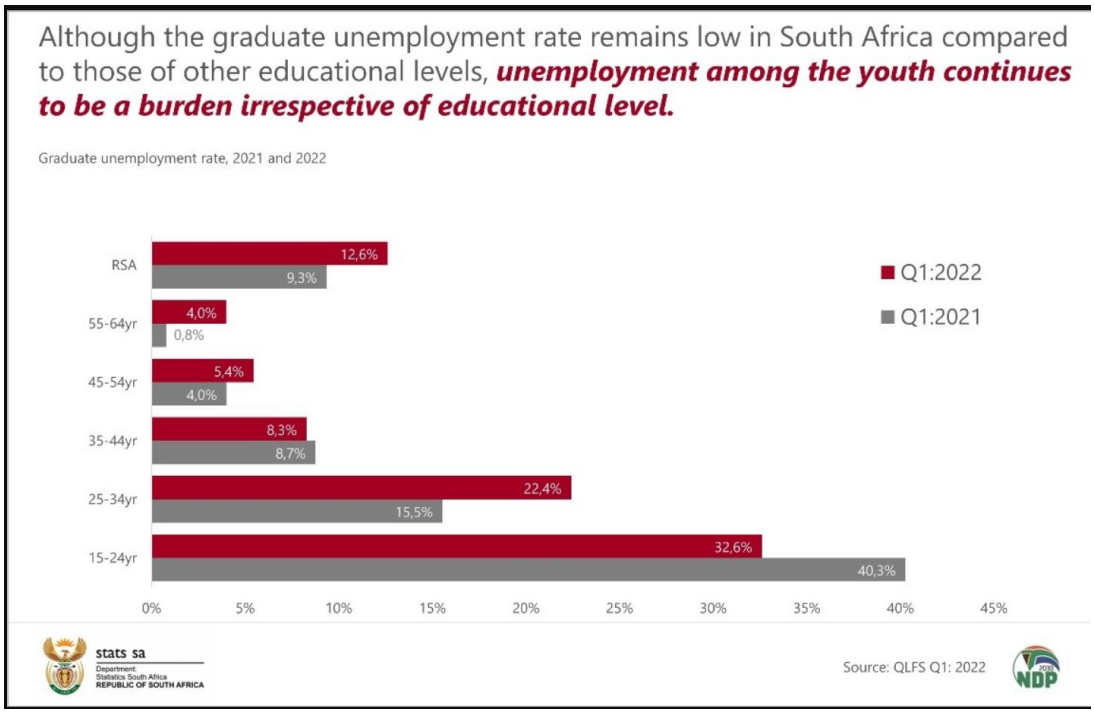
This letter serves to confirm that The Innovation Hub gives you permission to conduct interviews with The Innovation Hub's staff members, including the 5 eKasiLabs Area Innovation Managers and will give you access to interact with incubated companies including Alumni companies. You will also be allowed to send out questionnaires to the entrepreneurs in the programme within the month of June 2023.

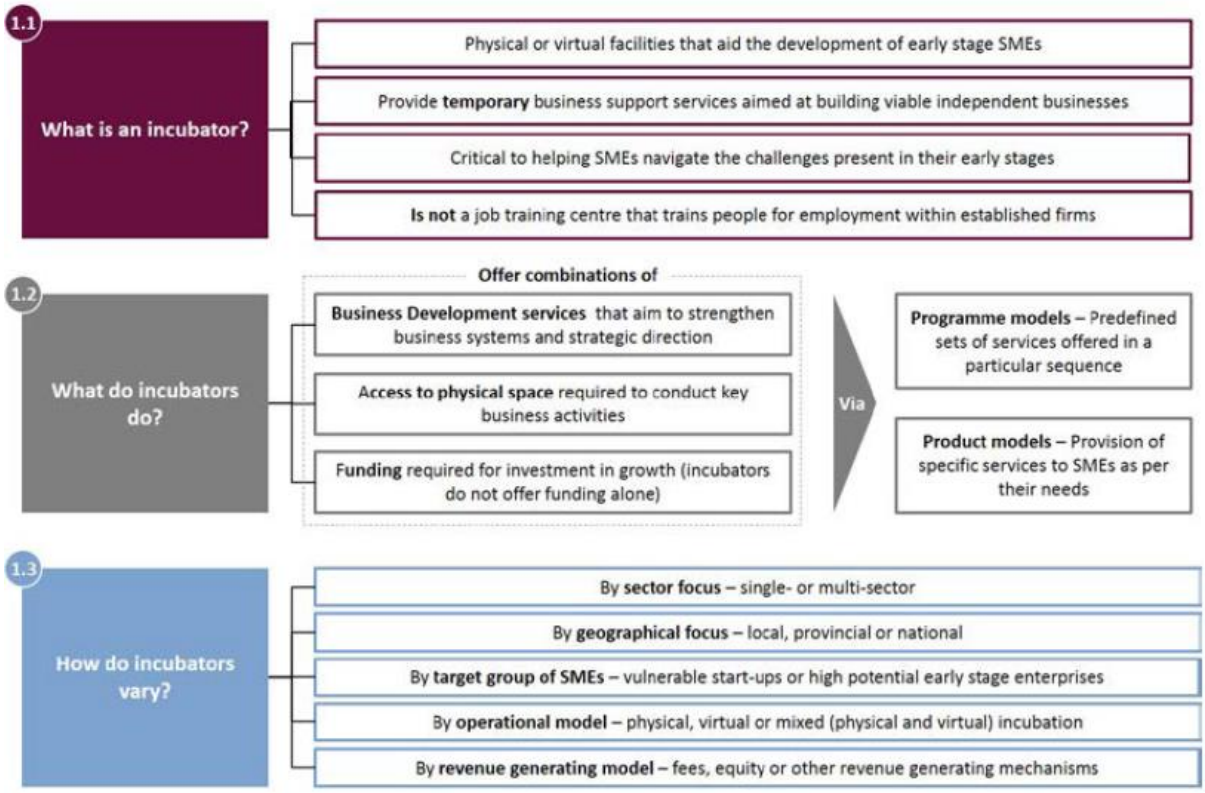
Ms Nothile Mpisi

General Manager: eKasiLabs
Acting Chief Executive Officer

Appendix J: Unemployment rate amongst the youth in South Africa.

Appendix K: Description of the business incubation in South Africa.




1.1
What is an incubator?
Physical or virtual facilities that aid the development of early stage SMEs
Provide temporary business support services aimed at building viable independent businesses
Critical to helping SMEs navigate the challenges present in their early stages
Is not a job training centre that trains people for employment within established firms
1.2
What do incubators do?
Offer combinations of
Business Development services that aim to strengthen business systems and strategic direction
Access to physical space required to conduct key business activities
Funding required for investment in growth (incubators do not offer funding alone)
Via
Programme models – Predefined sets of services offered in a particular sequence
Product models – Provision of specific services to SMEs as per their needs
1.3
How do incubators vary?
By sector focus – single- or multi-sector
By geographical focus – local, provincial or national
By target group of SMEs – vulnerable start-ups or high potential early stage enterprises
By operational model – physical, virtual or mixed (physical and virtual) incubation
By revenue generating model – fees, equity or other revenue generating mechanisms

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