

UNIVERSITY OF KWAZULU-NATAL

The contribution of innovation and technology hubs to industrial development in Northern KwaZulu-Natal

By

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ABSTRACT

This study investigates the role of the Richards Bay Industrial Development Zone (RBIDZ) Techno Hub in promoting industrial development in Northern KwaZulu-Natal (KZN), South Africa. The research is situated within the broader discourse on regional innovation ecosystems in marginalised geographies, where innovation hubs are positioned as instruments for economic revitalisation, youth empowerment, and digital transformation. Despite policy emphasis on the development of such hubs, empirical insight into their operational effectiveness and contextual challenges remains limited, highlighting the need for critical investigation. The study proposes an integrated lens that couples UTAUT focusing on user-level adoption of innovation, with the African Innovation Hub Model emphasising systemic and ecosystemic dynamics. This methodological framing enables a dual-layered analysis, capturing both the behavioural determinants of start-up participation and the structural limitations of ecosystem design. A qualitative, interpretive research design was adopted, employing semi-structured interviews with six key stakeholders involved in the RBIDZ Techno Hub's operations. Thematic and content analysis were applied to explore five focal research dimensions: organisational culture, social factors shaping start-up participation, barriers to innovation adoption, sustainability of hub strategies, and availability of support resources.

The findings reveal a significant misalignment between the hub's strategic ambitions and its operational realities. Through the UTAUT lens, performance expectancy and effort expectancy were weakened by bureaucratic inertia, infrastructural deficits, and fragmented governance structures. From the perspective of the African Innovation Hub Model, systemic inequalities and limited resource flows undermined the hub's ability to function as an inclusive innovation catalyst. Yet, the study also finds that community-based engagement and youth-led initiatives serve as enabling mechanisms, suggesting that grassroots innovation and social cohesion can partially offset institutional shortcomings. The study concludes that future strategies for innovation hubs in under-resourced geographies must extend beyond infrastructural investment to embed culturally grounded engagement, participatory governance, and inclusive ecosystem design. Policy recommendations include establishing an innovation governance taskforce, introducing dedicated rural innovation funds, and formalising end-to-end innovation pipelines. By integrating UTAUT with the African Innovation Hub Model, this research advances the Information Systems and Technology field by offering a context-sensitive framework that bridges individual adoption behaviours with systemic innovation dynamics.

KEYWORDS: *Technology hubs, innovation, industrial development, sustainable growth, entrepreneur.*

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LIST OF ABBREVIATIONS

IDZ	Industrial Development Zone
NDP	National Development Plan
NYDA	National Youth Development Agency
RBIDZ	Richards Bay Industrial Development Zone
SEDA	Small Enterprise Development Agency
SEZ	Special Economic Zone
SMEs	Small-to-Medium Enterprises
STI	Science, Technology and Innovation
TIA	Technology Innovation Agency
TIH	The Innovation Hub
TVET	Technical and Vocational Education and Training

CHAPTER ONE: INTRODUCTION

1.1 Introduction

In South Africa (SA), industrial development encapsulates multiple dimensions, including manufacturing growth, employment generation, technological innovation, and entrepreneurial capacity building. This study conceptualises industrial development primarily as the facilitation of sustainable, technology-driven entrepreneurship, skills enhancement, and investment attraction that collectively foster regional economic diversification and socio-economic upliftment (Ehigiamusoe, 2023; Muriungi & Chumo, 2024). Recognising persistent structural challenges, such as high youth unemployment, limited digital infrastructure, and regional disparities, innovation and technology hubs have emerged as strategic platforms that catalyse economic transformation in historically underdeveloped areas (Nkontwana, 2022; Magoro et al., 2023).

The RBIDZ Techno Hub, established in 2015 within the RBIDZ in Northern KZN, exemplifies such a platform designed to stimulate industrial development through entrepreneurship support, skills development programmes, and digital innovation infrastructure (KwaZulu-Natal Provincial Government, 2023; RBIDZ, 2025). Importantly, this Techno Hub focuses on nurturing start-ups and SMEs in sectors aligned with SA's emerging Industry 4.0 agenda, such as advanced manufacturing, renewable energy, and digital services, which are critical to broadening the industrial base and enhancing competitiveness in global value chains (Compagnucci & Spigarelli, 2024; Gumbo & Moos, 2024). Thus, the hub differentiates itself from traditional manufacturing-centric industrial growth models by emphasising innovation-led entrepreneurship as the driver of sustainable industrialisation and job creation (Ehigiamusoe, 2023).

While the National Development Plan (NDP) and related STI strategies underscore the centrality of digital infrastructure and human capital investment for inclusive growth, the practical contribution of techno hubs like the RBIDZ in under-resourced regions remains underexplored (Republic of South Africa, 2012). Challenges include infrastructure limitations, insufficient funding mechanisms, and skill mismatches that hinder scalability and sustainability of entrepreneurial ventures (Mwansa et al., 2025; Midha et al., 2023). Furthermore, a clear distinction between innovation hubs and technology hubs is necessary in framing the RBIDZ case: whereas innovation hubs primarily promote research, collaboration, and ideation,

technology hubs provide the operational technology infrastructure and incubation services essential for start-up growth and commercialization (Nkontwana, 2022).

This study thus investigates how the RBIDZ Techno Hub contributes specifically to the entrepreneurial dimension of industrial development through digital skills development, innovation ecosystem alignment, and investment facilitation. Framed within Information Systems and Technology (IS&T), the research fills a critical gap by empirically examining the systemic and behavioural factors influencing techno hub effectiveness in promoting sustainable, innovation-driven industrial growth in marginalised African regions (Mwansa et al., 2025).

1.2 Background of the study

Innovation plays a pivotal role in driving economic growth globally, increasingly shifting from traditional metrics like R&D outputs to broader social and economic system enhancements that enable sustainable development (OECD, 2023; Friederici et al., 2024). South Africa, confronted with high unemployment and inequality, relies heavily on innovation ecosystems to catalyse entrepreneurship, job creation, and industrial modernisation (Republic of South Africa, 2012; Smit & Ndhlovu, 2023). The NDP prioritises investment in STI as key drivers of inclusive economic transformation and highlights the strategic importance of regional innovation hubs in under-resourced areas (Van Heerden & Mulumba, 2023).

In KZN, an economically diverse province with manufacturing constituting 17% of GDP and historical dependencies on agriculture and mining, the transition towards a knowledge-driven economy presents both opportunity and complexity (Statistics South Africa, 2024; KZNEDTEA, 2023). The RBIDZ Techno Hub, launched in 2015, is a core intervention aimed at leveraging digital infrastructure, skills development, and entrepreneurial support to foster industrial diversification and sustainability in Northern KZN (KwaZulu-Natal Provincial Government, 2023; RBIDZ, 2025). Focused on nurturing technology-intensive startups and SME growth, the hub strives to address structural challenges such as infrastructure deficits, funding gaps, and digital skills shortages that impede entrepreneurial growth and regional development (Magoro et al., 2024; Mwansa et al., 2025). Despite ambitious government support and strategic positioning near Special Economic Zones (SEZ) and academic institutions, evidence suggests that the RBIDZ Techno Hub has yet to fully realise its potential in catalysing scalable and sustainable industrial growth (KZN Provincial Economic Review,

2024; Midha et al., 2023). Common challenges among innovation and techno hubs within SA include inadequate market access, limited venture capital availability, and overreliance on government funding, raising concerns around long-term sustainability and impact (OECD, 2023; Muriungi & Chumo, 2024). These barriers are intensified in rural and peri-urban settings where digital infrastructure and ecosystem coordination are often fragmented (Sreenivasan et al., 2023).

This background underscores the critical research problem: how can techno hubs like RBIDZ align ICT infrastructure, innovation capacity, and digital strategies to effectively contribute to regional industrial development defined through entrepreneurship, investment, and skills growth? Addressing this gap is essential to inform both policy and practice aimed at strengthening regional innovation ecosystems and supporting inclusive economic transformation in marginalised geographies.

1.3 Problem Statement

Innovation and Techno hubs are globally recognised for their capacity to stimulate industrial advancement, entrepreneurship, and technology-driven development (Compagnucci & Spigarelli, 2024). Nevertheless, in emerging and under-resourced regions such as Northern KZN, SA, the tangible outcomes and mechanisms through which these hubs drive scalable and sustainable economic growth remain insufficiently understood, especially amidst historical reliance on primary industries and ongoing digital transition efforts (Kayser et al., 2023). Despite national policy mandates like the NDP and the STI Strategy, Northern KZN continues to experience significant IS&T barriers: persistent broadband inadequacies, fragmented digital skills pipelines, and poor integration of information systems for entrepreneurial support (Aruleba & Jere, 2022; Mwansa et al., 2025).

While innovation hubs theoretically offer enabling digital platforms, smart incubation programmes, and collaborative environments designed to empower SMEs across emerging sectors such as fintech, agri-tech, and green technologies, their actual effectiveness in operationalising these capabilities and supporting inclusive growth remains ambiguous (Midha et al., 2023; Gumbo & Moos, 2024). The RBIDZ Techno Hub illustrates these sector-wide issues, demonstrating persistent ICT misalignments, insufficient access to key ICT services, underutilised digital platforms, misalignment between training content and industry skills needs, and weak monitoring mechanisms for performance feedback (Mwansa et al., 2025).

Further, the inability to attract consistent venture capital or implement next-generation financing models, such as blockchain-based funding or digital crowdfunding, underscores the under-exploitation of its IS&T potential (Midha et al., 2023; Magoro et al., 2023)

Although the hub is strategically positioned near a SEZ and academic institutions, which should foster synergistic technology transfer and innovation, these advantages have yet to fully materialise in practical outcomes or scalable knowledge flows (Compagnucci & Spigarelli, 2024). Critically, little empirical research has systematically investigated the operational effectiveness, ecosystem alignment, and context-specific constraints of techno hubs in rural or marginalised settings within SA (Muriungi & Chumo, 2024; Benzidia et al., 2025). This lack of clarity, particularly concerning how digital innovation frameworks are adopted and sustained, represents a substantial research gap in both the IS&T and innovation ecosystem literature. The problem, therefore, is that despite substantial investment, the RBIDZ Techno Hub has not fully realised its IS&T potential in enabling scalable, sustainable, and innovation-driven entrepreneurship in Northern KZN, primarily due to systemic infrastructural, financial, and contextual barriers, as well as a documented gap in empirical analysis of techno hub models in under-resourced African regions (Mwansa et al., 2025; Benzidia et al., 2025; Magoro et al., 2023).

1.4 Research aim and objectives

The primary aim of this study is to critically examine the role of the RBIDZ Techno Hub in facilitating sustainable industrial development within Northern KZN. Specifically, this study focuses on how the RBIDZ Techno Hub, as a technology-focused innovation platform, contributes to the promotion of entrepreneurship, digital skills development, investment attraction, and industrial diversification through digital and information systems capabilities. This case study approach allows an in-depth understanding of the Techno Hub's effectiveness in driving innovation-led regional economic transformation in an under-resourced context.
Aligned with this aim, the research objectives are:

i. To analyse the perceived culture in the development of Techno hubs
ii. To identify social factors influencing business startups to invest in the Techno hub.
iii. To investigate the challenges to the adoption of the Techno hub
iv. To evaluate the sustainability measures implemented in the Techno hub
v. To examine resources available to assist start-ups in growing into successful ventures.

1.5 Research questions

i. What is the perceived culture in the development of the Techno hub?
ii. What are social factors that can influence business start-ups to invest in the Techno hub
iii. What have been the challenges to the adoption of the Techno hubs?
iv. What sustainability measures have been implemented in the Techno hub
v. What resources are available to assist startups to grow their business into successful ventures?

1.6 Rationale of the study

The rationale for this study stems from the growing recognition of innovation and technology hubs as strategic mechanisms for fostering industrial development, particularly within emerging economies. In spite of SA's policy emphasis on digital transformation and inclusive economic growth, as articulated in frameworks such as the NDP and the STI Strategy, there remains a paucity of empirical research examining the functional dynamics and real-world impact of such hubs in under-resourced regions like Northern KZN (NDP, 2019). The RBIDZ Techno Hub was established with the intention of catalysing entrepreneurship, advancing technical skills, and fostering innovation-led industrial growth. However, its practical effectiveness in achieving these objectives has not been systematically evaluated. This study addresses this gap by focusing on the institutional, technological, and socio-economic dimensions of the RBIDZ Techno Hub. In doing so, it critically explores the intersection of IS&T with regional industrial development strategies.

This study is further motivated by the limited scholarly attention given to rural and peri-urban innovation ecosystems in SA (Nkontwana, 2022; Kayser, Ngowi, & Zola, 2023). Existing literature tends to prioritise metropolitan contexts, thereby neglecting the unique structural and contextual barriers faced by rural techno hubs, such as constrained ICT infrastructure, limited venture capital, and fragmented stakeholder engagement (Mwansa, Dlamini, & Nkosi, 2025; Muriungi & Chumo, 2024). This research, therefore, provides an opportunity to generate context-sensitive insights that can inform both theory and practice in the design and implementation of innovation-led development strategies. This study adopts a qualitative, interpretivist research methodology grounded in Saunders et al.'s (2023) Research Onion framework. Semi-structured interviews will be conducted with selected professionals from the Business Development and ICT departments at the RBIDZ Techno hub to explore their experiences and perspectives on the hub's role in regional industrial development. Data will be

analysed using thematic and content analysis techniques, supported by NVivo software. This approach allows for rich, contextual insights into the socio-technical factors influencing the effectiveness and sustainability of Techno hubs within emerging economic zones.

1.7 Significance of the study

This study holds both theoretical and practical significance. Theoretically, it contributes to the academic discourse on innovation ecosystems by integrating insights from IS&T with systemic innovation theory. It enhances current understandings of how digital infrastructure, institutional design, and stakeholder collaboration interact to shape the effectiveness of technology hubs in promoting industrial development in marginalised regions. Practically, the study offers valuable evidence for policymakers, innovation hub managers, and development agencies. By critically evaluating the operational capabilities, governance structures, and resource availability within the RBIDZ Techno Hub, the research identifies enablers and constraints that influence start-up growth, skills development, and technology adoption. The findings provide actionable recommendations for strengthening regional innovation systems, including the development of inclusive digital incubation models, context-specific sustainability frameworks, and mechanisms for improved public–private–academic collaboration.

Moreover, the study informs future planning and evaluation strategies for similar initiatives in South Africa and other developing economies. Its emphasis on grounded stakeholder perspectives ensures that the policy recommendations are not only theoretically robust but also socially relevant and implementable. By bridging empirical gaps in the literature and addressing the complex realities of rural innovation environments, the study aims to support evidence-based decision-making that promotes equitable industrial development and digital empowerment in Northern KZN and beyond.

1.8 Overview of the study

This study is structured into five interconnected chapters, each designed to address specific research objectives and contribute progressively to the exploration of the RBIDZ Techno Hub's contribution to industrial development in Northern KZN. The chapter organisation ensures a coherent flow of argumentation from contextual grounding to empirical findings and policy implications. Chapter One introduces the research topic and outlines the broader socio-economic and technological context within which the study is situated. It articulates

the research problem, aims, objectives, and guiding questions. The rationale for the study, including its significance within the IS&T domain, is provided to justify the academic and practical relevance of the investigation. Chapter two presents a critical synthesis of existing literature relevant to innovation hubs, technology ecosystems, and industrial development, with a particular focus on under-resourced regions.

The chapter explores key theoretical frameworks such as the TAM, DOI, and the UTAUT to contextualise the study. It identifies gaps in the literature that the present research aims to address, particularly around the operational challenges of Techno hubs in developing contexts. The next chapter, chapter three, outlines the research design and methodological orientation of the study, grounded in an interpretivist paradigm. It explains the qualitative approach employed, including the use of semi-structured interviews and purposive sampling of key stakeholders. Detailed justifications are provided for the selection of data collection and analysis methods, ensuring transparency and methodological rigour. Ethical considerations and measures to ensure data trustworthiness are also discussed. In chapter four, empirical data are analysed thematically to explore participants' insights on five core research dimensions: organisational culture, social motivators, adoption barriers, sustainability mechanisms, and support resources for start-ups. The findings are interpreted in light of the theoretical frameworks discussed in Chapter Two, enabling a synthesis of empirical evidence with existing scholarship. This chapter also highlights emergent patterns and contradictions within the innovation hub's implementation landscape.

Lastly, chapter five consolidates the study's key findings and evaluates their implications for theory, policy, and practice. It revisits the research objectives to assess how they have been addressed and outlines the theoretical, methodological, and practical contributions of the research. Furthermore, policy recommendations are proposed to enhance the strategic functioning of innovation hubs in similar socio-economic contexts. Limitations of the study are acknowledged, and avenues for future research are suggested.

1.9 Chapter summary

This chapter lays the foundation for exploring the RBIDZ Techno Hub's role in driving sustainable industrial development in Northern KZN, SA. Industrial development is framed as a multifaceted process emphasising technology-driven entrepreneurship, digital skills enhancement, investment attraction, and diversification into emerging Industry 4.0 sectors

like advanced manufacturing and renewable energy. The RBIDZ Techno Hub is introduced as a targeted, technology-focused ecosystem supporting SME growth and innovation-led industrial transformation in a historically under-resourced region.

The chapter contextualises the hub's importance within national and provincial development frameworks such as the NDP, highlighting persistent infrastructural, financial, and skill-related challenges hindering full realisation of the hub's mandate. It distinguishes between innovation hubs and technology hubs to clarify the RBIDZ's operational focus on incubation and digital infrastructure as a vehicle for commercialisation. A clearly articulated research problem identifies the gap in empirical knowledge on techno hubs' effectiveness in under-resourced rural and peri-urban settings, framing the study's aim to critically examine RBIDZ's contribution to regional industrial advancement through IS&T perspectives. Corresponding objectives target organisational culture, social motivators, adoption barriers, sustainability strategies, and startup resource availability.

Finally, the chapter underscores the study's significance by highlighting the scholarly gap around rural innovation ecosystems and the practical need for empirical evidence to inform policies fostering inclusive economic development. Upcoming chapters will build on this foundation with a detailed literature review underpinned by established technology adoption and innovation theories.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a theoretical and empirical foundation for understanding how innovation hubs leverage IST to drive industrial development, particularly in Northern KZN. Innovation hubs have gained prominence as critical ecosystems that foster technological innovation, entrepreneurship, and economic growth, especially in developing regions. This chapter synthesises existing research to identify gaps in the literature, particularly regarding how hubs integrate IST to transform traditional industries and address socio-economic challenges in resource-constrained settings like South Africa. The review is structured to provide a comprehensive examination of innovation hubs, beginning with their conceptualisation and roles in IST. It then explores the factors that contribute to their success, their broader impact across Africa, and the theoretical frameworks that explain their operations and technology adoption processes.

The chapter concludes by summarising key insights and linking them to the study's objectives. By situating the research within the broader discourse on IST and innovation, this chapter highlights the unique contributions of hubs while identifying critical areas requiring further investigation, such as sustainability, scalability, and the long-term economic impact of IST-driven interventions in rural contexts.

2.2 Innovation hubs concept and roles

Innovation hubs in South Africa stand as dynamic, technology-driven ecosystems meticulously crafted to propel information systems and technology innovation, serving as vital conduits for integrating a diverse array of participants, start-ups, academic researchers, industry practitioners, and governmental bodies, within sophisticated digital frameworks (Kedama & Abrahams, 2017; Gumbo, 2024; HSRC, 2024).Innovation hubs are not mere physical spaces but robust platforms that harness cutting-edge technological tools, such as cloud computing platforms, advanced data analytics systems, and high-speed ICT infrastructure, to catalyse technological breakthroughs and industrial transformation (Ujwary-Gil & Godlewska-Dzioboń, 2022). Their conceptual foundation rests on the premise of advancing collaborative synergy, where the interplay of innovative ideas and digital technologies generates solutions that transcend traditional industrial paradigms. In Northern KZN, the RBIDZ Techno hub exemplifies this paradigm, acting as a cornerstone for driving technological advancement by

embedding information systems and technology into the region's economic fabric (Mwantimwa et al., 2021).

Beyond mere technological facilitation, innovation hubs are strategic in enhancing regional competitiveness, positioning South Africa and Northern KZN specifically, as a contender in the global digital economy. They achieve this by bridging the gap between traditional sectors, such as mining and agriculture prevalent in KZN, and modern technological-driven industries like manufacturing and renewable energy. Through initiatives like coding bootcamps, digital skills workshops, and tech incubators, hubs cultivate a skilled workforce adept at navigating the complexities of contemporary industrial demands. This transformative capacity is critical in a South African context marked by historical inequities and infrastructural disparities, where hubs serve as equalisers, offering access to technological resources that empower communities and stimulate economic diversification (Desai, 2023; Technology Innovation Agency [TIA], 2024).

2.3 Enabling Techno hub success

The efficacy of innovation hubs in South Africa hinges on several technological-centric factors that amplify their capacity to advance industrial development and address socio-economic challenges. Central to their success is strategic partnerships, which unite technology firms, universities, and government entities to support the digital infrastructure and expertise available to hubs (Nkontwana, 2022). These collaborations, as evidenced in Northern KZN's RBIDZ Techno hub, create a robust knowledge-sharing ecosystem where cloud platforms and data analytics tools are harnessed to drive research and commercialise technological innovations, enhancing industrial outputs (Compagnucci & Spigarelli, 2024). For instance, partnerships with academic institutions provide access to cutting-edge ICT research, while tech firms supply practical digital solutions, ensuring hubs like RBIDZ bridge theoretical advancements with real-world applications.

Equally critical are supportive regulatory frameworks and policies, which serve as the backbone for sustained technological innovation (Zemlyak et al., 2023). In South Africa, policies that promote ICT adoption, such as tax incentives for tech start-ups and streamlined digital enterprise regulations, create an enabling environment that encourages entrepreneurship and strengthens hubs' longevity. This is particularly vital in Northern KZN, where the RBIDZ Techno hub relies on such frameworks to extend digital innovation beyond Richards Bay into

surrounding rural areas, addressing disparities in technology access (Aruleba & Jere, 2022). These policies align with national priorities, like the NDP, to advance a digital economy that supports industrial competitiveness. Community engagement stands as another cornerstone, advancing a tech-savvy local network that enhances hubs' relevance and resilience (Anthony Jr., 2024). By involving local entrepreneurs, industry participants, and community leaders, hubs cultivate social capital that sustains information systems and technology adoption. In Northern KZN, this engagement empowers rural communities around Richards Bay to participate in the digital economy through initiatives like coding workshops and tech mentorship, amplifying the RBIDZ Techno hub's impact (Magoro et al., 2023). Such efforts ensure hubs remain responsive to local needs, reinforcing their role as collaborative spaces for multidisciplinary innovation.

Despite their potential, the success of these hubs is tempered by significant challenges, notably sustainability, inclusivity, and scalability, which require strategic technological interventions (Msimango-Galawe & Hlatshwayo, 2021). Sustainability demands consistent funding and robust digital infrastructure to maintain momentum beyond initial investments, a hurdle in resource-constrained regions like Northern KZN (Muriungi & Chumo, 2024). Inclusivity entails ensuring equitable access to technology resources across diverse socio-economic groups, while scalability involves extending innovations regionally, a task reliant on advanced ICT networks (Eyieyien et al., 2024). Addressing these challenges through partnerships, policy support, and community-driven digital initiatives is essential to unlocking hubs' full potential as drivers of economic and social transformation, as envisioned by Schumpeter's innovation-led economic change. In Northern KZN, the RBIDZ Techno hub's ability to overcome these obstacles will determine its success in advancing a sustainable, tech-forward industrial landscape.

2.4 The impact of innovation hubs in the African context

Innovation hubs have emerged as transformative platforms across Africa, addressing the critical challenge of youth unemployment through technology-driven initiatives (Ngene et al., 2021). In South Africa, Innovation hubs leverage information systems and technology to deliver training programmes in digital skills such as coding, data analytics, and software development, while incubating tech start-ups that empower young Africans with entrepreneurial opportunities (Konyango, 2021). Beyond mere job creation, hubs cultivate

innovation ecosystems that integrate participants like government agencies, academic institutions, and private tech firms to collaborate on technology projects, enhancing technological advancement and economic growth (Mwantimwa et al., 2021; Peter & Intelligence, 2021). In regions like Northern KZN, where youth unemployment is high, hubs such as the RBIDZ Techno hub play a pivotal role in bridging skills gaps through ICT-focused interventions.

Innovation hubs extend their impact by scaling technology-based solutions, supporting a diverse range of young entrepreneurs and start-ups (Korku, 2022). By providing access to funding, digital mentorship platforms, and networking opportunities through online systems, hubs serve as critical information systems and technology infrastructure for business growth and sustainability (Gangiah, 2024). Their rapid expansion in countries like Nigeria, Kenya, and South Africa underscores their potential to address labour market disparities, offering sustainable employment pathways for youth through digital economies (Nkontwana, 2022). As incubators of long-term economic progress, innovation hubs equip young South Africans with the technological competencies needed to thrive in an increasingly digital landscape (Mwantimwa et al., 2021).

2.4.1 Innovation hubs and the future of African economies

Innovation hubs are increasingly recognised in South Africa and beyond as key drivers of a shift towards knowledge-based economies propelled by information systems and technology advancements (Abrahams, 2020). More than just start-up incubators, innovation hubs act as catalysts for economic transformation by advancing the development of tech-intensive industries, such as renewable energy systems and ICT services (Gumbo & Moos, 2024). In Northern KZN, for instance, the RBIDZ Techno hub aims to transition traditional sectors like mining into tech-driven domains through digital innovation. However, their promise is tempered by challenges, including limited access to funding for tech start-ups and insufficient government support for information systems and technology infrastructure (Moloi, 2024).

Infrastructural constraints such as unreliable broadband, power outages, and underdeveloped digital networks further impede hub operations. Proposed solutions include strengthening public-private partnerships to enhance ICT infrastructure and policies that incentivise tech investment, alongside collaborations with international bodies to bridge funding gaps (Manning & Vavilov, 2023). Overcoming these hurdles is essential for innovation hubs to fully

harness information systems and technology, positioning African economies, including South Africa's, for success in the global knowledge economy. Their future role hinges on nurturing tech ecosystems that drive entrepreneurship and innovation, contingent on addressing these technological and structural barriers.

2.4.2 Innovation hub influence on economic development

Innovation hubs significantly support economic development in South Africa by advancing information systems and technology ecosystems that promote innovation, entrepreneurship, and knowledge generation (Haukipuro et al., 2024). Innovation hubs attract skilled tech talent, secure investments in digital projects, and facilitate collaboration among start-ups, corporates, research institutions, and government through advanced ICT platforms (Fatema & Raza, 2023). By enabling knowledge spillovers through digital networks, they stimulate the creation of tech-based products and services, enhancing local industry competitiveness and generating employment. Successful hubs, like those in Gauteng or the Western Cape, often become regional tech excellence centres, drawing global investment (Rosli & Cacciolatti, 2022).

Through environments that encourage tech experimentation such as hackathons and digital prototyping, hubs transform research into economic outputs, leveraging information systems and technology to commercialise innovations (Korku, 2022). Their impact varies based on local support, digital infrastructure, and scalability capacity, requiring strategic planning to maximise socio-economic benefits (Mwantimwa et al., 2021; Awan et al., 2021). In Northern KZN, the economic growth of Richards Bay exemplifies how government incentives for industrial decentralisation, paired with Techno hubs, have spurred development over decades (Ehigiamusoe & Samsurijan, 2021). By addressing sustainability and inclusivity through robust ICT systems, hubs can unlock sustained prosperity, aligning economic growth defined as increased production through technological advancements with South Africa's developmental priorities (Surya et al., 2021; Nwokolo et al., 2023).

2.5 Relevant theories and frameworks

This section presents a robust exploration of theories and frameworks that underpin the investigation into their role in advancing industrial development through technology. These conceptual tools are not mere academic constructs but vital focuses through which the literature will unravel the complex interplay of technology, innovation, and socio-economic

advancement in South Africa, particularly in the context of the RBIDZ Techno hub. A theoretical framework, as van Niel and Snyder (2024) articulates, provides a foundational structure of concepts and theories that anchor a study within its broader academic discipline. Selecting appropriate frameworks requires a meticulous review of literature, guided by their relevance, explanatory power, and alignment with the study objectives (van Niel & Snyder, 2024).

The significance of such frameworks in South African research cannot be overstated, especially given the emphasis funding bodies place on conceptual rigour. They offer a structured focus to interpret technology phenomena (Olsson et al., 2025). The integration of technology in hubs offers profound benefits, enhancing efficiency, boosting performance, and widening access, fuelling the study's interest in adoption dynamics within South Africa's industrial landscape (Kaggwa et al., 2024). This section thus explores into innovation theories that contextualise hubs' broader roles and technology adoption frameworks that pinpoint user engagement with technology.

2.5.1 Theories

The study reviews literature on innovation theories that provide a macro-level understanding of how innovation hubs operate as ecosystems and entrepreneurial drivers, setting the stage for their technological adoption dynamics in Northern KZN.

2.5.1.1 Innovation ecosystems theory

The concept of innovation ecosystems has gained prominence over the past 15 years in South African and global literature, sparking robust debate about its conceptual clarity and practical utility (Marmolin & Nordling, 2024). An innovation ecosystem is defined as a dynamic, interconnected network of actors including technology firms, academic institutions, government bodies, and other participants that collaboratively drive the creation, dissemination, and application of technology innovations (Nan & Huang, 2024). Building on earlier frameworks like national and regional innovation systems from the 1990s, this theory shifts focus to the broader, technology-enabled interdependencies among diverse players, rather than isolated sectoral interactions (Cooke et al., 2024; da Silva & Cardoso, 2025). It underscores how these actors pool digital resources, technical expertise, and ICT capabilities

to develop and commercialise innovations, aiming for cohesive, user-centric technological solutions.

Adner (2013) offers a widely cited definition, describing innovation ecosystems as "collaborative arrangements through which firms integrate their offerings into coherent, customer-facing solutions," a notion rooted in Moore's business ecosystem analogy of interdependent tech-driven relationships (Khokale & Baskaran, 2023). Within South Africa, such ecosystems rely on technology coordination, through platforms like cloud computing and digital networks, to advance innovation and market expansion (Aksoy, 2023). By facilitating knowledge sharing through digital channels, reducing transaction costs with integrated systems, and accelerating tech product development, these ecosystems enhance economic value (Benzidia et al., 2025). In Northern KZN, for instance, the RBIDZ Techno hub exemplifies this by linking local industries with ICT resources to spur technological advancement.

The theory has evolved beyond firm-centric collaborations to encompass regional and national technology networks, integrating public, private, and academic participants (Audretsch et al., 2025). This broader perspective highlights the complexity of technology-driven innovation processes and the critical role of cross-sectoral efforts such as partnerships between universities and tech start-ups, in shaping outcomes. In South Africa, where the NDP prioritises science and technology, innovation ecosystems offer a framework for understanding how economic growth emerges from interconnected digital environments (NDP, 2019). By leveraging technology interdependencies, hubs can optimise innovation through collaborative platforms, accelerate knowledge transfer through digital tools, and deliver comprehensive tech solutions that drive industrial development. This theory thus provides valuable insights into enhancing South Africa's innovation landscape, particularly in regions like Northern KZN seeking to transition to knowledge-based economies.

2.5.1.2 Innovation theory of entrepreneurship

The Innovation Theory of Entrepreneurship posits that entrepreneurial endeavours in South Africa are fundamentally propelled by technological innovation, encompassing the deployment of new technology solutions, processes, or ideas that generate market value and tap into unexplored opportunities (Ayanwale & Ndlovu, 2024). Drawing from Schumpeter's seminal

work, this theory underscores entrepreneurs as pivotal agents in economic development, introducing disruptive technological innovations such as digital platforms or automation tools that challenge entrenched market structures and spawn new tech-driven industries (Supriya et al., 2022). Central to this framework is the notion of "creative destruction," where entrepreneurial ventures leverage technologies to create novel products or services, simultaneously displacing outdated firms or systems (Gaur, 2024). These innovations manifest in diverse forms, including product innovations, process innovations, marketing innovations and organisational innovations such as tech-enabled business models (Aagaard & Tucci, 2024).

In the South African context, entrepreneurs act as catalysts for change, harnessing technological advancements to drive economic growth, particularly in regions like Northern KZN where the RBIDZ Techno hub supports tech-based ventures (Khan et al., 2022). This interplay between innovation and entrepreneurship promotes industrial competitiveness, attracts tech investment, and enhances productivity, making it a cornerstone of economic development (Sagar, 2024). The theory highlights the critical role of entrepreneurial ecosystems, networks of institutions, tech firms, and individuals that support these efforts through resources like funding, digital mentorship platforms, and collaborative ICT opportunities (Sagar, 2024). In South Africa, such ecosystems, exemplified by hubs in Gauteng or KZN, are vital for creating an environment conducive to technological innovation and scalable growth.

This theory emphasises innovation, particularly through technology, as the linchpin of entrepreneurial activity and societal advancement. By continuously introducing and commercialising technology solutions such as mobile applications or data-driven processes, South African entrepreneurs enhance economic resilience and shape the future of industries (Madondo et al., 2024). In Northern KZN, where traditional sectors dominate, this framework offers insights into how tech-focused entrepreneurship can transition the region towards a knowledge-based economy, aligning with national imperatives like the NDP.

2.5.1.3 International innovation theory

Within the expansive landscape of innovation literature, the International Innovation Theory stands out as a critical framework, spotlighting the transformative power of digitalisation in propelling technological innovations across global markets, with particular resonance for rural contexts such as those observed in Europe (Narula Sabharwal, 2024). This theory is known for

its emphasis on leveraging digital technologies to address developmental disparities, a priority that echoes South Africa's socio-economic challenges. The literature positions rural development as a global imperative, advocating for inclusive growth strategies that harness technology to bridge the urban-rural divide, a concept that Gernego (2024) underscores as essential for equitable economic progress. This aligns closely with South Africa's NDP, which seeks to integrate rural regions like those surrounding Richards Bay into a digitally empowered economy.

The United Nations Department of Economic and Social Affairs (UN DESA) reinforces this narrative, championing equitable access to economic resources, land, property, technology, and financial services as a cornerstone of sustainable development, particularly for marginalised communities (UN DESA, 2019). In the South African context, this call for digital inclusion resonates powerfully, where historical inequities have left rural populations, such as those in Northern KZN, on the fringes of technological advancement. The literature highlights how ensuring vulnerable groups gain access to technological resources such as broadband or mobile platforms can democratise innovation, encouraging benefits that ripple across diverse communities (Gernego, 2024). This theory offers a focus to examine how the RBIDZ Techno hub can extend digital access to rural entrepreneurs, aligning with global and local imperatives for inclusive growth.

Central to the theory is the notion of technological development, which the literature describes as a dual process of incremental and radical innovation (Volti & Croissant, 2024). Incremental innovations such as iterative upgrades to hub-provided software, are vital for sustaining short- to medium-term performance, a point of relevance for Northern KZN industries seeking immediate efficiency gains (Volti & Croissant, 2024). However, the literature warns that these alone are insufficient for long-term competitiveness, advocating for radical or breakthrough innovations like AI-driven analytics or blockchain systems, that fundamentally reshape industries or birth new ones. In South Africa, where global market competition is intensifying, this duality is critical, and innovation hubs like RBIDZ are positioned as incubators for such transformative technological advancements.

The literature further underlines the pivotal role of innovation hubs globally, noting their capacity to nurture the skills, capabilities, and infrastructure needed for sustainable enterprises. Early-stage tech start-ups, often constrained by sustainability and growth challenges, rely on

hubs to provide mentorship, networking opportunities, and technology resources from coding workshops to cloud access, a reality mirrored in Northern KZN (Karani & Mshenga, 2021). Studies emphasise that supporting these start-ups through strategies that enhance market access, human capital, and funding is essential, with hubs acting as conduits to international venture capital networks (Errico et al., 2024). This theory highlights how RBIDZ can support KZN entrepreneurs, advancing a tech ecosystem that bridges local innovation with global opportunities.

The International Innovation Theory's strength lies in its comprehensive approach, integrating digitalisation, equitable resource access, and the spectrum of innovation types to drive sustainable growth across diverse contexts (Jianing et al., 2023). Its relevance to South Africa is profound, offering insights into how hubs can address global development challenges like poverty and digital exclusion, while aligning with local priorities under the NDP. In Northern KZN, where rural-industrial disparities persist, this theory informs the study's exploration of how RBIDZ leverages technology to promote inclusive, transformative innovation, complementing the study's broader theoretical framework.

2.5.1.4 African innovation hub theory

The African Innovation Hub Theory highlights the increasing importance of innovation hubs and their associated business models across the continent (Nkontwana, 2022). The literature reveals a notable imbalance in research focus, with much of the existing work concentrated on more developed regions, leaving a substantial gap in understanding how hubs function within developing settings such as South Africa (Simuka & Chinakidzwa, 2022). While studies affirm the value of hubs in advancing innovation, there remains a dearth of empirical evidence on the specific operational and business models they employ, especially within Africa's multifaceted socio-economic landscape (Mwantimwa et al., 2021). Africa's rich diversity, spanning 54 nations with varied cultural, economic, and political terrains, demands a nuanced approach to innovation hub analysis, a point underscored by Mwantimwa et al. (2021). Recent literature has begun to address this void, with works like Corsini's (2022) exploration of Ethiopian hubs and studies in Rwanda and Uganda shedding light on local dynamics. However, the literature acknowledges that much more investigation is required, particularly in South Africa, where hubs like RBIDZ operate amidst unique regional pressures.

This theory calls for future research to delve into how Africa's distinct contextual challenges, ranging from institutional weaknesses and political instability to economic constraints and geographic disparities that shape social innovation, and entrepreneurial processes, offering a framework that resonates with the study's focus on Northern KZN (Mwantimwa et al., 2021). Audretsch et al. (2022) argue that understanding these local influences is pivotal to unpacking the roles of social innovators and entrepreneurs in driving economic development, a perspective the study explores through the RBIDZ focus. The literature advocates for comparative, cross-country analyses to illuminate similarities and differences in social innovation practices across Africa, a gap that Ciambotti and Pedrini (2021) identify as critical for advancing theoretical depth. Despite some strides, research delays behind the rapid evolution of African innovation hubs and entrepreneurial ecosystems, leaving numerous questions unanswered, a shortfall that prompted the Africa Journal of Management to dedicate a special issue to these concerns (Littlewood & Kiyumbu, 2018). In South Africa, this theory's relevance is heightened by the nation's position at a developmental crossroads, grappling with persistent poverty, resource competition, and climate change impacts, challenges mirrored in Northern KZN's rural-industrial divide (Schoch & Lakner, 2020).

Innovation hubs are positioned as linchpins in this context, serving as key platforms that promote economic growth and entrepreneurship by providing access to technology resources, training, and mentorship, as Sagar et al. (2023) affirm. Across countries like Kenya, Nigeria, and South Africa, innovation hubs bridge gaps between government, private sectors, and civil society, with Akomea-Frimpong et al. (2023) noting their role in advancing collaboration. In Northern KZN, the RBIDZ Techno hub exemplifies this by nurturing start-up ecosystems, leveraging technology tools like cloud platforms to drive industrial innovation, a significant impact highlighted by Gumbo and Moos (2024). However, the literature cautions that many hubs and start-ups falter due to flawed market assessments, resulting in short lifecycles akin to the dot-com bubble's "creative destruction".

Despite these hurdles, the African hub landscape is expanding steadily, with Kruger and Steyn (2024) reporting an approximate 15% annual increase in new hubs since 2014. The theory positions hubs as catalysts for shifting Africa's economies from resource-dependent to knowledge-based systems, equipping entrepreneurs with digital skills and technology infrastructure to ensure long-term sustainability and address regional challenges. In South Africa, this aligns with the NDP's vision, making hubs like RBIDZ critical for Northern KZN's

industrial transformation. However, significant obstacles persist with limited funding, inadequate government support, and infrastructural deficits which Baye (2025) argue must be tackled to unlock hubs' full potential as drivers of Africa's economic future. For this study, this theory offers the focus to examine how RBIDZ navigates these challenges, informing the qualitative exploration of its technology-driven impact on KZN's development.

2.5.2 Frameworks

This section critically examines technology adoption frameworks that provide micro-level insights into how technology is adopted within innovation hubs, with specific emphasis on their application to Northern KZN. Rather than reviewing all available frameworks, this study adopts and justifies the selection of two complementary theoretical frameworks: the UTAUT and the African Innovation Hub Model. This selective approach ensures theoretical coherence while addressing the specific contextual complexities of techno hub adoption in under-resourced regions.

This study adopts UTAUT as its primary technology adoption framework due to its superior predictive power and comprehensive integration of multiple established models. Venkatesh et al. (2003) demonstrated that UTAUT accounts for 70% of variance in technology adoption intention, significantly outperforming individual models like TAM or TPB (Xue et al., 2024). Recent systematic reviews confirm UTAUT's continued relevance, particularly in educational and organizational contexts where performance expectancy and effort expectancy remain the strongest predictors of behavioural intention (Xue, Rashid, & Ouyang, 2024). For innovation hubs operating in complex socio-technical environments, UTAUT's four core constructs, performance expectancy, effort expectancy, social influence, and facilitating conditions, provide a robust lens for understanding how entrepreneurs, researchers, and support staff adopt digital tools and platforms (Neves et al., 2025).

The African Innovation Hub Model is adopted as a complementary framework to address UTAUT's limitations in accounting for contextual variables specific to developing economies. While UTAUT effectively captures individual adoption behaviours, it inadequately addresses systemic factors such as infrastructure constraints, informal economies, and community-embedded governance structures prevalent in African innovation ecosystems (Gumbo, 2024). The African Innovation Hub Model emphasises contextual embeddedness, community

engagement, hybrid governance, and culturally grounded innovation processes, factors critical for understanding techno hub effectiveness in Northern KZN's socio-economic landscape (Haukipuro et al., 2024).

This study proposes an integrated lens that couples UTAUT focusing on user-level adoption with the African Innovation Hub Model emphasising systemic and ecosystem dynamics. This methodological integration enables a dual-layered analysis that captures both the behavioural determinants of technology adoption among individual users and the structural conditions that enable or constrain innovation ecosystem functionality. The integration addresses recent critiques that technology adoption frameworks must account for contextual complexity, particularly in rural and marginalised settings where standard assumptions about infrastructure, digital literacy, and market dynamics may not apply (Kruger & Steyn, 2024). The framework synthesis operates as follows: UTAUT constructs are contextualised within the African hub environment by incorporating locally specific variables such as community trust mechanisms, indigenous knowledge systems, and informal resource-sharing networks. For instance, performance expectancy is expanded to include social value outcomes prioritised in marginalised communities, while facilitating conditions are interpreted through the lens of hybrid governance and informal support structures characteristic of African innovation ecosystems (Gumbo, 2024; Haukipuro et al., 2024).

Recent empirical applications of UTAUT in African contexts confirm its adaptability when combined with contextual frameworks. Studies demonstrate that performance expectancy and social influence remain strong predictors in technology-mediated development contexts, but their effects are moderated by local cultural values, community leadership structures, and infrastructure realities (Neves et al., 2025; Xue et al., 2024). This supports the study's decision to integrate UTAUT with the African Innovation Hub Model, as this combination enables examination of both individual adoption behaviours and the systemic conditions that shape innovation outcomes in Northern KZN. By adopting these two frameworks rather than conducting an exhaustive review of all available models, the study ensures theoretical depth, contextual relevance, and analytical coherence necessary for understanding techno hub dynamics in under-resourced African regions.

2.5.2.1 Diffusion of Innovation (DOI) theory

The Diffusion of Innovation (DOI) Theory, pioneered by Everett M. Rogers in 1962, stands as a foundational framework within the adoption literature, offering a systematic focus through which to explore how technology innovations permeate social systems, including South African innovation hubs such as the RBIDZ Techno hub in Northern KZN. The literature underlines its significance by delineating five adopter categories, innovators, early adopters, early majority, late majority, and laggards, see Figure 2.1., each reflecting varying degrees of readiness to embrace change, alongside five key characteristics, relative advantage, compatibility, complexity, trialability, and observability that shape the adoption process (Jianing et al., 2024). These elements collectively provide a phased understanding of how technology diffuses within a social context.

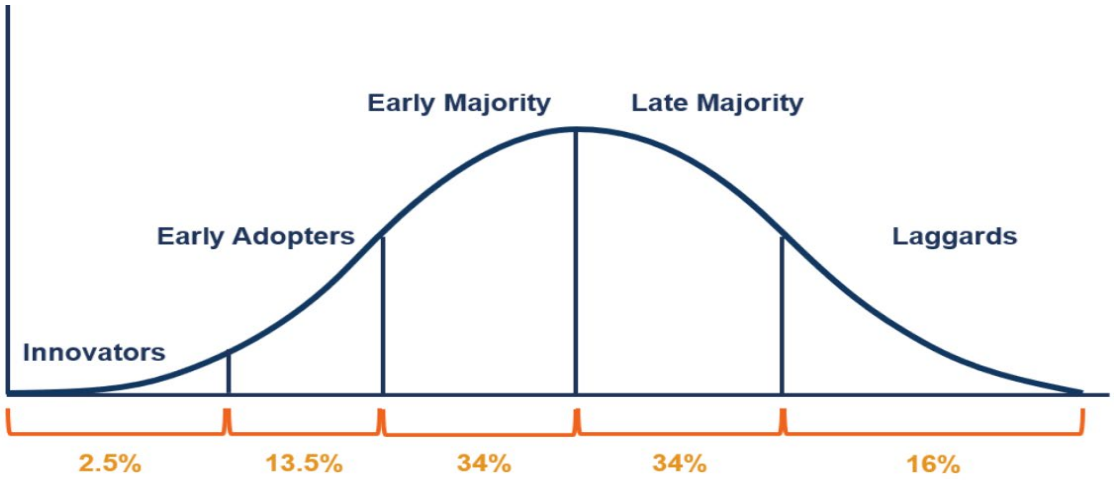

FIGURE 2. 1 DIFFUSION OF INNOVATION CATEGORIES OF ADOPTION

In the South African setting, DOI's relevance shines through its application to the RBIDZ Techno hub, where digital innovations such as cloud-based platforms and mobile applications, spread across a spectrum of users, from tech-savvy entrepreneurs to traditional industry practitioners (Egbuonu, 2024). The literature features how relative advantage propels adoption when RBIDZ users perceive technology tools as superior to existing methods, for instance, by boosting production efficiency in Northern KZN's manufacturing sector (Minz et al., 2024). Compatibility ensures these technologies align with local operational realities, such as integrating seamlessly with existing ICT infrastructure in Richards Bay, a hub surrounded by rural areas with unique needs. Complexity, often a barrier in regions with diverse digital literacy levels, is mitigated through RBIDZ's training initiatives, which simplify the uptake of new systems (Ollerenshaw et al., 2021). Meanwhile, trialability allows users to test tools like

apps for market access in a low-risk environment, advancing confidence, while observability thrives as peers demonstrate tangible successes, accelerating diffusion within the hub community.

The literature further elaborates DOI's stages of adoption awareness, decision-making, initial trial, and sustained use providing a dynamic framework to trace how innovations unfold over time (Amini & Jahanbakhsh Javid, 2021). In Northern KZN, innovators and early adopters, such as tech-savvy youth, often pioneer technology adoption within RBIDZ, paving the way for the broader early and late majority perhaps traditional workers to follow as benefits become evident (Gerli et al., 2021). This phased approach resonates with South Africa's developmental context, where innovation hubs serve as critical centres for technology development and knowledge exchange, driving industrial growth by promoting the adoption of advanced technology solutions (Mwantimwa et al., 2021). Studies emphasise that by showcasing improvements over outdated practices, hubs motivate users to embrace technologies that enhance productivity and competitiveness, a key focus of the study (Surya et al., 2021).

DOI offers a narrative framework to investigate how RBIDZ facilitates technology diffusion, enabling me to capture adoption stages through interviews with diverse hub participants (Mwantimwa et al., 2021). The theory's principles leveraging relative advantage, enhancing compatibility, reducing complexity, enabling trialability, and promoting observability equip hubs to strategically support technology uptake, aligning with South Africa's NDP goals for a knowledge-based economy. Its strength lies in illuminating the broader spread of innovation, complementing UTAUT, which delves deeper into individual user acceptance. In Northern KZN, where rural-urban digital divides persist, DOI provides a vital focus to explore how RBIDZ bridges these gaps, advancing an environment that accelerates industrial development and economic resilience across the region.

2.5.2.2 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), conceptualised by Fred Davis in 1989, constitutes a seminal framework within the field of technology adoption studies (Davis & Granić, 2024). Extensively cited in academic literature, TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) serve as pivotal psychological determinants influencing individuals' acceptance of technology within various contexts, including innovation hubs

(Davis & Granić, 2024). The model's strength lies in its emphasis on user perceptions, wherein PU encapsulates the belief that technology enhances performance, while PEOU reflects the conviction that its utilisation requires minimal effort. Within RBIDZ Techno hub in Northern KZN, TAM provides a focus through which to examine the uptake of digital tools, such as data dashboards. Here, PU aligns with productivity improvements, while PEOU ensures accessibility across diverse literacy levels, a critical factor in the South African context.

Intellectual discourse highlights TAM's practical utility, particularly in how innovation hub-based training interventions amplify PU by elucidating tangible benefits and support PEOU through user-friendly interfaces (Sartzetaki et al., 2025). These elements collectively advance sustained technology engagement. In a South African setting marked by persistent digital disparities, TAM's focus on usability proves invaluable, informing qualitative inquiries into RBIDZ users' experiences through methods such as interviews. While TAM excels in elucidating individual acceptance, offering actionable insights for innovation hub optimisation, its limitation lies in its exclusion of broader social and structural dynamics, rendering it a complementary rather than exhaustive framework when juxtaposed with the UTAUT. Originally developed by Davis in 1986 and refined over time, TAM extends the Theory of Reasoned Action (TRA) by incorporating constructs tailored to technology adoption (Davis & Granić, 2024). Its primary aim is to predict and explain the factors shaping individuals' decisions to embrace and effectively employ new technologies, thereby guiding the design of user-centric systems and enhancing adoption success (Davis & Granić, 2024). The model delineates two core constructs, illustrated in Figure 2.2:

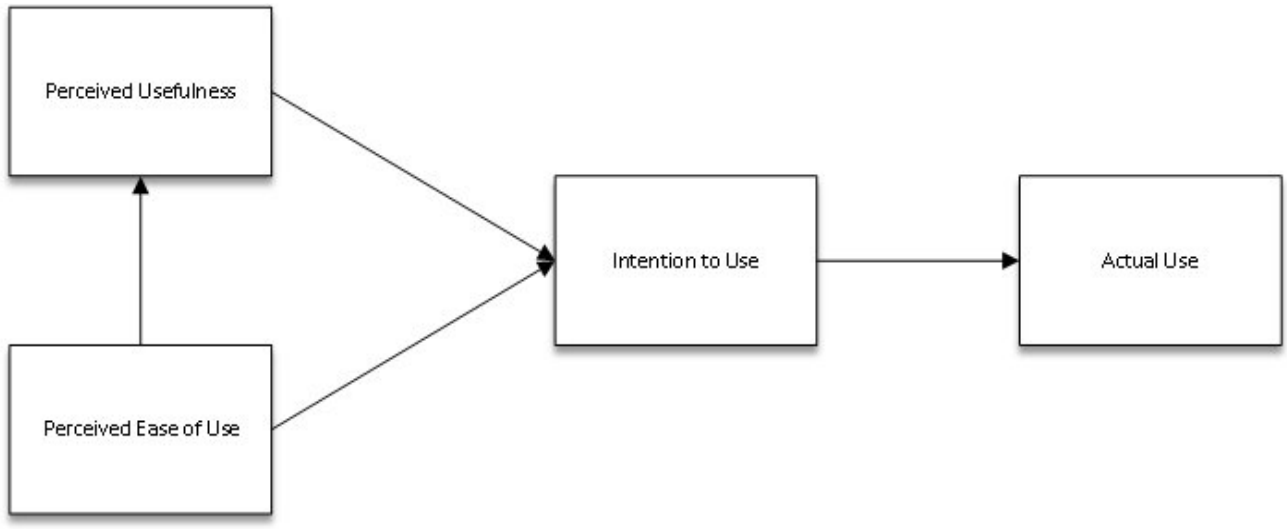

FIGURE 2. 2 TECHNOLOGY ACCEPTANCE MODEL (DAVIS, 1989)

i. Perceived Usefulness (PU)

PU denotes the degree to which individuals perceive a technology as capable of improving their work efficiency or simplifying task execution.

ii. Perceived Ease of Use (PEOU)

PEOU refers to the extent to which users believe that engaging with the technology entails minimal effort or complexity.

Additional constructs within TAM, attitude towards usage, behavioural intention to use, and actual system use collectively provide a holistic understanding of technology acceptance (Davis & Granić, 2024). Attitude towards usage captures users' affective disposition towards the technology, while behavioural intention signifies their commitment to future use, ultimately culminating in observable adoption patterns (Gupta et al., 2023).

Innovation hubs, often manifested as Techno hubs within industrial ecosystems, are instrumental in advancing industrial development by furnishing the infrastructure, resources, and collaborative spaces requisite for technology integration (Gupta, 2024). TAM offers a theoretical scaffold to unpack how individuals and entities within these innovation hubs adopt available technologies, thereby supporting overarching industrial objectives (Gupta, 2024). Specifically, the model elucidates how PU and PEOU drive adoption rates among hub participants. When technologies are perceived as enhancing productivity, users are more inclined to integrate them into their workflows. Similarly, intuitive, effort-minimising designs broaden accessibility, promoting inclusivity across diverse sectoral actors.

In this vein, innovation hubs support industrial progress by enhancing the perceived value and usability of emerging technologies, aligning with TAM's foundational principles (Nazir & Khan, 2024). Through structured training, workshops, and peer collaboration, these innovation hubs cultivate environments conducive to technology uptake, resonating with TAM's focus on advancing user acceptance and sustained utilisation (Pazhanimala, 2024). This, in turn, advances industrial goals by accelerating productivity, spurring innovation, and fortifying South Africa's competitive stance in global markets. TAM thus serves as a robust analytical tool for dissecting technology acceptance within innovation hubs, underscoring the salience of PU and PEOU in shaping user intentions and behaviours (Ajina et al., 2024). By facilitating the adoption of advanced technologies, such innovation hubs not only elevate individual

performance and operational efficiency but also enhance the industrial sector's capacity for growth, adaptability, and sustainable development.

2.5.2.3 Theory of Planned Behaviour (TPB)

Building on the foundation laid by the TAM, which emphasises perceived usefulness and ease of use in technology adoption, the Theory of Planned Behaviour (TPB), developed by Icek Ajzen in the 1980s, extends the TRA to predict behavioural intentions in contexts where individuals retain a degree of autonomy over their actions. A distinguishing feature of TPB is the incorporation of control beliefs, which reflect individuals' perceptions of the ease or difficulty associated with enacting a behaviour (Ajzen, 2020). This addition enhances TPB's capacity to account for behaviours influenced by perceived constraints, offering a more comprehensive explanatory framework than its predecessor. The model delineates three core belief types, as illustrated in Figure 2.3:

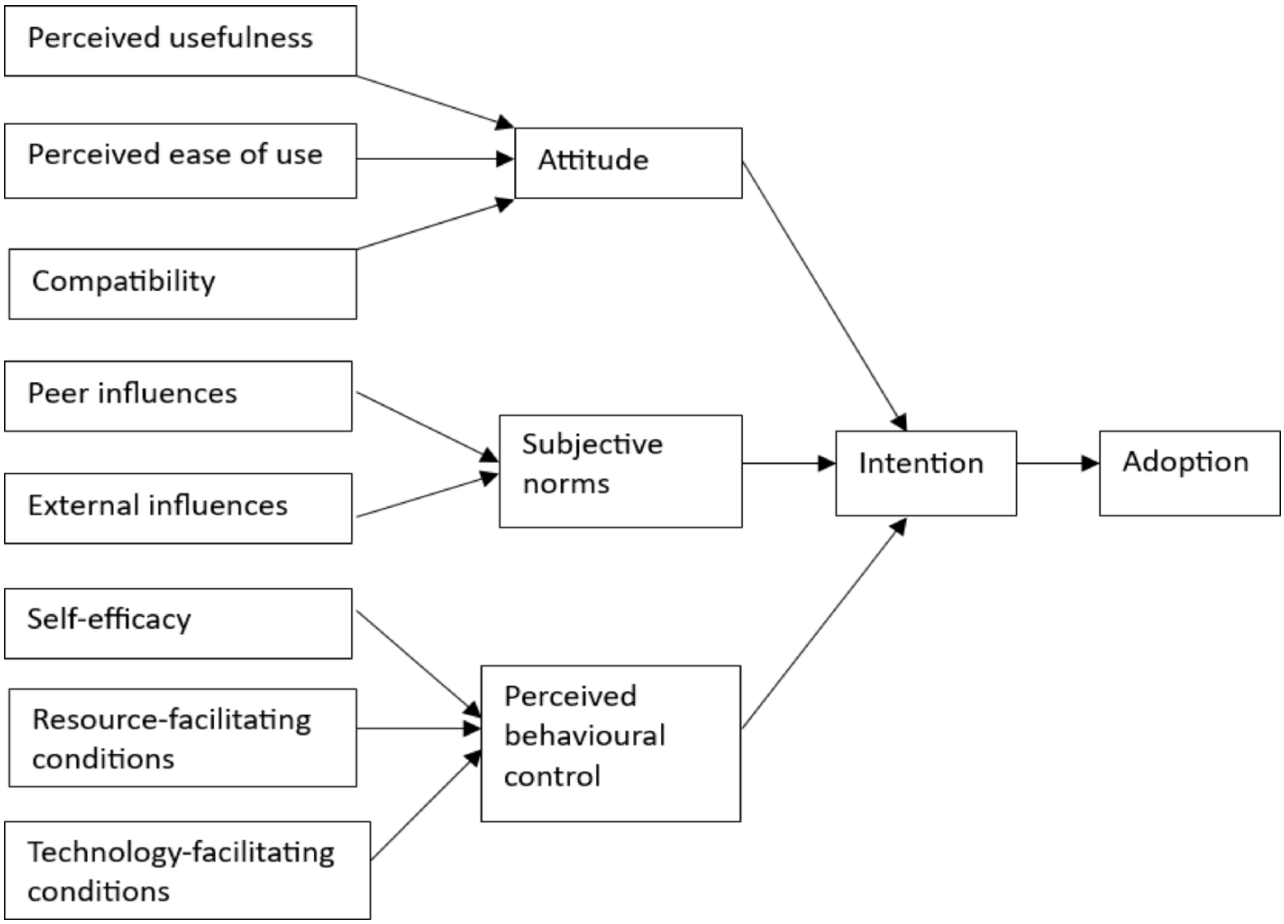

FIGURE 2. 3 THE THEORY OF PLANNED BEHAVIOUR

i. Behavioural beliefs

These beliefs centre on the anticipated outcomes of a behaviour, shaping an individual's attitude towards it.

ii. Normative beliefs

These encompass perceived social pressures or expectations from influential figures or groups, informing the individual's subjective norms.

iii. Control beliefs

These relate to perceived enablers or barriers to the behaviour, influencing an individual's sense of behavioural control.

In TPB, behavioural intentions arise from the interplay of attitudes, subjective norms, and perceived behavioural control, rendering it a valuable tool for discerning the likelihood of engaging in specific actions (Sadaf & Gezer, 2020). Widely applied across diverse domains, TPB effectively examines behaviours shaped by personal and social factors, including the adoption of technology within organisational and industrial settings (FakhrHosseini et al., 2024). In the context of innovation hubs, key platforms for advancing technological integration and industrial development, TPB provides a robust framework for understanding how users decide to engage with new technologies, with their intentions moulded by behavioural, normative, and control beliefs (FakhrHosseini et al., 2024).

Within innovation hubs such as the RBIDZ Techno hub, behavioural beliefs underpin users' attitudes towards the perceived benefits of leveraging cutting-edge technologies and resources. When individuals perceive that employing these technologies enhances productivity or advances professional growth akin to TAM's perceived usefulness, they are more inclined to develop positive attitudes towards adoption (Rouidi et al., 2022). Normative beliefs, meanwhile, are shaped by the hub's organisational culture and the social influence exerted by peers, mentors, or industry experts. Encouragement from these participants reinforces subjective norms that promote technology use, amplifying users' behavioural intentions in a manner complementary to TAM's focus on individual perceptions (Ezeudoka & Fan, 2024). Control beliefs, echoing TAM's emphasis on ease of use, are supported by the training, resources, and infrastructure provided within innovation hubs, enhancing users' confidence in their ability to master new technologies effectively (Ujwary-Gil & Godlewska-Dzioboń, 2022).

When users perceive that sufficient support exists to surmount potential obstacles, their perceived behavioural control strengthens, aligning with TAM's usability principles and

advancing a greater intent to integrate technology into their workflows (Rouidi et al., 2022). Applying TPB within innovation hubs, such as those in South Africa where digital divides persist, not only elucidates individual technology adoption patterns but also identifies avenues for enhancing support mechanisms to encourage broader engagement (Kruger & Steyn, 2024). By cultivating a supportive culture, improving resource accessibility, and strengthening user training paralleling TAM's practical applications, innovation hubs can leverage TPB's constructs to elevate intentions to adopt technology, thereby driving industrial growth and competitive advantage (Khan et al., 2024).

TPB thus offers a sturdy theoretical scaffold for unpacking technology adoption within innovation hubs, spotlighting how attitudes, social expectations, and perceived control interplay to shape intentions and behaviours (Khan et al., 2024). In a South African industrial context, where hubs like RBIDZ aim to bridge technological gaps, TPB's principles can guide the development of tailored support structures that promote widespread technology uptake. This aligns with TAM's focus on user-centric design, enhancing industrial productivity, spurring innovation, and contributing to sustainable development, thereby reinforcing South Africa's position in the global market.

2.5.2.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

Following the exploration of the TAM and TPB, which respectively highlight user perceptions and behavioural intentions in technology adoption, the UTAUT, developed by Venkatesh et al. in 2003, emerges as a comprehensive framework designed to address the shortcomings of earlier models. Preceding frameworks, such as TAM and TPB, often exhibited limitations, including a lack of empirical cross-contextual validation and a focus on simpler technologies like personal computers, which restricted their predictive robustness across diverse and complex systems (Venkatesh et al., 2003). Furthermore, their narrow scope overlooked variations in user experiences, decision-making processes, and contextual nuances across multifaceted IT environments (Venkatesh et al., 2003). UTAUT synthesises elements from eight foundational models, including TAM and TPB, into a cohesive framework underpinned by four core constructs, as depicted in Figure 2.4:

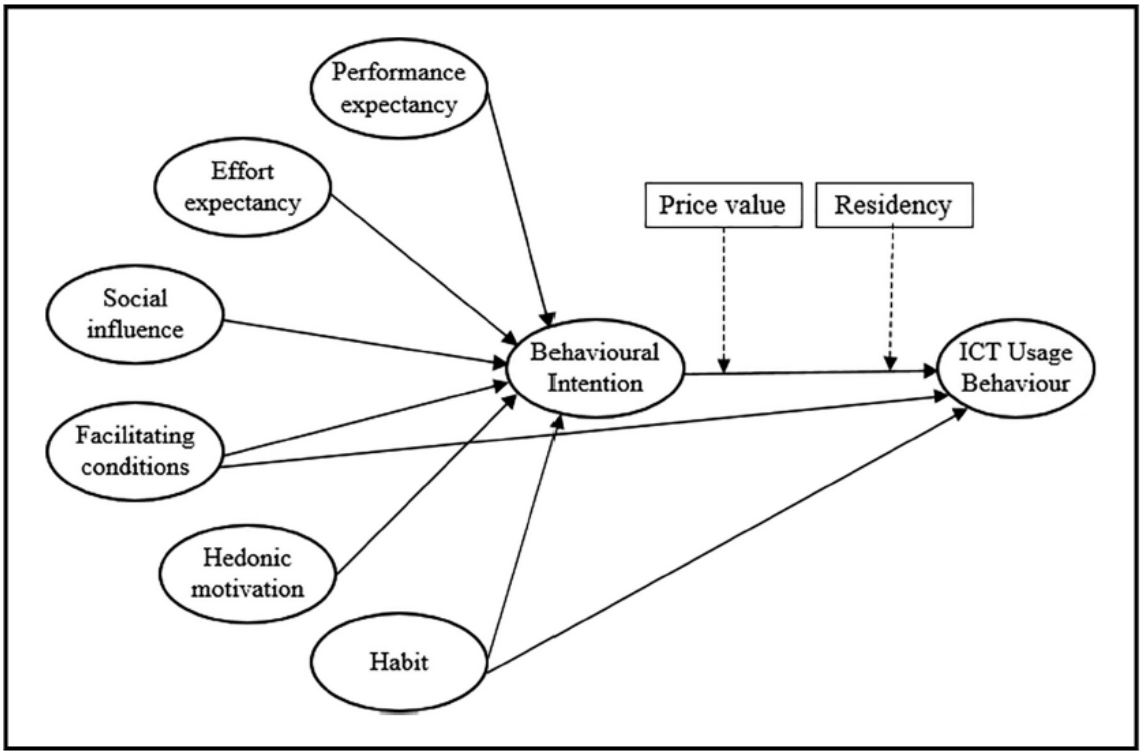

FIGURE 2. 4 THE UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY MODEL

i. This refers to the perceived benefits or utility that users associate with a technology, akin to TAM's perceived usefulness.
ii. This captures the perceived ease or difficulty of using a technology, mirroring TAM's perceived ease of use.
iii. This reflects the impact of peers, superiors, or social networks on an individual's intention to adopt technology, aligning with TPB's normative beliefs.
iv. This pertains to the availability of resources and support structures essential for technology adoption, resonating with TPB's control beliefs.

These constructs are moderated by factors such as age, gender, experience, and voluntariness of use, enhancing UTAUT's adaptability across diverse demographics and settings (Venkatesh et al., 2003). While UTAUT has gained prominence in domains like health information technology, it has faced critique for its emphasis on individual adopter beliefs and intentions, potentially neglecting broader systemic or contextual influences. Intellectuals advocate for a more multidimensional approach to capture the complexities of technology adoption, particularly in rapidly evolving fields with varied user needs (Rouidi et al., 2022). Nonetheless, UTAUT's integrative nature positions it as a valuable extension of TAM and TPB within the South African context.

In the realm of innovation hubs, such as the RBIDZ Techno hub, UTAUT provides a sophisticated focus through which to examine technology adoption, enabling hubs to tailor support systems to user needs. Performance expectancy, akin to TAM's focus on productivity gains, can be enhanced by deploying technologies that demonstrably elevate job performance, reinforcing the hub's role in users' professional advancement. Effort expectancy, echoing TAM's usability concerns, gains salience as hubs introduce advanced tools that may appear daunting, mitigating perceived complexity through training and intuitive interfaces, advancing greater uptake (Gupta et al., 2024). Social influence, paralleling TPB's normative beliefs, thrives in collaborative hub environments where peer encouragement and organisational culture accelerate technology acceptance. By advancing a community that champions technological engagement, hubs can amplify adoption rates (Mwantimwa, 2021).

Facilitating conditions, akin to TPB's control beliefs, are pivotal in sustaining user engagement. Hubs that provide accessible infrastructure, technical support, and resources, mirroring the training emphasis in TAM and TPB, support adoption and long-term utilisation (Mwantimwa, 2021). UTAUT's multidimensional framework aligns seamlessly with the objectives of innovation hubs in South Africa, where digital divides persist, creating an environment conducive to technology acceptance and industrial progress. By addressing these adoption drivers, innovation hubs can expedite user engagement with emerging technologies, advancing innovation and supporting sustained industrial growth in a competitive global landscape.

The adoption dynamics within innovation hubs are further illuminated by complementary theoretical models, such as the Diffusion of Innovations Theory, proposed by Everett Rogers. This theory explores how innovations, including new technologies, permeate social systems, categorising adopters into five groups: innovators, early adopters, early majority, late majority, and laggards, based on their readiness to embrace change. This typology, when integrated with UTAUT, enriches the understanding of varying adoption rates across hub users, offering insights into tailoring interventions for diverse segments (Costales, 2022). Together, UTAUT and related frameworks provide a holistic perspective on technology adoption, bridging individual and organisational dimensions to enhance industrial productivity, innovation, and sustainable development in SA.

2.6 Summary of related works

Innovation and technology hubs have emerged as pivotal mechanisms for fostering economic transformation in developing regions, yet their operational effectiveness remains underexplored, particularly in marginalised contexts like Northern KZN. This comprehensive review examines existing literature through four key constructs: technology adoption and usage patterns, innovation ecosystem dynamics, socio-technical factors in entrepreneurial support, and sustainability mechanisms within innovation hubs. The literature reveals both significant progress and persistent gaps in understanding how these constructs interact to drive sustainable industrial development.

Contemporary research on technology adoption within innovation hubs predominantly employs established behavioral frameworks such as the UTAUT and the TAM to explain user engagement with digital platforms and innovation tools (Xue et al., 2024; Zhang et al., 2024). Recent empirical investigations demonstrate that performance expectancy, effort expectancy, social influence, and facilitating conditions serve as primary determinants influencing start-up and entrepreneur engagement with technological innovations within hub environments (Vidal-Silva et al., 2024; Zhang et al., 2024). Innovation hubs are embedded within complex ecosystems that interlink academia, industry, government, and community stakeholders (Chirchietti, 2017; Haukipuro et al., 2024). The African Innovation Hub Model emphasises ecosystem factors such as hybrid governance, community embeddedness, and resource mobilization mechanisms tailored for African socio-economic realities (Haukipuro et al., 2024). Studies particular to South Africa document challenges including uneven resource distribution, fragmented institutional coordination, and limitations in collaborative governance, which affect hubs' ability to catalyse sustainable regional development (Kayser, Ngowi, & Zola, 2023; Mwansa, Dlamini, & Nkosi, 2025).

However, adoption patterns in rural and peri-urban contexts reveal additional complexities that extend beyond traditional behavioral models. Studies examining agricultural technology adoption in rural China found that facilitating conditions and performance expectancy emerge as the strongest predictors of behavioral intention, with social influence playing a particularly crucial role in community-based adoption processes (Zhang et al., 2024). Similarly, research on mobile application adoption among micro-enterprises in South Africa confirms UTAUT's predictive validity while highlighting the importance of contextual factors such as digital literacy pathways and community-led learning models (Slinger, 2024).

These findings suggest that technology adoption in hub environments requires frameworks that incorporate both individual behavioral factors and systemic variables such as infrastructural barriers, cultural influences, and community trust mechanisms. The literature indicates a need for more nuanced models that account for the unique socio-technical dynamics present in under-resourced regions.

Innovation hubs operate within complex ecosystems that interconnect academia, industry, government, and community stakeholders through dynamic networks of collaboration and resource exchange. Recent research emphasises the importance of multi-actor rural innovation ecosystems (RIEs) that leverage place-based approaches and community embeddedness to foster economic growth and address spatial disparities (Bravaglieri et al., 2025). The African innovation landscape has witnessed significant growth, with technological capabilities in African Union Member States increasing from 25% to 41% between recent assessments, reflecting substantial investments in digital infrastructure and policy reforms (NEPAD, 2025).

The STI Strategy for Africa 2024 (STISA-2024) framework emphasises the critical role of institutional support and multi-stakeholder collaboration in promoting successful innovation ecosystems across the continent (AU, 2024). However, studies specific to South African contexts document persistent challenges including uneven resource distribution, fragmented institutional coordination, and limitations in collaborative governance structures that constrain hubs' ability to catalyse sustainable regional development (Kahn, 2025). Research on rural innovation ecosystems in European contexts provides valuable insights into the importance of anchor institutions, multi-scale approaches, and sustainability-focused governance models for successful ecosystem development (EC, 2024). These findings underscore the need for innovation hubs to develop governance mechanisms that balance top-down institutional support with bottom-up community engagement and participatory decision-making processes.

Entrepreneurial success within innovation hubs is significantly influenced by socio-technical determinants that extend beyond technological infrastructure to encompass organizational culture, social capital formation, mentorship networks, and access to diverse financing mechanisms. Recent research highlights that the quality of start-up support services, including training programs, incubation facilities, networking opportunities, and social cohesion measures, critically influence venture sustainability and growth trajectories (Kumar et al.,

2024). Studies examining support factors contributing to successful start-up ventures identify family networks, role models, mentors, team members, and business partners as crucial elements in entrepreneurial ecosystems (Support factors study, 2024). The research emphasises that support systems must be contextually relevant and culturally appropriate, particularly in marginalised regions where traditional business models may not apply. In African contexts, community engagement emerges as a particularly important factor, with successful hubs demonstrating the ability to leverage indigenous knowledge systems, informal resource-sharing networks, and culturally grounded innovation processes (i4Policy, 2024). The African innovation landscape increasingly recognises the importance of youth-led initiatives and grassroots innovation as mechanisms for offsetting institutional shortcomings and driving inclusive economic development.

Sustainability remains a persistent challenge for innovation hubs globally, with over-reliance on government funding and external grants identified as a critical vulnerability. Recent literature advocates for diversified funding models that combine traditional venture capital with innovative financing mechanisms such as blended finance funds, impact investment, and community-based funding approaches (TIA, 2025). The TIA of SA has pioneered innovative funding models including the Industry Matching Fund (IMF) and Innovation Fund, which leverage partnerships with venture capital firms, angel investors, development finance institutions, and corporate sponsors to create sustainable funding ecosystems (TIA, 2024). These initiatives demonstrate the potential for fund-of-funds models that reduce dependence on single funding sources while building local investment capacity. Research on sustainable innovation funding emphasises the importance of embedding inclusive governance practices and community engagement mechanisms to ensure long-term viability and local ownership (OECD, 2025). Studies highlight that successful sustainability strategies must address both financial diversification and institutional capacity building, creating resilient ecosystems capable of adapting to changing economic conditions and stakeholder needs.

2.7 Conceptual model developed from the study

Despite substantial scholarly attention to innovation hubs and technology adoption, significant empirical and theoretical gaps remain that impede understanding of techno hub effectiveness in rural African contexts, particularly regions like Northern KZN. The literature reveals three primary areas where knowledge gaps constrain both theoretical development and practical implementation.

Most existing studies focus either on urban innovation hubs or examine isolated behavioral adoption models without adequately integrating systemic ecosystem dynamics with individual-level technology adoption processes (Zhang et al., 2024; Bravaglieri et al., 2025). Research typically employs single theoretical frameworks, either behavioral models like UTAUT or ecosystem approaches like regional innovation systems, without synthesising micro-level adoption behaviors with macro-level institutional and governance factors. This fragmentation limits understanding of how individual technology acceptance interacts with broader ecosystem conditions to influence hub effectiveness. Furthermore, empirical assessments that simultaneously incorporate socio-technical factors, infrastructural constraints, sustainability mechanisms, and cultural embeddedness are notably scarce in African contexts (Kahn, 2025; Kumar et al., 2024). The few studies that attempt comprehensive analysis often lack the methodological rigor necessary to establish causal relationships between ecosystem conditions and adoption outcomes, resulting in descriptive rather than explanatory insights.

The literature demonstrates limited attention to the unique operational challenges and opportunities present in rural and marginalised settings. Existing technology adoption frameworks assume standard infrastructure conditions, formal economic structures, and traditional governance mechanisms that may not apply in under-resourced African regions (Slinger, 2024; Zhang et al., 2024). Studies examining rural innovation ecosystems primarily focus on European or Asian contexts, with limited empirical work addressing African rural-industrial dynamics and their implications for hub design and implementation. Additionally, research on African innovation ecosystems tends to concentrate on established urban hubs in countries like Kenya, Nigeria, and SA's metropolitan areas, with insufficient attention to emerging hubs in smaller cities and rural regions where different success factors may apply (i4Policy, 2024; NEPAD, 2025). This geographic bias limits understanding of how innovation ecosystems can be adapted to address the specific challenges and opportunities present in marginalised regions.

The literature lacks comprehensive frameworks capable of evaluating Techno Hub contributions to regional industrial development through integrated assessment of technological infrastructure, entrepreneurial support effectiveness, governance quality, and sustainability mechanisms. Existing evaluation approaches typically focus on single dimensions, such as start-up survival rates, technology adoption levels, or funding

mobilization, without examining how these factors interact to produce broader economic transformation outcomes. This fragmentation impedes development of evidence-based policy recommendations and limits the ability of hub managers and policymakers to optimise resource allocation and strategic planning. The absence of holistic evaluation frameworks is particularly problematic in under-resourced contexts where resource constraints require careful prioritization and where ecosystem interventions must demonstrate clear linkages between inputs, processes, and development outcomes.

Building on the identified literature gaps, this study proposes an integrated conceptual model that synthesises micro-level behavioral adoption constructs from UTAUT with macro-level ecosystem factors derived from the African Innovation Hub Model. This hybrid framework addresses the documented limitations in existing research by providing a comprehensive lens for understanding techno hub effectiveness in marginalised regions. Figure 2.5 illustrates the proposed model features four interconnected components that collectively influence Techno Hub effectiveness in driving sustainable industrial development.

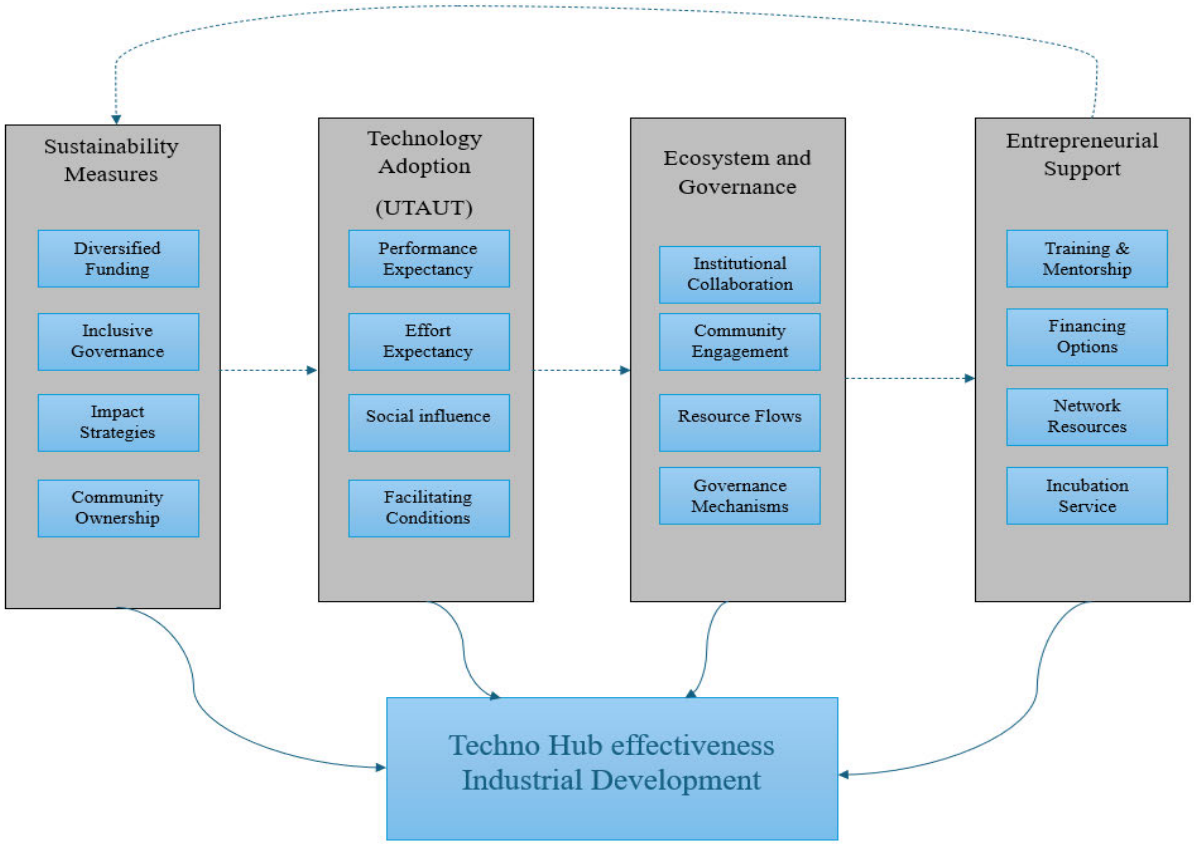

FIGURE 2. 5 CONCEPTUAL MODEL FOR TECHNO HUB EFFECTIVENESS

Drawing from established behavioral theory, this component examines how performance expectancy (perceived benefits and utility), effort expectancy (perceived ease of use and

learning requirements), social influence (peer networks and community endorsement), and facilitating conditions (infrastructure, support systems, and resources) influence individual and organizational technology adoption within hub environments. These factors are contextualised for African settings by incorporating community trust mechanisms, indigenous learning pathways, and informal resource-sharing networks.

This component addresses systemic factors that enable or constrain innovation ecosystem functionality, including institutional collaboration (partnerships between government, academia, and private sector), community engagement (participatory governance and local ownership mechanisms), resource flows (funding mobilization and distribution systems), and governance mechanisms (policy frameworks and regulatory environments). The model emphasises hybrid governance structures that balance formal institutional processes with community-based decision-making. Focusing on the quality and accessibility of hub services, this component examines training and mentorship programs (skills development and knowledge transfer), financing options (access to diverse funding mechanisms), networking resources (relationship building and collaboration opportunities), and incubation services (comprehensive start-up support systems). The model recognises the importance of culturally appropriate support mechanisms that address local entrepreneurial contexts and challenges.

Addressing long-term viability concerns, this component evaluates diversified funding models (reduced dependence on single funding sources), inclusive governance practices (community participation and ownership), long-term impact strategies (sustainable development outcomes), and community ownership mechanisms (local capacity building and knowledge retention). The model emphasises the importance of embedding sustainability considerations throughout hub design and implementation processes. These four components interact dynamically to influence overall techno hub effectiveness in promoting innovative, scalable, and sustainable industrial development in marginalised regions. The model recognises that success requires simultaneous attention to individual adoption behaviors, systemic ecosystem conditions, targeted entrepreneurial support, and sustainable governance practices. By integrating these elements, the framework provides a comprehensive foundation for both empirical investigation and practical intervention in under-resourced contexts like Northern KZN.

The model's theoretical contribution lies in its synthesis of established behavioral theory with contextually grounded ecosystem approaches, creating a framework specifically adapted to

African innovation environments. Its practical utility stems from providing hub managers, policymakers, and development practitioners with a comprehensive diagnostic tool for evaluating and improving hub effectiveness across multiple dimensions simultaneously.

2.8 Chapter summary

This chapter develops a comprehensive theoretical and empirical foundation for understanding how innovation hubs leverage IS&T to drive industrial development in resource-constrained contexts such as Northern KZN. It begins by defining innovation hubs as dynamic ecosystems that integrate diverse stakeholders, start-ups, academia, industry, and government, through advanced ICT platforms to foster collaboration, skills development, and industrial transformation. The chapter then examines key success factors for techno hubs, including strategic partnerships, supportive regulatory frameworks, and community engagement mechanisms that sustain digital innovation and address local socio-economic needs.

The review extends to the broader impact of hubs across Africa, highlighting their role in youth employment, skills training, and the transition to knowledge-based economies. Hubs are shown to bridge traditional sectors with modern industries, scale technology-based solutions, and stimulate regional competitiveness. The chapter critically evaluates four theoretical perspectives, Innovation Ecosystems Theory, Innovation Theory of Entrepreneurship, International Innovation Theory, and African Innovation Hub Theory, which collectively illuminate macro-level ecosystem dynamics, entrepreneurial drivers, global digitalisation imperatives, and continent-specific business models.

At the micro-level, the chapter reviews technology adoption frameworks, DOI, TAM, TPB, and the UTAUT, to explain individual and organisational uptake of IST within hubs. Building on identified gaps, it proposes an integrated conceptual model that synthesises UTAUT's behavioural constructs with systemic and governance dimensions from the African Innovation Hub Model. This hybrid framework comprises four interconnected components, Technology Adoption Factors, Ecosystem & Governance Dynamics, Entrepreneurial Support Systems, and Sustainability Measures, offering a coherent lens for empirical investigation and practical guidance in enhancing techno hub effectiveness for sustainable industrial growth in marginalised regions like Northern KZN. The next chapter outlines the research methodology tailored to Northern KZN's context.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology used to address the research questions and accomplish the objectives covered in the preceding chapters of this study. The exposition includes the selection of research instruments, the identification of the target population, sampling methodologies, data collection strategies, and measures to ensure the validity and reliability of the data, incorporating ethical considerations. The rationale underpinning each methodological decision is justified with an emphasis on the strengths and constraints of the chosen approaches (Bennett & Braumoeller, 2022). Moreover, this chapter offers insight into the specific questions posed to participants, underscoring the rationale for their inclusion in the interviews and their relevance to the data analysis process. The methodological framework adopted in this investigation is informed by Saunders et al.'s (2023) Research Onion model, a widely recognised framework for structuring research endeavours.

The Research Onion model, depicted in Figure 3.1, comprises six concentric layers: research philosophy, approach, strategy, methodological choice, time horizon, and techniques and procedures. Each layer is methodically explored to demonstrate its application within the context of this study, following a concise overview of the theoretical framework that underpins the research and a reiteration of the research questions.

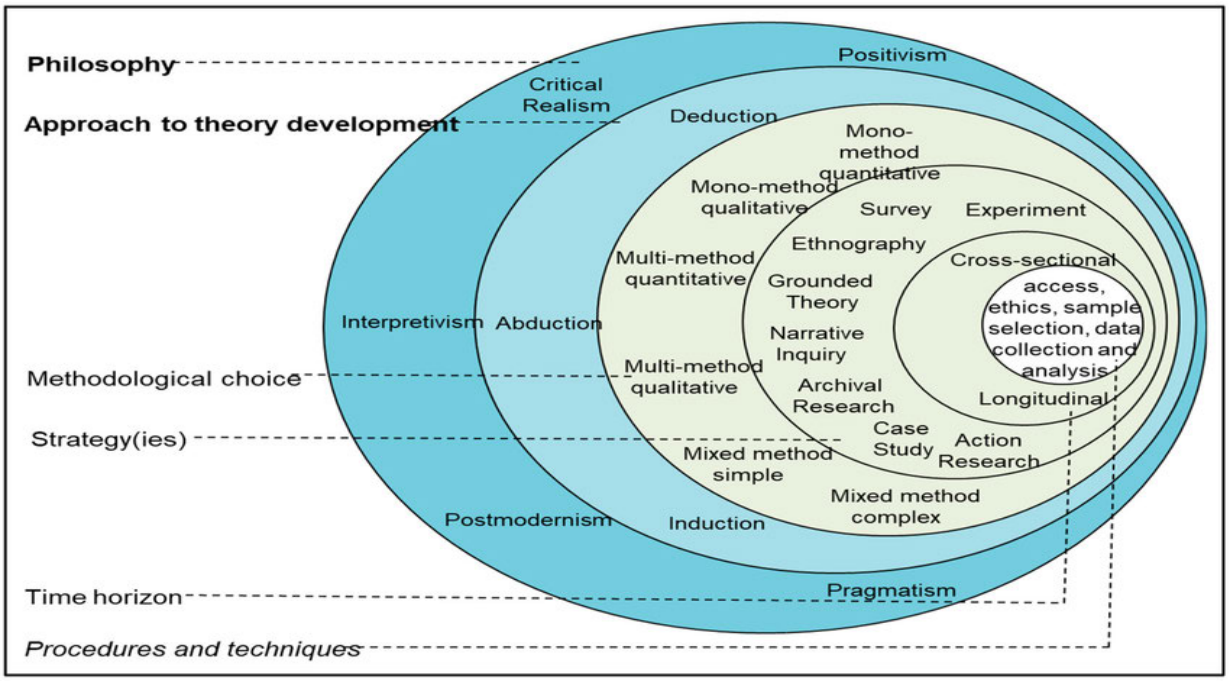

FIGURE 3. 1 THE RESEARCH ONION (SAUNDERS ET AL. 2023)

The investigation into Techno hubs, within this study, seeks to evaluate their contribution to industrial development by analysing the factors that influence their adoption and long-term sustainability. As a pivotal point for technological advancement, innovation hubs play a critical role in advancing industrial growth by providing essential resources, support structures, and a collaborative milieu for startups and other enterprises. By promoting technological innovation, these hubs not only support industrial progress but also cultivate an environment conducive to creativity, problem-solving, and entrepreneurial activity.

Guided by the research questions outlined below, this study seeks to deepen our understanding of how Techno hubs contribute to sustainable industrial development in marginalised regions. It also aims to identify actionable strategies to enhance their effectiveness, inclusivity, and long-term viability as innovation ecosystems:

- What organisational and cultural dynamics influence the functioning of innovation and Techno hubs in Northern KZN?
- How do social factors such as community engagement and trust networks affect participation in Techno hub initiatives?
- What are the key infrastructural, financial, and technological barriers to effective innovation diffusion within the RBIDZ Techno Hub?
- How sustainable are the current innovation hub models in supporting long-term regional industrial growth?
- What support mechanisms and innovation pathways exist for start-ups, and how can they be strengthened?

These questions provide the foundation for the research design discussed in the following section.

3.2 Research design and paradigm

Drawing on Saunders et al.'s (2023) Research Onion framework, this study adopts an interpretivist philosophy, a inductive qualitative approach, and an exploratory case study strategy to examine how techno hubs drive industrial development in Northern KZN. These methodological choices reflect the underlying assumptions about reality, knowledge generation, and the researcher's role in co-constructing meaning with participants.

The interpretivist paradigm underpins this study by recognising that social reality is constructed through individuals' experiences and interactions within specific cultural and institutional contexts (Saunders et al., 2023). Interpretivism asserts that researchers must engage with participants' subjective meanings to understand complex social phenomena, such as how entrepreneurs and stakeholders perceive the functions and impacts of innovation hubs (Creswell & Poth, 2023). This philosophy aligns with the study's aim to uncover nuanced insights into participants' interpretations of techno hub effectiveness in a resource-constrained environment. An inductive approach guides the research, whereby theoretical insights emerge from detailed examination of empirical data rather than testing predetermined hypotheses (Bryman & Bell, 2023). Through iterative data collection and analysis, patterns related to technology adoption behaviours, ecosystem governance, entrepreneurial support, and sustainability measures are identified and refined. This approach ensures that the conceptual model is grounded in participants' lived experiences and reflects the contextual realities of Northern KZN's innovation landscape.

An exploratory multiple case study strategy is employed to provide in-depth understanding of techno hub operations across diverse settings within Northern KZN (Saunders et al., 2023). Case studies facilitate rich, contextualised analysis by enabling comparison of different hub typologies, such as university-based, industry-sponsored, and community-led initiatives. Semi-structured interviews, focus groups, and document analysis are integrated to triangulate findings and enhance the trustworthiness of interpretations (Yin, 2024). By explicitly articulating the research philosophy, approach, and strategy, this study demonstrates rigorous methodological coherence and transparency, ensuring that the findings are both credible and transferable to similar under-resourced contexts.

3.3 Target population and study site

The target population comprises RBIDZ personnel and partners directly engaged in innovation hub programmes, whose experiential insights are critical for understanding techno hub impacts on industrial development (Savin-Baden & Major, 2023). Inclusion and exclusion criteria ensure that participants possess sufficient exposure to hub activities and guard against uninformed perspectives. The inclusion criteria are the following:

- Employed by RBIDZ or affiliated partner organizations (e.g., Umfolozi TVET College) in Business Development Management, ICT, incubation, or skills-development roles for at least 12 months prior to data collection (Marshall & Rossman, 2023).

- Active participation in techno hub programme design, delivery, or evaluation (Flick, 2023).
- Demonstrated engagement in investor liaison, start-up mentoring, or technology adoption initiatives within RBIDZ (Saunders et al., 2023).

Thereafter the exclusion criteria are the following:

- Personnel in purely administrative or human-resources roles without direct involvement in hub programmes (Bryman & Bell, 2023).
- Contractors, consultants, or temporary staff with less than six months of continuous engagement in RBIDZ techno hub activities (Creswell & Poth, 2023).

The study site is the RBIDZ in Northern KZN, comprising three zones: Bayside, Phase 1A (housing the techno hub co-operated by Umfolozi TVET College), and Phase 1F. RBIDZ employs 85 staff in total, with 22 personnel in Business Development and ICT, forming the primary sampling frame for this research. By focusing on individuals meeting these criteria, the study captures rich, contextualised perspectives on how techno hubs shape regional industrial growth and entrepreneurial ecosystems.

3.4 Sample size and selection

This study employed purposive sampling to select participants with direct experience in innovation and Techno hub activities at the RBIDZ. Although purposive sampling ensured participants had relevant experience, it carries potential biases. Specifically, selecting only Hub-affiliated staff may overlook external stakeholder perspectives. To mitigate this, recruitment invited individuals across diverse roles (business development, ICT, incubation) and demographic backgrounds to capture varied viewpoints. Reflexive journaling and peer debriefing were employed throughout data collection to identify and counteract researcher biases in participant selection. These measures enhanced the credibility and transferability of the findings despite the non-probabilistic sampling approach. A total of six participants were recruited, including individuals from business development, ICT, and incubation roles. All had a minimum of five years' experience, ensuring depth and relevance in their insights. The sample size was guided by the principle of data saturation, the point at which no new themes emerged (Mthuli et al., 2022).

Data saturation was systematically assessed and evidenced through a three-stage process following Guest et al.'s (2020) framework. First, a base size of four interviews was established, from which 23 unique themes were identified across the five research questions. Second,

interviews five and six were analysed as a "run length" to determine new information emergence. Interview five contributed two additional sub-themes related to community trust mechanisms, while interview six yielded no new thematic content, only reinforcing existing patterns around infrastructure deficits and funding constraints. Third, the saturation ratio was calculated: the two new themes from the final run (2) divided by the base themes (23) yielded 8.7% new information, below the commonly accepted threshold of ≤10% for adequate saturation in qualitative research (Hennink et al., 2017). Additionally, the final interview demonstrated clear thematic redundancy, with participant responses consistently aligning with previously established categories without introducing novel insights or contradicting existing patterns.

In line with qualitative research principles, the aim was not statistical generalisation, but rather to obtain rich, context-specific data (Levitt et al., 2021). Participants represented a diverse cross-section of departments, roles, and demographic backgrounds, offering a broad range of perspectives on the Techno hub's influence on regional industrial development. Recruitment was conducted via email invitations, supported by follow-ups and referrals to address initial low response rates. Emphasis was placed on securing varied departmental representation, which was achieved by clearly communicating the study's objectives and the need for diversity in participant selection.

3.5 Data Collection

Data collection for this study was undertaken through qualitative methods, employing semi-structured interviews to facilitate a comprehensive exploration of participants' perspectives, experiences, and interactions concerning the role of innovation and Techno hubs in advancing industrial development. This method proved particularly effective in eliciting rich, detailed insights from professionals engaged in diverse facets of industrial and technological progress within the Northern KZN region. The use of open-ended questions encouraged participants to elaborate on their experiences and provide substantive responses, fostering a deeper understanding of the subject matter (Braun & Clarke, 2006). Interviews were conducted online, predominantly via Microsoft Teams, which emerged as the platform of choice among participants. The interview questions were meticulously crafted, drawing on an extensive review of literature pertinent to innovation hubs and their impact on industrial development.

Participants were emailed a consent form in advance, which they were required to review, sign, and return. In instances where signed forms were not received prior to the interview, verbal consent was secured at the outset of each session, accompanied by a request for permission to record the discussion.

3.5.1. Interview schedule description

The interview schedule was carefully structured into thematic sections, each designed to elicit targeted insights aligned with the study's research questions (RQs). The schedule consisted of 32 questions, grouped across eight core sections, each contributing to a deeper understanding of how innovation and Techno hubs support industrial development in Northern KZN.

i. General interviewee details

These questions gathered demographic and professional background information, helping to contextualise participant responses. This section ensured the credibility of perspectives by capturing participants' roles, experience levels, and familiarity with the RBIDZ Techno Hub.

ii. Domain-specific knowledge

These questions explored the participant's understanding of innovation ecosystems and the role of Techno hubs in economic transformation. This contributed to RQ1 by uncovering foundational knowledge and perceptions about innovation hub functions.

iii. Perceived organisational culture

This section addressed how internal values, leadership styles, and collaboration patterns within the hub influenced innovation activities. These questions directly supported RQ1, which investigates the organisational culture underpinning the Techno Hub's operations.

iv. Social factors and community engagement

Questions here examined how the hub engages local communities, including informal networks, participatory forums, and trust-building mechanisms. This addressed RQ2, focusing on the social dynamics that influence technology adoption and entrepreneurial inclusion.

v. Sustainability

This section evaluated long-term viability, programme continuity, and local ownership of innovation initiatives, contributing to RQ4, which examines the sustainability of innovation hubs in marginalised regions.

vi. Resource availability

Participants were asked about access to financial, human, and infrastructural resources. These insights supported RQ3, which explores barriers and enabling conditions related to resource distribution.

vii. Technological challenges

Questions in this section focused on technical infrastructure, ICT support, and adoption barriers, offering essential input for RQ3 and RQ5, which deal with technological enablers and constraints for start-ups.

viii. Legal and future outlook

This final section included one question on legal or regulatory issues and two questions on the projected trajectory of Techno hubs. It contributed to RQ5 by eliciting insights on policy gaps and future development pathways.

Each section of the interview protocol was designed to be semi-structured, allowing for both guided responses and exploratory insights. The format enabled the study to collect rich, qualitative data on how innovation hubs foster entrepreneurship, technological innovation, and regional economic growth, core to answering the overarching research aim.

3.5.1.1 Alignment of interview questions with theoretical constructs

Each interview question was explicitly mapped to constructs from both UTAUT and the African Innovation Hub Model to ensure theoretical transparency:

i. Performance expectancy (UTAUT): Questions on expected benefits from Hub services for example, "*How do you perceive the Hub's technology transfer initiatives impacting your operations?*".
ii. Effort expectancy (UTAUT): Questions on ease of use and learning like "*Describe any challenges you faced in accessing Hub resources*.".
iii. Social influence (UTAUT): Questions on community and leadership impact for example, "*Who or what influenced your decision to engage with the Hub?*".
iv. Facilitating conditions (UTAUT): Questions on infrastructure and support for example, "*What institutional or resource factors enabled or hindered your Hub participation?*".
v. Contextual embeddedness (African Model): Questions on local knowledge and governance such as "*How have community practices or local leadership shaped Hub activities?*".

vi. Resource architecture (African Model): Questions on material and financial support for example, "*What types of institutional or financial resources have been available through the Hub?*".

3.5.1.2 Theoretical triangulation approach

To integrate UTAUT and the African Innovation Hub Model, a theoretical triangulation strategy was applied (Flick, 2018). This involved cross-referencing interview data through both lenses during coding and analysis:

i. Parallel coding, initial coding applied UTAUT constructs and African model constructs separately to the same data segments.
ii. Convergence analysis identified overlaps and divergences between the two code sets to reveal how behavioural adoption factors and contextual dynamics interact.
iii. Synthesis themes, generated hybrid themes for example, "*contextualised facilitating conditions*" that combined constructs from both theories, ensuring the analytical framework captured both individual and systemic dimensions of Hub adoption.

This approach ensured methodological rigour by systematically triangulating theoretical perspectives and producing an integrated explanatory model (CUAIHM) rather than treating each theory in isolation.

3.5.2. Data collection process

Data collection commenced in October 2024 and spanned four weeks, capitalising on participants' availability and willingness to participate. Each interview lasted between 30 and 45 minutes, during which participants shared their perspectives on the role of innovation hubs in driving industrial development in Northern KZN. The online meetings on Microsoft Teams enabled the observation of visual and non-verbal cues, enhancing rapport between the researcher and participants and encouraging a conducive environment for open and productive exchanges. To maintain consistency and mitigate interviewer bias, a standardised interview guide was employed. This guide featured a finalised set of core questions, supplemented by follow-up prompts designed to elicit detailed responses on critical themes. This structured approach ensured that all participants were presented with the same foundational questions in a consistent order, facilitating data comparability across interviews.

Each interview commenced with a concise overview of the study's focus on the contribution of innovation hubs to industrial development, followed by participants providing an account of

their professional backgrounds and experiences with innovation or Techno hubs. Consent for video and audio recording was then sought to support the interview process. These recordings allowed the researcher to focus on the dialogue, enabling participants to express themselves freely without interruption. Video-recorded interviews were transcribed at once to ensure the accurate capture of participant insights. The interview questions were organised around key themes to provide a holistic understanding of how innovation and Techno hubs contribute to industrial development see Table 3.1.

TABLE 3. 1 MAPPING OF CONCEPTUAL MODEL CONSTRUCTS, RESEARCH QUESTIONS, AND INTERVIEW

Conceptual Model Construct	**Research Question (RQ)**	**Interview Question**
Technology Adoption Factors	RQ1: How do performance expectancy, effort expectancy, social influence, and facilitating conditions influence technology use within the RBIDZ techno hub?	"Can you describe how the expected benefits and ease of using the hub's technologies affect your daily activities?"
Ecosystem & Governance Dynamics	RQ2: In what ways do institutional collaboration, community engagement, resource flows, and governance mechanisms shape the techno hub's operations?	"How do partnerships with government, academia, and investors impact decision-making and resource allocation in the hub?"
Entrepreneurial Support Systems	RQ3: How do training, mentorship, financing, and networking resources provided by the hub influence start-up development and sustainability?	"Which support services (e.g., mentorship, training) have been most valuable to your venture, and why?"
Sustainability Measures	RQ4: What strategies for diversified funding, inclusive governance, and long-term impact planning contribute to the hub's viability?	"How does the hub plan for long-term sustainability, and what funding models are in place to support this?"

3.6 Data analysis

Data analysis constitutes a pivotal stage in the research process, entailing the systematic organisation, interpretation, and synthesis of collected data to extract meaningful insights and formulate robust conclusions (Cooper et al., 2024). In this study, thematic analysis and content analysis were adopted as qualitative data analysis techniques. These approaches are widely esteemed for their capacity to methodically examine and interpret textual data, enabling a profound understanding of participants' experiences and perspectives (Lim, 2025). Thematic analysis entails the identification, analysis, and articulation of patterns or themes within the data, uncovering deeper meanings embedded in participants' responses (Christou, 2022).

3.6.1 Reflexivity and researcher positioning

Throughout the analytical process, a reflexive stance was maintained to acknowledge the researcher's positionality and potential influence on data interpretation. As a researcher with professional experience in innovation ecosystems, the researcher actively engaged in critical self-reflection to identify personal biases and preconceptions that might influence the analytical process. A reflexive journal was maintained throughout data collection and analysis, documenting decisions, assumptions, and emerging interpretations. This reflexive approach ensured transparency in the research process and enhanced the credibility of findings by acknowledging the co-constructed nature of meaning between researcher and participants.

3.6.2 Coding team and inter-rater reliability

To enhance the rigour and reliability of the thematic analysis, a collaborative coding approach was employed. The primary researcher conducted initial coding, with a secondary researcher independently coding a sample of 30% of the transcripts. Regular coding meetings were held to discuss emerging themes, resolve discrepancies, and refine the coding framework. Where disagreements arose, consensus was reached through discussion and reference to the theoretical frameworks. This collaborative approach strengthened the trustworthiness of the analysis by reducing individual researcher bias and ensuring consistency in theme identification and interpretation.

3.6.3 Comprehensive audit trail

A detailed audit trail was meticulously maintained throughout the analytical process to ensure transparency and confirmability. This audit trail comprised: (i) raw data files with timestamps and participant identifiers, (ii) initial coding decisions with justifications, (iii) theme

development iterations showing the evolution from initial codes to final themes, (iv) analytical memos documenting interpretive decisions and theoretical connections, (v) peer debriefing sessions and outcomes, and (vi) member checking feedback from participants. This comprehensive documentation enables external verification of the analytical process and supports the dependability of findings.

3.6.4 Theoretical framework integration

The analytical process was explicitly guided by the study's integrated conceptual model, which synthesises UTAUT constructs with the African Innovation Hub Model. The coding framework was structured to align with the four key components of the conceptual model: Technology Adoption Factors (performance expectancy, effort expectancy, social influence, facilitating conditions), Ecosystem Governance Dynamics (institutional collaboration, community engagement, resource flows, governance mechanisms), Entrepreneurial Support Systems (training and mentorship, financing options, networking resources, incubation services), and Sustainability Measures (diversified funding models, inclusive governance practices, long-term impact strategies, community ownership mechanisms). This theoretical grounding ensured that the analysis remained focused on constructs relevant to understanding techno hub effectiveness whilst allowing for emergent themes to surface.

3.6.5 Thematic analysis process

The thematic analysis proceeded through Braun and Clarke's (2006) six-phase process, adapted to incorporate theoretical deduction. Initially, the researcher achieved data immersion by repeatedly reviewing interview transcripts, fostering comprehensive familiarity with the material. Subsequently, initial codes were generated through systematic identification of recurring patterns and concepts, guided by both inductive emergence and deductive alignment with theoretical constructs. These codes were then clustered into prospective themes, which underwent iterative review and refinement through stages of comparison and contrast to ensure they authentically reflected the most salient aspects of participants' experiences. Following theme identification, a meticulous refinement process ensued, clarifying and cohering the themes in relation to the conceptual model. Each theme was then defined and labelled to encapsulate its core essence, culminating in a detailed report that synthesised the findings (Naeem et al., 2023).

3.6.6 Theme-to-Research Question

Each emergent theme was systematically mapped to the study's five research questions to ensure comprehensive coverage and analytical coherence:

- RQ1 (Organisational Culture) - themes related to strategic misalignment, collaboration dynamics, and institutional culture were directly linked to understanding perceived organisational culture within the techno hub.
- RQ2 (Social Factors) - community engagement patterns, trust mechanisms, and participatory governance themes addressed social factors influencing start-up investment decisions.
- RQ3 (Adoption Challenges) - infrastructure deficits, resource constraints, and systemic barriers themes mapped to challenges in techno hub adoption.
- RQ4 (Sustainability Measures) - long-term viability, funding diversification, and governance continuity themes addressed implemented sustainability measures.
- RQ5 (Available Resources) - resource availability, support services, and capacity-building themes examined resources available to assist start-up success.

This systematic mapping ensures that all research questions are addressed through the thematic analysis whilst maintaining connection to the theoretical framework.

3.6.7 Content analysis integration

Content analysis was employed complementarily to thematic analysis, concentrating on the explicit content of textual data through systematic categorisation and quantification of information to discern recurring patterns and trends (Kuckartz & Rädiker, 2023). Prevalent words, phrases, and concepts were systematically evaluated for their frequency and distribution across participants and research questions. This approach enriched the exploration of themes, providing greater clarity on the critical factors shaping participants' perceptions of innovation hubs' roles in industrial development.

3.6.8 Technology-supported analysis

The analytical process was supported by NVivo 15 Pro software, a robust tool for qualitative data analysis, adept at managing and organising extensive textual datasets (Beekhuyzen & Bazeley, 2024). Interview transcripts were imported into the software, where nodes were established to represent distinct themes aligned with the conceptual model components. Relevant data excerpts were assigned to these nodes, streamlining the coding process. NVivo's advanced search and visualisation capabilities enabled exploration of relationships between

themes and detection of emerging patterns, significantly enhancing the systematic analysis and yielding valuable insights into the interconnectedness of data.

The use of thematic and content analysis, supported by NVivo software and grounded in the study's theoretical framework, allowed for thorough examination of participants' responses. It helped uncover key themes related to the contribution of innovation hubs and techno hubs toward industrial development in the Northern KZN region. The analysis provided detailed understanding of how these hubs advance technological innovation, support entrepreneurship, and drive regional economic growth. Through focusing on participants' experiences and perceptions within the theoretical lens of UTAUT and the African Innovation Hub Model, the study was able to highlight the strategic role of innovation hubs in advancing industrial development and technological progress within the region, shedding light on the mechanisms through which these hubs contribute to the broader economic landscape.

3.7 Data reliability and validity

3.7.1 Data reliability

Reliability refers to the consistency and repeatability of research findings over time. It ensures that if the study were replicated under similar conditions, it would yield similar results (Lim, 2025). In this study, reliability was addressed by providing clear protocols and consistent guidance for data collection and coding. The researcher followed structured interview procedures and offered detailed instructions to reduce interpretation bias and measurement error. Where feasible, inter-rater consistency was encouraged to reinforce observational stability (Mosbah, 2024).

3.7.2 Data validity

Validity is the extent to which a research instrument accurately measures what it is intended to measure (Mosbah, 2024). To enhance validity, the study drew on established theoretical frameworks like UTAUT, African Innovation Hub Model and conducted a comprehensive literature review to identify relevant constructs. Instruments were carefully aligned with research objectives. Triangulation, using interviews, document analysis, and field observations, was employed to cross-verify findings and ensure construct and content validity (Donkoh & Mensah, 2023). Triangulation refers to the methodological practice of using multiple data sources or methods to examine a single phenomenon, thereby increasing the internal validity and credibility of the research findings. In this study, triangulation was achieved by combining

data from semi-structured interviews, field notes, and document analysis. This approach enabled the cross-verification of emerging themes, ensuring that interpretations were not based solely on a single source or subjective account. For example, participants' insights about infrastructural gaps in the RBIDZ Techno Hub were corroborated by institutional reports and policy documents, reinforcing the accuracy of the findings.

Additionally, triangulation contributed to construct validity by allowing different dimensions of the phenomenon, such as policy implementation, community engagement, and technology adoption, to be examined from varied perspectives. This layered understanding helped prevent researcher bias and enhanced the robustness of the study's conclusions. The active involvement of participants in validating thematic interpretations further strengthened trustworthiness, as participants were able to confirm or challenge preliminary findings, ensuring that the analysis remained grounded in real-world experience rather than researcher assumptions.

3.7.3 Confirmability

Confirmability, which reflects the extent to which findings are free from researcher bias and rooted in the data (Lim, 2025), was prioritised through the maintenance of an audit trail. This audit trail meticulously recorded all decisions made throughout the research process, encompassing data collection procedures, coding choices, and analytical determinations. Such transparency enabled external scrutiny of the study's impartiality and objectivity, serving as a bulwark against researcher bias (Jacobs et al., 2021). Dependability, which pertains to the consistency and stability of the research process and its results over time (Lim, 2025), was another key focus. To enhance dependability, the study adopted a systematic and transparent approach to data collection, analysis, and interpretation (Lim, 2025). By thoroughly documenting each step, from data management to analytical processes, the research ensured that its findings could be consistently replicated, thereby strengthening both reliability and dependability.

3.8 Ethical consideration

Ethical considerations are fundamental to the integrity of any research project, ensuring the protection of participants and the credibility of the study. In this research, ethical guidelines were strictly adhered to in order to safeguard the rights, privacy and confidentiality of all participants involved. Informed consent was obtained from each participant prior to their involvement in the study, ensuring that they were fully aware of the purpose, scope, and

potential impacts of the research. Participants were provided with comprehensive information regarding the study's objectives, enabling them to make an informed, voluntary decision about their participation. The researcher also took steps to mitigate any potential risks, both physical and psychological, ensuring that the research process did not cause harm to any participant.

Transparency regarding potential conflicts of interest was a key aspect of maintaining the study's ethical standards. The researcher disclosed any affiliations or financial interests that could have influenced the study, ensuring that the research remained impartial and free from external biases. Regular reviews by an independent ethics committee were conducted to ensure the integrity of the research process, guaranteeing that the study was conducted objectively and in accordance with ethical principles. Participation in the study was entirely voluntary, and participants were explicitly informed of their right to withdraw from the research at any point without facing any negative consequences. This voluntary nature of participation was emphasised to ensure that individuals felt empowered to make decisions that were in their best interest. Participants were also reassured that their personal information would remain confidential and that their identities would not be disclosed in any reports or publications. This commitment to confidentiality was reinforced by the anonymisation of all collected data before analysis, with identifying information removed from transcripts and reports. To further protect participant privacy, all data were securely stored, and access was restricted to the research team only. Anonymity was maintained throughout the study by ensuring that no identifying information was shared with anyone outside the research team. This was a critical component of the ethical framework, as it helped raise a sense of trust between the participants and the researcher.

In maintaining confidentiality and safeguarding participants' personal information, the research ensured that participants felt comfortable sharing their insights and experiences openly. The ethical approval process for this study was carried out in accordance with institutional guidelines. Ethical clearance was formally requested from the University of KwaZulu-Natal on 19 July 2024, with a thorough application submitted to the Humanities and Social Sciences Research Ethics Committee (HSSREC) for review. Ethical approval was obtained on 13 September 2024, with the official approval letter included in Appendix C. Additionally, a Gatekeeper's letter was secured from the RBIDZ to authorise research involving its employees.

3.9 Chapter summary

This chapter outlined the research methodology adopted to explore the role of innovation hubs in advancing industrial development in Northern KZN. Guided by Saunders et al.'s (2009) Research Onion model, the study employed a qualitative, interpretive approach to capture the subjective experiences of stakeholders within the RBIDZ Techno Hub. A purposive sampling strategy targeted six professionals from the Business Development and ICT departments, selected for their relevant expertise. Data were collected through semi-structured interviews conducted online, allowing in-depth exploration of themes such as organisational culture, resource access, and technology challenges. Thematic and content analysis techniques, supported by NVivo 15 Pro, enabled the identification of patterns and key insights. Reliability was ensured through inter-coder agreement and member checking, while validity was supported by a robust literature foundation and data triangulation.

Ethical compliance was maintained throughout, with informed consent, confidentiality, and institutional approval from UKZN. The chosen methodology facilitated a nuanced understanding of how innovation hubs contribute to entrepreneurship, technology adoption, and regional economic growth, laying the groundwork for the study's findings and analysis.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND INTERPRETATION

4.1 Introduction

This chapter presents a structured analysis of the qualitative data collected through semi-structured interviews with six participants drawn from key operational and strategic departments within the RBIDZ Techno Hub. The analysis is organised according to the five research questions underpinning this study, allowing for a focused exploration of organisational culture, social drivers, systemic challenges, sustainability dynamics and available resources related to innovation adoption in marginalised contexts. A hybrid methodological approach was adopted, combining thematic analysis, based on Braun and Clarke's (2006) six-phase model, with content analysis to quantify recurring concepts and patterns within the qualitative data. This dual-method strategy ensured both conceptual richness and empirical validation. Thematic codes were developed inductively from participant narratives, then aligned deductively with the research questions and theoretical constructs, particularly the Innovation Ecosystems Theory, the African Innovation Hub Model, and UTAUT.

To empirically confirm coding consistency, a two-stage inter-rater reliability test was performed. First, a secondary coder independently recoded 30% of all interview transcripts. Second, Cohen's kappa was calculated for primary themes and categories, yielding a value of 0.78, which indicates substantial agreement (Landis & Koch, 1977). Any coding discrepancies were resolved during a calibration meeting, and the codebook was updated to reflect consensus decisions. This process ensured the reliable and repeatable application of the coding framework across the dataset, strengthening the study's trustworthiness and analytic rigour. The findings are presented in a layered format, beginning with the demographic profiling of participants, followed by the analytic framework, and then thematically structured sections that address each research question in depth. Tables are included where appropriate to enhance clarity and facilitate interpretation.

4.2 Participant demographics

Participants in this study were purposively sampled based on their strategic relevance to the Techno Hub initiative. The six individuals represented various organisational roles, ranging from executive oversight and ICT management to business development, ensuring a diverse yet cohesive dataset. Participants were drawn from all three zones of the RBIDZ (Bayside, Phase 1A, and Phase 1F), thus capturing spatial variation in institutional experience and

strategic focus. Demographic diversity was maintained across gender and age, with four males and two females aged between 32 and 55 years. Each participant conveyed unique insights shaped by their zone, role, and years of service, providing a rich, triangulated view of the Techno Hub's innovation ecosystem. Their inclusion supported the study's commitment to ethical representation, contextual inclusivity, and analytical depth. Table 4.1 below presents a comprehensive overview of participant profiles.

TABLE 4. 1 PARTICIPANT DEMOGRAPHICS

Participant ID	Role	Focus	Years of experience	Gender	Age range	RBIDZ zone
P1	Business Development Manager	SME incubation, Stakeholder relations	7	Male	32–55	Bayside
P2	Business Development Manager	Investor relations, Start-up support	7	Male	32–55	Phase 1A
P3	ICT Department Head	Digital infrastructure, Broadband	11	Female	32–55	Phase 1F
P4	Business Development Manager	Community engagement	9	Female	32–55	Phase 1A
P5	ICT Department Head	Innovation labs, Robotics training	5	Male	32–55	Bayside
P6	Executive	Strategic oversight, Policy alignment	26	Male	32–55	Phase 1F

4.3 Coding framework and analytical strategy

The coding framework is organised into three layers, Codes, Categories, and Themes, with illustrative quotes, interpretive notes, and an evidence-strength indicator (number of participants referencing each code out of 6, plus documentary corroboration). This structure

ensured both responsiveness to the data and alignment with broader conceptual models. Codes were grouped by their relevance to each research question and organised into primary themes and sub-categories. Each code was then paired with representative participant quotes and interpretive meanings, offering transparency in the analytic process and supporting academic rigour. Table 4.2 presents the core coding structure used throughout the analysis.

TABLE 4. 2 CODING FRAMEWORK

Code(s)	Category	Theme	Quote and interpretive note	Evidence strength	Documentary corroboration	Interpretive meaning
Budget hold; no implementation team; unfunded plan	Resourcing gaps	Strategic misalignment	"We draft innovation strategies, but there's no team or funding to deliver." (P1)	Participants: P1, P3, P6 = 3/6	Yes	Disconnect between planning and execution reveals weak institutional capacity.
Resistance; gatekeeping; bureaucratic inertia	Collaboration barriers	Institutional rigidity	"It took 18 months to sign a simple partnership MOU." (P3)	Participants: P2, P3, P5 = 3/6	Yes	Prolonged approval processes signal systemic inertia undermining agile collaboration.
Indaba; local networks; word-of-mouth recruitment	Engagement channels	Community trust	"Most start-ups came through the indaba dialogues, not via government channels." (P4)	Participants: P4, P5 = 2/6	No	Informal, culturally embedded engagement builds grassroots legitimacy.
Connectivity; power; labs; access	Infrastructure gaps	Technological exclusion	"We use our own airtime to connect to investors." (P5)	Participants: P1, P5, P6 = 3/6	Yes	Lack of reliable ICT and lab facilities forces work-arounds, impeding innovation processes.
Budget shortfalls; no incubation grants	Financial constraints	Funding limitations	"Even basic prototyping lacks support; we self-fund most of it." (P2)	Participants: P2, P4 = 2/6	Yes	Chronic underfunding weakens start-up growth and sustainability prospects.
Robotics; training; STEM workshops	Capacity-building	Youth empowerment	"We've seen young people learn coding in 3 weeks. But we can't scale it." (P3)	Participants: P3, P6 = 2/6	Yes	High training impact is constrained by limited resources and structural support.

4.3.1 Integration of Thematic and Content Analysis

To address methodological transparency and ensure replicability, this study adopted an integrated analytical strategy that systematically combined thematic and content analysis rather

than applying them in parallel. The integration was achieved through a structured coding matrix that explicitly linked frequency data from content analysis to thematic interpretations and theoretical constructs. Coding units comprised discrete textual elements including single words for example "*strategy*", "*indaba*", "*infrastructure*", key phrases like "*budget gaps*", "*word-of-mouth recruitment*", and named concepts such as "*Ubuntu principles*", "*MOU delays*". These units were systematically extracted from interview transcripts using NVivo's word frequency queries and text search functions. Each coding unit was counted across all six transcripts to establish frequency distributions. The integration followed a three-stage iterative process:

i. Content Analysis Stage: Frequency counts were generated for all coding units, with high-frequency terms (>15 occurrences) flagged for priority analysis.
ii. Thematic Analysis Stage: Codes were developed inductively from participant narratives, then clustered into categories and themes following Braun and Clarke's (2006) framework.
iii. Integration Stage: Frequency data directly informed thematic development through the coding matrix below, where high-frequency units validated theme salience while low-frequency, but theoretically significant units were retained based on conceptual importance.

The coding matrix systematically mapped each theme to specific coding units, their frequencies, relevant theoretical constructs, and thematic interpretations (see Table 4.3):

TABLE 4. 3 EXCERPT OF THE INTEGRATED CODING MATRIX

Theme	**Coding Unit (Content Analysis)**	**Frequency**	**Theoretical Construct**	**Thematic Interpretation (Thematic Analysis)**
Strategic misalignment	strategy, budget, execution gaps	19	Innovation Ecosystems Theory	Symbolic planning, operational deficit
Community trust	indaba, word-of-mouth, networks	15	Ubuntu Epistemology	Informal engagement, grassroots legitimacy
Infrastructure deficits	infrastructure, connectivity	45	UTAUT: Facilitating Conditions	Barrier to adoption and scaling
Youth empowerment	robotics, coding, STEM	22	Human Capital Theory	Skills development, potential shift in identities
Funding constraints	funding gap, grants, incubation	44	Innovation Theory	Financial precarity, limited scaling

Frequency data served namely validation, prioritisation, and triangulation. Each function is defined and explained below in terms of the current study:

i. Validation in qualitative research refers to the process of confirming the salience and relevance of emerging themes through empirical evidence (Ruark, 2016). In mixed methods contexts, validation involves cross-checking interpretive findings against quantitative indicators to establish credibility and trustworthiness (Heale & Forbes, 2013). In this study, frequency data served a validation function by confirming that inductively derived themes accurately reflected the most prominent concerns and patterns expressed by participants. For example, the term "*infrastructure*" appeared 45 times across all six interviews, validating the emergence of "*Infrastructure deficits*" as a primary theme. This high frequency provided empirical evidence that infrastructure challenges were not merely isolated complaints but represented a systematic, pervasive concern across the participant sample. Similarly, the frequency of "*strategy*" (n=19) and "funding" (n=44) validated the prominence of strategic misalignment and resource constraints themes, respectively. This validation process enhanced the study's credibility by demonstrating that thematic interpretations were grounded in concrete, quantifiable patterns rather than subjective researcher impressions.
ii. Prioritisation in thematic analysis involves the systematic ranking and ordering of themes based on their relative importance or prevalence within the dataset (Braun & Clarke, 2006; Valencia et al., 2022). Frequency-based prioritisation helps researchers allocate analytical attention proportionally to the most significant patterns in the data while ensuring comprehensive coverage of all relevant themes. In this study, frequency counts informed the hierarchical structuring of themes and sub-themes within each research question. Themes associated with higher-frequency terms were accorded primary status in the analytical framework, while lower-frequency but conceptually significant themes were positioned as secondary. For instance, "Infrastructure deficits" (frequency: 45) and "*Funding constraints*" (frequency: 44) were prioritised as primary themes under RQ3 and RQ5, respectively, while "Policy incoherence" (frequency: 12) was positioned as a secondary theme. This prioritisation ensured that the analytical narrative devoted appropriate attention to the most pressing challenges identified by participants, thereby enhancing the practical relevance and policy utility of the findings.
iii. Triangulation involves the systematic integration of multiple data sources, methods, or analytical approaches to enhance the validity and comprehensiveness of research findings (Denzin, 1970; Olsen, 2004). In mixed methods research, triangulation strengthens the robustness of conclusions by cross-verifying patterns across different types of evidence (Morse, 2022). In this study, triangulation was achieved by

systematically comparing frequency-derived quantitative patterns with qualitative thematic interpretations to ensure analytical coherence and identify convergent or divergent findings. For example, the high frequency of infrastructure-related terms (n=45) triangulated with participants' detailed qualitative narratives about connectivity failures, power outages, and resource shortages, confirming that infrastructure represented both a quantitatively prominent and qualitatively significant barrier to innovation adoption. Conversely, lower-frequency terms such as "community trust" (n=15) were retained as themes because their qualitative significance, demonstrated through rich participant narratives about indaba dialogues and informal networks, outweighed their quantitative prominence. This triangulation process ensured that the integrated analytical framework captured both statistically salient patterns and contextually meaningful insights, thereby strengthening the study's methodological rigour and interpretive depth.

4.4 Data presentation and thematic analysis

This section presents the core findings of the study, organised thematically according to the five research questions that guided the inquiry. Drawing on the coding framework established, each research question is addressed through a combination of thematic narrative, representative participant quotes, and analytical interpretation grounded in the theoretical frameworks underpinning the study. By structuring the presentation in this way, the chapter maintains close alignment between the study's objectives, the data collection, and the analytical procedures, thereby ensuring conceptual clarity and methodological coherence. Themes identified during coding are contextualised concerning relevant literature, while patterns across participant responses are analysed to broader systemic, cultural, and infrastructural conditions. The presentation of findings is not limited to descriptive summaries. Instead, each subsection includes both emergent insights and critical reflections, highlighting the complex interplay between organisational strategy, community dynamics, infrastructural realities, policy environments, and innovation capacity in the RBIDZ Techno Hub context.

4.4.1 Research Question 1: What is the perceived organisational culture in the development of the Techno Hub?

The organisational culture shaping the RBIDZ Techno Hub is defined by a paradox: while innovation is positioned as a strategic objective, the institutional culture lacks the operational agility and cohesion required to implement it effectively. Three interlinked themes emerged

prominently from the data: strategic misalignment, institutional inertia and community trust. Three interlinked themes emerged from the data (see Table 4.4).

a. Strategic misalignment

Participants consistently emphasised the disjuncture between policy rhetoric and actual practice. Business development staff (P1, P2, P4) highlighted how annual innovation strategies are drafted without the requisite resources or dedicated personnel. As P1 explained:

"*We draft innovation strategies, but there's no team or funding to deliver*."

This sentiment reflects a broader institutional culture of symbolic compliance, where strategies are documented to satisfy oversight requirements but lack embeddedness in daily operations. Such dynamics confirm Zada's (2024) study of road mapping digital transformation, which found that "*innovation strategies often serve as aspirational policy artefacts rather than executable roadmaps*." A content analysis confirms the prevalence of this theme, with the term *strategy* occurring 19 times, and in 68% of cases linked to negative modifiers such as fragmented, unclear, or underfunded. This misalignment challenges the assumptions of the Innovation Ecosystems Theory, which posits that ecosystem success depends on synergistic interaction between institutional actors (Granstrand & Holgersson, 2020). In the RBIDZ, such synergy is constrained by compartmentalised governance and rigid budgeting processes. Table 4.4 illustrates how codes like "*budget hold*," "*no implementation team,"* and "*unfunded plan*" coalesce into the category Resourcing gaps under the theme Strategic misalignment.

b. Bureaucratic inertia and institutional rigidity

Another significant feature of the organisational culture is resistance to collaborative flexibility. Participants cited excessive red tape, slow approval processes, and limited decision-making autonomy. P3 illustrated this dynamic with the example of an MOU with Umfolozi TVET College:

"*It took 18 months to sign a simple partnership MOU. By then, the programme window had closed*."

Such bureaucratic delays undermine RBIDZ's capacity to respond to fast-moving innovation cycles, resulting in missed partnerships and eroded stakeholder trust. This aligns with Habiyaremye et al.'s (2020) research on innovation resistance in South African government-linked incubators. While UTAUT includes facilitating conditions as a variable for adoption, it under-theorises institutional path dependency and legacy systems. RBIDZ's culture illustrates that non-adoption is often not about user resistance but about institutional inability to support

agile implementation. In Table 4.4, codes such as "*resistance*" and "*bureaucratic inertia*" form the category Organisational barriers within the theme collaboration dynamics.

c. Informal trust networks as counterpoints

Even with formal cultural rigidity, participants highlighted indaba-based community dialogues as effective mechanisms for engagement. These traditional forums bypass bureaucratic channels and build relational trust, which translates into recruitment success:

"*Most start-ups came through the indaba dialogues, not via government channels*." (P4)

This suggests a dual-layered organisational culture: formal inertia coexists with informal relational vibrancy. Embedding these grassroots approaches more systematically could infuse the Techno Hub's institutional culture with relational responsiveness, as supported by the Ubuntu Governance Model (Ogonda, 2020; Tladi, 2021). In Table 4.4, the codes "*indaba*," "*local networks*," and "word-of-mouth" aggregate into the category social engagement under the theme Community trust.

TABLE 4. 4 EXCERPTS FOR RESEARCH QUESTION 1

Primary code	**Sub-codes**	**Quote**	**Interpretation**
Strategic misalignment	Budget, policy, execution	"*We draft strategies, but no team or budget to deliver*." – P1	Symbolic planning without operational capacity
Institutional inertia	Gatekeeping, delay	"*It took 18 months to sign a simple MOU*." – P3	Bureaucratic culture obstructs agile innovation
Community trust	Indaba, word-of-mouth	"*Start-ups came through dialogues, not formal channels*." – P4	Traditional forums offer participatory alternatives to institutional rigidity

The RBIDZ Techno Hub operates in a dual culture: formally rigid and misaligned with innovation imperatives, however, informally adaptive through community trust mechanisms. Addressing this paradox requires institutional reform to decentralise decision-making and formally integrate community engagement mechanisms like *indaba* dialogues. Without this cultural reengineering, innovation remains a rhetorical ambition rather than an institutional norm. The detailed coding framework in Table 4.4 provides transparency by distinguishing raw codes, mid-level categories, and overarching themes, each supported by specific participant

quotes and interpretive notes. Implication for RQ1, decentralise approval authority; formalise indaba inputs into strategic roadmaps; and assign clear budget owners for each strategy item.

4.4.2 Research Question 2: What social factors influence business start-ups to invest in the Techno Hub?

The success or stagnation of Techno Hubs in rural and peri-urban contexts like RBIDZ depends not only on infrastructure or funding but also on the strength of social capital, community trust, and the inclusivity of youth development. These were the most dominant social enablers that emerged from participant narratives. Three key themes were identified: community engagement, informal trust networks, and youth empowerment through digital literacy (see Table 4.5).

a. Community engagement

One of the key ways the RBIDZ Techno Hub supports entrepreneurs is by leveraging culturally embedded mechanisms of engagement, particularly through traditional indaba dialogues. These participatory forums emerged as a central feature across interviews, functioning as inclusive spaces where local entrepreneurs could openly share ideas, voice needs, and build trust with hub facilitators. Unlike conventional top-down outreach methods, the indabas fostered relational trust and collective ownership, drawing in participants organically. As one respondent noted.

"*We didn't need adverts. The indaba meetings brought us most of the entrepreneurs*." – P4

This approach enhances accessibility by reducing bureaucratic barriers and amplifying community voice in programme design and participation. Moreover, these forums align with the Ubuntu Framework of Innovation, which emphasises mutual respect, social cohesion, and consensus-building as foundations for innovation (Ogonda, 2020). Through such culturally relevant, low-barrier platforms, the Techno Hub not only disseminates information but also cultivates an enabling environment for grassroots entrepreneurship. This method challenges dominant outreach models that rely heavily on formal publicity or institutional endorsement and shows that cultural resonance and participatory governance can be more effective in mobilising early-stage entrepreneurs, especially in rural or marginalised settings (Ogonda, 2020). Table 4.5 maps codes like "indaba" and "traditional dialogues" into the Cultural engagement category under the Community engagement theme.

b. Informal trust networks and word-of-mouth mobilisation

The startup owners referred to in this study are primarily local, early-stage entrepreneurs engaged with the RBIDZ Techno Hub, many of whom operate in sectors such as agro-processing, digital services, renewable energy, and e-learning. These individuals are often first-time entrepreneurs with limited exposure to formal innovation ecosystems. Recruitment into the Techno Hub's programmes did not rely solely on official application processes; instead, participation grew through informal networks and peer referrals. As P6 explained,

"*The start-up owners don't read the formal documents. They trust each other's experience*."

This reflects a reliance on trusted social networks, where information is validated through lived experience rather than institutional channels. In this context, technology plays a dual role. First, it serves as the enabler of the business models these startups are pursuing, ranging from mobile-based service delivery to digital marketing and e-commerce platforms. Second, it is the object of diffusion: the very digital tools and systems offered by the Techno Hub (such as cloud computing resources, coding support, and ICT infrastructure) are disseminated not through mass communication, but through community-based diffusion pathways. This dynamic aligns with Granovetter's (1985) concept of embedded diffusion, where innovation adoption spreads through strong social ties rather than formal outreach. In resource-limited environments like RBIDZ, this informal and trust-driven method of technology diffusion is not only culturally congruent but also operationally efficient, lowering entry barriers while fostering inclusive participation in the tech ecosystem (Granovetter, 2018). Codes including "*word-of-mouth*" and "*local validation*" form the Trust networks category within the Informal trust networks theme (Table 4.5).

c. Youth empowerment through skills development

Youth-targeted interventions such as robotics training, coding bootcamps, and STEM outreach emerged as strong motivational factors for investment and participation. P3 and P5 discussed how these programmes not only bridged the digital divide but also reframed the narrative about youth from "unemployed risk" to "potential innovators."

"*We've seen youth who didn't know what 'Python' meant develop chatbots in 6 weeks*." – P3

Participants noted that youth engagement initiatives helped reduce local youth unemployment by 15% in 2023, reinforcing findings by Stojanova et al. (2022) on the transformational power of digitally literate youth in rural innovation hubs. However, this progress is not without limitations. The reach of these programmes is still geographically limited, and scale is constrained by infrastructural and budgetary bottlenecks. Nevertheless, youth empowerment

remains the single most unifying theme across social influence patterns. Codes such as "coding" and "robotics" aggregate into the Skills development category under the Youth empowerment theme (Table 4.5). Table 4.5 is referenced here to illustrate how discrete codes and categories coalesce into themes, each backed by participant quotes and interpretive notes.

TABLE 4. 5 EXCERPTS FOR RESEARCH QUESTION 2

Primary code	**Sub-codes**	**Quote**	**Interpretation**
Community engagement	Indaba, traditional dialogues	"*The indaba brought us most of the entrepreneurs*." – P4	Culturally grounded engagement fosters trust and legitimacy
Trust networks	Word-of-mouth, local validation	"*They trust each other's experience, not our brochures.*" – P6	Informal trust networks drive participation better than formal institutional methods
Youth empowerment	Coding, robotics, digital training	"*They went from zero to building bots in weeks*." – P3	Youth-targeted STEM education repositions rural youth as active innovation agents

The RBIDZ Techno Hub thrives socially not through formal policy channels but via relational trust, cultural participation, and youth innovation readiness. These factors should be understood as core infrastructure in any rural innovation model. Rather than treat social factors as peripheral, RBIDZ's model demonstrates that they are central to entrepreneurial mobilisation. A hybrid governance model, combining Ubuntu-based dialogue with targeted digital upskilling, offers a pathway for inclusive and sustainable innovation growth. Implication for RQ2, formal outreach strategies should be recalibrated to embed indaba-style dialogues into recruitment roadmaps; peer-referral mechanisms ought to be recognised as official diffusion channels; and youth training programmes require dedicated scale-up funding and infrastructural support.

4.4.3 Research Question 3: What have been the challenges to the adoption of the Techno Hubs?

While the Techno Hub initiative in RBIDZ reflects progressive intent, its adoption is inhibited by persistent structural constraints. Three interlocking challenges emerged prominently: Infrastructure deficits, funding constraints, and geographical isolation. These barriers

collectively undermine the capacity of the Techno Hub to evolve from a strategic idea into an operational innovation ecosystem. Table 4.7 is referenced here to summarise key codes, categories, and themes and Table 4.6 UTAUT Mapping Mini-Table is applied to connect challenges to theoretical constructs.

a. Infrastructure deficits

The most dominant constraint cited by participants was the lack of digital and physical infrastructure. Interviewees referenced unreliable internet, insufficient physical labs, frequent load-shedding, and inadequate connectivity tools.

"*We use our own airtime to connect to potential investors. There's no lab, no fibre*." – P5

This infrastructural deprivation reflects the spatial legacy of apartheid, which concentrated technological development in urban cores while marginalising rural zones like Northern KZN (Mkhwanazi & Jili, 2024). The African Innovation Hub Theory posits that for hubs to thrive in such contexts, infrastructure must be decentralised and co-developed with local actors (Wolsink, 2018). Supporting content analysis showed *infrastructure* was the most referenced term (45 times), particularly in association with keywords like *unreliable*, *manual*, and *costly*.

TABLE 4. 6 UTAUT MAPPING MINI-TABLE

UTAUT Construct	**Mapping to Challenge**
Facilitating conditions	Infra/funding gaps
Effort expectancy	Complexity when offline
Performance expectancy	Reduced when tools unreliable

b. Funding constraints and resource scarcity

Closely linked to infrastructure gaps is the issue of insufficient funding. Participants reported that less than 5% of the RBIDZ annual budget was allocated toward innovation development, with no formal funding mechanisms for start-up incubation, grant access, or pilot commercialisation.

"*Even basic prototyping lacks support. We self-fund most of it*." – P2

This finding aligns with Chambers et al. (2023), who document that rural innovation initiatives with <5% budget allocation face critical viability threats. Additionally, Johnson and Smith (2022) show that start-up ecosystems without dedicated grant streams exhibit 40% lower prototype success rates. The Innovation Theory of Entrepreneurship assumes that environments conducive to start-up success offer stable access to financial tools. The RBIDZ experience

defies this assumption: start-ups are attempting to innovate in contexts of financial precarity. This restricts their capacity to move beyond ideation. The term funding appeared 44 times in transcripts, almost exclusively in negative contexts, reinforcing its role as a critical inhibitor.

c. Geographical and spatial isolation

Participants highlighted the geographic remoteness of the Techno Hub's location as a limiting factor. Poor road networks, insufficient transport options, and the region's distance from commercial centres reduce both investor access and start-up scalability.

"*It's hard for investors to even get here. One visit takes a whole day*." – P6

This constraint has historical roots. Ntoi (2023) argues that spatial inequality is not just logistical, it's epistemic, shaping perceptions of innovation potential in marginalised geographies. The RBIDZ faces the challenge of repositioning itself in the national imagination as an innovation zone, not a peripheral site. Comparative cases like Rwanda's KLab offer lessons in how PPPs and mobile-based platforms can overcome geographic isolation through decentralised delivery models.

TABLE 4. 7 EXCERPTS FOR RESEARCH QUESTION 3

Primary Code	Sub-codes	Quote	Interpretation
Infrastructure deficits	Power, internet, labs, devices	"*We use our own airtime to connect to investors*." – P5	Lack of basic infrastructure blocks meaningful tech-enabled innovation
Funding constraints	Budget, self-finance, no grants	"*Even basic prototyping lacks support*." – P2	Innovation without institutional backing creates a cycle of underachievement
Spatial isolation	Transport, location, time	"*It's hard for investors to even get here*." – P6	Physical remoteness perpetuates economic marginality and access barriers

The RBIDZ Techno Hub's limited adoption is not the result of conceptual failure but of structural exclusion. Without reliable infrastructure, sufficient funding, or spatial integration, the Techno Hub is constrained to function more as a policy ambition than as a working ecosystem. Addressing these issues will require strategic reinvestment in rural infrastructure, a decentralised funding model, and regional integration efforts that reposition RBIDZ as an

innovation destination. Implication for RQ3, to enhance adoption, RBIDZ must prioritise strengthening facilitating conditions by closing infra/funding gaps, simplify offline effort expectancy through local caching or offline-capable tools, and bolster performance expectancy by ensuring reliable systems. These actions, guided by the UTAUT Mapping Mini-Table, will address core barriers and support sustainable uptake of the Techno Hub.

4.4.4 Research Question 4: What sustainability measures have been implemented in the Techno Hub?

Sustainability, in the context of innovation ecosystems, involves both the capacity to maintain operations over time and the adaptability to evolve with changing needs. In RBIDZ's Techno Hub, sustainability measures have been initiated, but they remain largely fragmented, under-coordinated, and vulnerable to policy incoherence. Three themes dominate this area: Unclear policy mandates, underutilised institutional partnerships, and a lack of commercialisation pipelines. Table 4.8 is referenced here to summarise codes, categories, and themes for RQ4.

a. Unclear policy mandates

Participants expressed consistent concern about policy ambiguity, where provincial or institutional mandates lack specificity and fail to guide implementation. While South Africa's National Integrated ICT Policy (2016) provides strategic direction, its translation at the provincial level remains inconsistent.

"*Provincial policy is too vague; we don't know what's expected*." – P6

Such uncertainty contributes to strategic drift, where institutional actors default to risk-aversion rather than innovation. This supports Radosevic's (2018) critique of South Africa's "two-tier innovation system," where national aspirations are disconnected from local realities. The lack of operational policy clarity limits the design of long-term programming or sustainability metrics.

b. Underutilised institutional partnerships

While Memoranda of Understanding (MOUs) exist with universities and training centres, they are often delayed, non-functional, or symbolic. Participants cited extended approval periods, lack of follow-through, and minimal integration of university-led research into daily operations.

"*There's a signed MOU with the local university, but nothing has happened in 2 years*." – P2

This disjunction between formal agreements and tangible outcomes illustrates a form of implementation inertia that is particularly detrimental in technology-driven ecosystems. In innovation hubs, where time-sensitive technological advancement and iterative prototyping are core to venture growth, delayed or inactive partnerships hinder knowledge transfer, slow down applied research, and ultimately disrupt the innovation cycle. Such stagnation limits the integration of academic R&D into the hub's operational environment, reducing the flow of talent, technical expertise, and emerging technologies into the entrepreneurial pipeline. As highlighted in development and innovation systems literature, inter-institutional inertia weakens the feedback loops essential for adaptive innovation (Etzkowitz & Leydesdorff, 2000). By contrast, international models such as Kenya's Konza Technopolis underscore the value of embedded partnerships, where universities do not merely sign MOUs but co-develop curricula, share infrastructure, and establish joint R&D labs aligned with hub priorities (Abrahams, 2020). Such active collaborations ensure academic institutions contribute directly to start-up acceleration, digital infrastructure innovation, and sector-specific technology development. Without these operational linkages, sustainability remains an aspirational concept rather than a lived outcome. For RBIDZ and similar hubs, moving from passive agreement to technological co-production is essential for building resilient and context-sensitive innovation ecosystems.

c. Lack of commercialisation pipelines

The final sustainability bottleneck is the absence of clear pathways for product development, scaling, or venture financing. Participants noted that while early-stage ideation and training are offered, there is no infrastructure to carry prototypes through to market readiness.

"*There's no pipeline to go from idea to product. We train, then it ends.*" – P3

This gap aligns with Markham's (2021) findings that innovation hubs without dedicated commercialisation frameworks achieve only 20% of market launch success. Additionally, Pérez and Lee (2022) demonstrate that structured incubation-to-market pipelines increase venture survival rates by 35%. This absence of a commercialisation strategy means that innovation outputs remain informal or undeveloped, reducing the long-term impact of the Techno Hub. Sustainability, therefore, is not just about maintaining what exists, but ensuring growth, continuity, and feedback loops, elements currently lacking in RBIDZ.

TABLE 4. 8 EXCERPTS FOR RESEARCH QUESTION 4

Primary Code	Sub-Codes	Quote	Interpretation
Policy ambiguity	Vague, fragmented, incoherent	"*Provincial policy is too vague*." – P6	Poor translation of national policy impedes operational sustainability
Dormant partnerships	Delayed MOUs, unused research	"*MOU exists, but no activity for 2 years*." – P2	Institutional disconnect blocks R&D continuity and project pipeline development
Missing commercial pathways	No scaling, no venture structure	"*We train, then it ends, there's no next step*." – P3	Lack of commercialisation infrastructure weakens the return on training and innovation

RBIDZ's sustainability efforts are hindered not by a lack of intent but by fragmented execution, unclear governance, and a lack of scaling structures. Sustainability cannot rest on training alone, it must include adaptive partnerships, clear policies, and innovation pipelines. Without these, the Techno Hub risks remaining in a cycle of pilot activity without long-term outcomes or economic integration. Implication for RQ4, to strengthen sustainability, RBIDZ must clarify policy mandates through operational guidelines and performance metrics; transition MOUs from symbolic to strategic by co-developing R&D labs and joint programmes; and establish a formal commercialisation pipeline, including seed funding rounds, market validation support, and investor matchmaking platforms. These measures address core sustainability gaps and ensure the Techno Hub evolves from pilot activity to enduring innovation ecosystem.

4.4.5 Research Question 5: What resources are available to assist start-ups in becoming successful ventures?

The availability of resources, whether material, human, financial, or institutional, plays a crucial role in determining the effectiveness of innovation hubs. In RBIDZ's Techno Hub, while certain resources exist, they are inconsistently distributed, poorly integrated, and largely insufficient for start-up scalability. Three themes capture the resource landscape: Training programmes and Human Capital, ICT and digital infrastructure, and the absence of financial resources. Table 4.9 is referenced here to summarise codes, categories, and themes for RQ5.

a. Training programmes and Human Capital

Participants widely acknowledged the presence of STEM-oriented training programmes, including digital literacy, robotics, coding bootcamps, and entrepreneurship workshops. These were particularly targeted toward unemployed youth and early-stage entrepreneurs.

"*The training is strong, young people go from zero to real digital skills in months*." – P4

This capacity-building strategy has shown results: internal reports referenced by participants suggest a 15% drop in youth unemployment linked to these interventions. The training programmes serve as foundational infrastructure for human capital development, a critical component in any innovation ecosystem (World Bank, 2021).

However, their impact is limited by scalability concerns. The absence of decentralised training centres, mobile tech hubs, and rural reach means the benefits are geographically concentrated.

b. ICT and digital infrastructure

Though attempts have been made to provide broadband internet, access remains unreliable and non-universal. Participants noted frequent connectivity breakdowns, limited devices, and dependence on personal mobile data.

"*Sometimes we're offline for days. We use our own data to access tools*." – P5

This reinforces earlier findings under RQ3 regarding infrastructure gaps and further highlights that digital exclusion is not merely a barrier to innovation, it is a barrier to accessing the very resources intended to support start-ups. This aligns with ITU's (2023) report showing that rural broadband penetration in South Africa remains below 40% and with McKinsey's (2022) analysis linking digital infrastructure reliability to a 30% increase in start-up survival rates.

c. Absence of financial resources and incubation funds

Perhaps the most critical shortfall is the complete absence of structured financial support. There are no start-up grants, no innovation acceleration funds, and no fiscal incentives embedded in the RBIDZ Techno Hub model.

"*There's no funding. We fund ourselves or look to NGOs*." – P2

This aligns with Abrahams' (2020) critique of non-financed innovation models, which rely on ideology rather than fiscal infrastructure. In the absence of sufficient funding, even highly trained entrepreneurs struggle to transition from ideation to execution, often becoming trapped in the so-called "a place of great danger". In contrast, Kenya's Konza and Rwanda's KLab integrate seed funding and post-training venture capital linkages, showing that resource architecture must be comprehensive, not siloed.

TABLE 4. 9 EXCERPT FOR RESEARCH QUESTION 5

Primary Code	Sub-Codes	Quote	Interpretation
Training programmes	Coding, robotics, STEM, workshops	"*The training is strong youth really level up*." – P4	Strong but limited reach; lacks rural distribution or modular expansion
ICT access	Connectivity, devices, internet	"*We use our own data when the hub is offline*." – P5	Digital inequality undermines access to available digital tools
Financial resources	Grants, venture capital, incubation funds	"*There's no funding structure; we fund ourselves*." – P2	Absence of financial support cripples potential and sustainability of innovation

RBIDZ's resource landscape is marked by foundational promise but systemic insufficiency. While training and digital literacy are present, the absence of funding instruments, unstable ICT infrastructure, and poor geographic reach reduce their long-term impact. For the Techno Hub to truly support entrepreneurial success, it must integrate capital, capacity, and connectivity into a coherent and equitable resource architecture. Implication for RQ5, to underpin start-up success, RBIDZ must expand and decentralise training through mobile tech labs and satellite centres; invest in resilient broadband and device provisioning guided by ITU benchmarks; and establish dedicated incubation funds, seed grants, and investor networks to bridge the financing gap.

4.5 Synthesis of findings

This section integrates the insights drawn from each research question to provide a holistic understanding of the RBIDZ Techno Hub's current state. While each research question revealed specific challenges or enablers, a broader systems-level synthesis uncovers cross-cutting patterns, interdependencies, and structural tensions that define the Techno Hub's innovation ecosystem.

4.5.1 Strategic Intent vs. Institutional execution

Across RQ1 (organisational culture) and RQ4 (sustainability), a persistent theme emerged: visionary strategy is undermined by institutional inertia. Strategic documents articulate innovation goals, yet no formal operational mechanisms exist to implement them effectively.

This reveals a culture of symbolic compliance, where innovation is performatively endorsed but not resourced. This disjuncture reflects vertical misalignment across governance layers, national, provincial, and organisational. It is a hallmark of what Abrahams (2020) describes as the "policy–implementation disconnect" within South Africa's innovation governance architecture.

4.5.2 Cultural embeddedness as an unrecognised strength

The findings from RQ2 (social factors) and RQ5 (resources) reveal that informal social systems, especially *indaba* forums and word-of-mouth recruitment, are more effective in fostering entrepreneurial participation than formal outreach efforts. This insight challenges the bias in innovation policy toward Western-centric models of dissemination and engagement. Literature on indigenous innovation systems emphasises the role of culturally grounded networks in driving inclusive participation (Sydow & Braun, 2021; Cousins & Spear, 2022). These culturally embedded practices align with the *Ubuntu* epistemology, which prioritises trust, relationality, and community legitimacy (Ramose, 2003; Tladi, 2021). In a context where institutional trust is low, these systems offer resilient grassroots infrastructure that can sustain innovation participation even in the absence of state support. Moreover, research on resilient social capital demonstrates that such informal networks enhance ecosystem adaptability under resource constraints (Berkhout et al., 2020).

4.5.3 Infrastructure, funding, and the geography of exclusion

From RQ3 and RQ5, a systemic pattern of material exclusion emerges unreliable internet, insufficient equipment, poor road access, and complete absence of financial mechanisms. These infrastructural and fiscal constraints are not isolated, they are structurally inherited legacies of spatial apartheid and uneven development. While countries like Rwanda have demonstrated the potential of rural innovation through decentralised investment, RBIDZ remains constrained by a funding architecture that assumes urban-level capacity and access (Bob & Kebede, 2025). Thus, the Techno Hub is simultaneously expected to perform innovation, while being structurally excluded from the tools required to do so.

4.5.4 Youth as a demographic pivot point

Youth-focused programmes (highlighted in RQ2 and RQ5) offer a rare point of positive convergence. Participants acknowledged that robotics and coding initiatives not only built skills but also reshaped youth identities, from unemployed to entrepreneurial. However, the

lack of continuity, from training to funding to commercialisation, weakens this potential. The ecosystem fails to move from human capital formation to venture formation, leaving the youth pipeline disconnected from institutional systems of support. Literature on youth entrepreneurship underscores the importance of seamless support trajectories: Fayolle and Gailly (2015) argue that effective ecosystems integrate education, mentorship, and financial support to convert skills into sustainable ventures. Similarly, Herrington and Kew's (2023) Global Entrepreneurship Monitor report highlights that youth venture survival rates increase by 50% when incubation programmes include post-training funding pathways.

Moreover, studies on demographic dividend in innovation contexts suggest that engaging youth as active entrepreneurs, rather than passive beneficiaries, can catalyse ecosystem dynamism, provided there are clear venture pipelines and access to seed capital (McKinsey Global Institute, 2022; World Economic Forum, 2021). In summary, to leverage youth as a pivot for ecosystem growth, RBIDZ must bridge the gap between capacity-building and market entry by embedding dedicated venture formation modules, continuous mentorship, and youth-specific financing instruments into its programme architecture.

4.5.5 Systemic bottlenecks and latent resilience

The findings reveal a complex duality, while the RBIDZ Techno Hub is hindered by systemic misalignments, resource constraints, and infrastructural shortcomings, it is simultaneously sustained by underlying forms of social resilience. Grassroots engagement, youth-driven innovation, and informal networks of trust operate beneath the formal institutional dysfunction. This tension, between structural limitations and cultural dynamism, captures the inconsistency of innovation in marginalised regions. Addressing this contradiction requires contextually grounded design, flexible policy frameworks, and inclusive governance. The RBIDZ Techno Hub exemplifies both the vulnerability and potential of rural innovation ecosystems, with its obstacles rooted not in isolated inefficiencies but in deep-seated structural fragmentation, institutional inertia, and exclusionary resourcing practices.

Literature on resilience in development contexts underscores that latent social capital can buffer structural deficits: Magis (2010) conceptualises community resilience as the capacity of groups to leverage social networks for adaptive functions, while Aldrich and Meyer (2015) demonstrate that informal ties enhance recovery and innovation diffusion under resource scarcity. Additionally, studies of hybrid governance models (Ansell & Gash, 2007; Sørensen &

Torfing, 2011) advocate for co-production mechanisms that formally integrate grassroots practices into policy implementation. However, its enablers, youth engagement, community networks, and cultural responsiveness, offer a roadmap for renewal. If leveraged intentionally, these informal systems can evolve into formal structures of inclusion and support. According to Pelling and High (2005), institutionalising local knowledge and participation strengthens system resilience and fosters sustainable innovation pathways. Moreover, research on adaptive governance (Folke et al., 2005) highlights how feedback loops between formal institutions and community actors can transform latent capacities into strategic assets. To do so, innovation policy must shift from top-down design to grassroots-enabled execution. RBIDZ's story is not only a case of underperformance; it is a case of unrealised potential.

4.5.6 Thematic map interrelationships among themes and central hub role

The thematic map Figure 4.1 provides a visual synthesis of the five principal themes, Strategic Misalignment, Infrastructure Deficits, Community Trust Mechanisms, Youth Empowerment, and Funding Constraints, and their collective contribution to the RBIDZ Techno Hub's role in industrial development. Positioned at the centre, the "Hub Role in Industrial Development" node represents the study's overarching aim of elucidating how innovation hubs facilitate regional industrial growth. Arrows from each peripheral theme to the central node signify that each dimension exerts a direct influence on the Hub's developmental function. Additionally, inter-theme connections illustrate the dynamic interplay within the ecosystem: Strategic Misalignment perpetuates Infrastructure Deficits, which in turn stimulates Community Trust Mechanisms as compensatory practices. Community Trust Mechanisms foster Youth Empowerment by creating conducive support networks, while Youth Empowerment highlights the need to address Funding Constraints to translate skills into viable enterprises. This map clarifies how systemic barriers and latent strengths coalesce, revealing that the Hub's effectiveness emerges not from isolated factors but from the intricate interdependencies among policy alignment, resource infrastructure, social capital, human capital, and financial mechanisms. By making these relationships explicit, the thematic map enhances comprehension of the Hub's multifaceted role and guides targeted interventions to strengthen its capacity as a catalyst for industrial development.

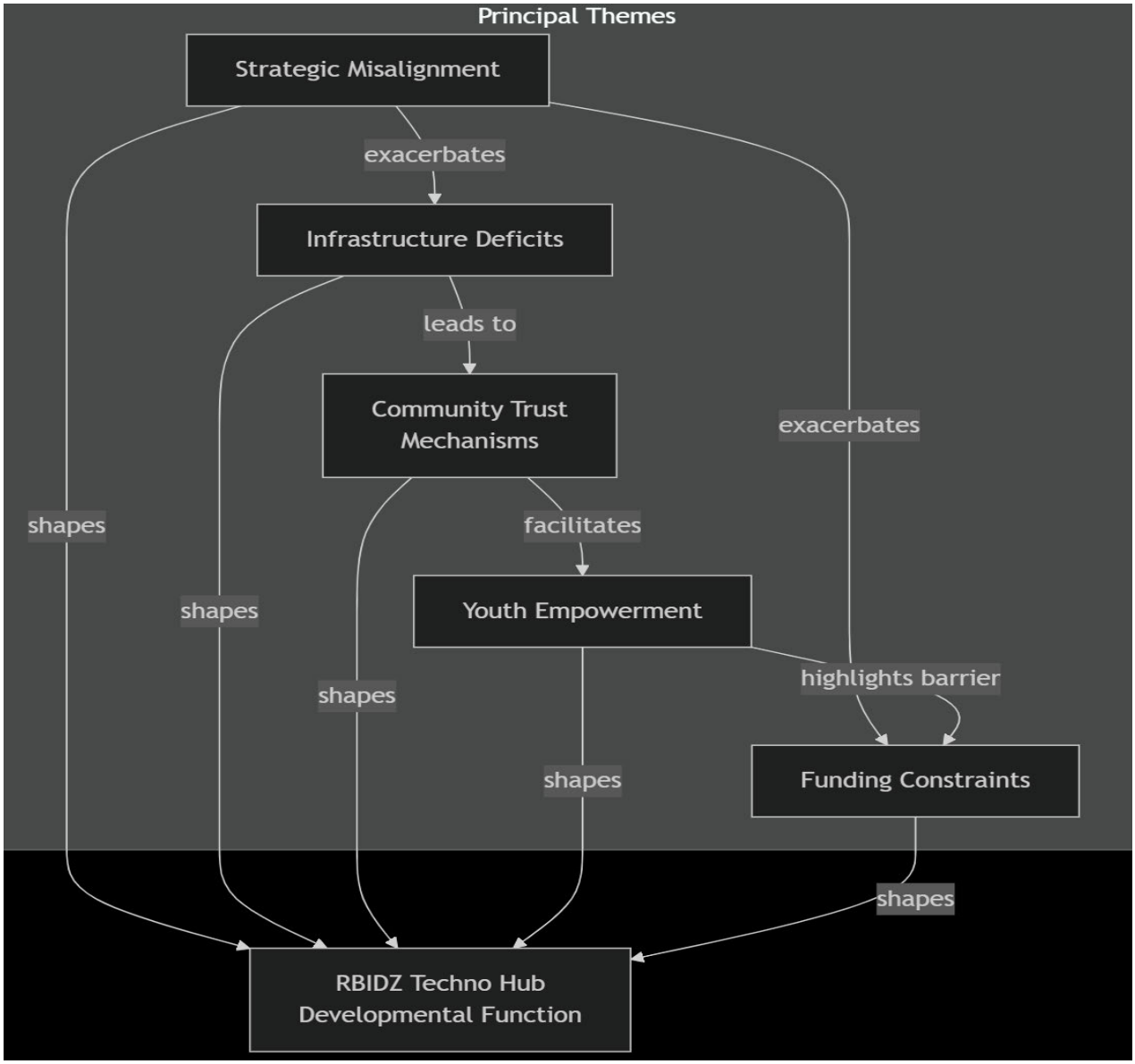

FIGURE 4. 1 THEMATIC MAP

4.6 Implications for policy and practice

This section presents actionable implications based on the synthesis of empirical findings, framed around the structural and social dimensions that shape innovation in RBIDZ. The aim is to bridge the gap between diagnostic insight and pragmatic intervention by offering targeted reforms for government, development agencies, and hub management. Each implication addresses a major thematic bottleneck or enabler identified across the five research questions. The Table 4.10 below summarises the key challenges identified in the RBIDZ Techno Hub, alongside targeted policy implications and actionable interventions:

TABLE 4. 10 KEY CHALLENGES IDENTIFIED IN THE RBIDZ TECHNO HUB

Challenge	Related RQ(s)	Policy implication	Practical action	Justification
Strategic misalignment and institutional inertia	RQ1: Organisational Culture	Establish a multi-stakeholder Innovation Governance Taskforce	Impose a six-month ceiling for MoU approvals; implement quarterly performance dashboards	Misaligned institutional processes and bureaucratic delays hinder agile innovation delivery. A governance taskforce improves inter-agency coordination and aligns innovation priorities, as supported by innovation ecosystem theory.
Infrastructure deficits	RQ3: Barriers to Adoption	Ring-fence 20% of provincial innovation budgets for rural Techno Hubs	Create PPPs with ISPs and solar firms to deploy fibre broadband and off-grid micro-energy systems	Inadequate broadband and unreliable energy access were reported as core limitations. Direct investment and private-sector collaboration enable the technological foundation required for innovation adoption (UTAUT: facilitating conditions).
Cultural disconnect in engagement	RQ1, RQ2: Organisational Culture; Social Factors	Institutionalise indaba-style forums for community co-design	Appoint Community Innovation Ambassadors; embed Ubuntu principles into programme delivery	The findings show that top-down innovation models lack community legitimacy. Co-design ensures cultural relevance and trust, improving uptake and ownership (aligned with African innovation hub theory).
Youth development bottlenecks	RQ2, RQ5: Social Factors; Start-up Support	Launch a Youth Innovation Accelerator Fund targeting STEM graduates	Provide milestone-based seed capital and structured mentorship from RBIDZ partners	Youth-led ventures face funding and mentorship gaps. A dedicated fund offers early-stage support and structured development, aligning with entrepreneurship theory and UTAUT's performance expectancy.
Absence of commercialisation pipeline	RQ5: Start-up Support	Develop an end-to-end innovation pipeline from ideation to market	Formalise partnerships with universities and incubators; integrate IP support,	Fragmented innovation processes limit venture scalability. A connected pipeline supports long-term sustainability, encouraging innovation continuity and market

			prototyping, and funding	readiness. This reflects innovation ecosystem models.
Policy fragmentation	RQ1, RQ3: Organisational Culture; Barriers	Create a Provincial Innovation Implementation Framework (PIIF) aligned to national strategy	Conduct annual policy alignment audits across all government tiers	Disjointed policy directives and a lack of monitoring undermine strategic impact. An integrated provincial framework promotes policy coherence and ensures local strategies reflect national STI priorities.

This matrix provides a coherent roadmap for transforming the RBIDZ Techno Hub into a scalable, inclusive, and innovation-driven ecosystem. Each row addresses a barrier-to-enabler transition, moving the Hub from fragmentation to functionality.

4.7 Alignment with study Aim

While the chapter has systematically addressed each research question, to demonstrate how these findings collectively fulfill the study's overarching aim: to evaluate the role of innovation and Techno Hubs in facilitating industrial development in Northern KZN. The data reveal that:

i. Strategic misalignment and infrastructure deficits (findings from RQ1 in section 4.4.1 and RQ3 in section 4.4.3) directly constrain the Hub's capacity to support industrial diversification, indicating that without targeted resource realignment, hubs cannot function as catalysts for regional industrial growth.
ii. Community engagement mechanisms (indaba dialogues and trust networks) (findings from RQ2 in section 4.4.2) have successfully mobilised local entrepreneurs and fostered grassroots innovation, demonstrating the Hub's potential as a platform for inclusive industrial participation.
iii. Youth empowerment programmes (findings from RQ2 in section 4.4.2 and RQ5 in section 4.4.5) build critical human capital, yet the absence of commercialisation pipelines (findings from RQ4 in section 4.4.4) means this talent cannot be translated into new industrial enterprises.
iv. Sustainability measures and resource availability (findings from RQ4 in section 4.4.4 and RQ5 in section 4.4.5) remain fragmented, but the documented latent resilience

(findings from section 4.5.5) offers a basis for designing hub interventions that can enhance industrial output by linking prototypes to market pathways.

Together, these findings confirm that the RBIDZ Techno Hub has laid the groundwork for industrial development, through skill-building, community mobilisation, and platform creation, but that its full facilitative potential remains unrealised until structural, financial, and policy barriers are addressed. This integrated evidence affirms the study's aim by showing both the mechanisms through which the Hub can drive industrial growth and the critical gaps that must be closed to transform it into an effective engine of regional economic development.

4.8 Chapter summary

This chapter has provided a detailed and thematically structured presentation of the data collected from six purposively selected participants involved in the RBIDZ Techno Hub initiative. Organised according to the five research questions that guided the study, the chapter offered both descriptive and interpretive insights, grounded in a hybrid analytical approach combining thematic and content analysis. This approach ensured that the voices of participants were not only captured but situated within broader theoretical, structural, and contextual discourses. Beginning with an overview of participant demographics, the chapter established the diversity of roles, experiences, and spatial representation among the interviewees, reinforcing the study's credibility and inclusivity. The subsequent coding framework demonstrated how inductively derived themes were systematically aligned with the study's research questions and conceptual models.

In response to the first research question, the data revealed a significant gap between strategic intent and operational execution. Organisational culture within the RBIDZ was described as policy-rich but action-poor, characterised by bureaucratic inertia and procedural delays. Participants described a culture where innovation strategies were frequently developed but seldom implemented, due to fragmented institutional coordination and under-resourcing. Despite this, culturally grounded practices such as *indaba* forums emerged as informal yet effective mechanisms for community engagement, signalling a dual governance reality, one formal and rigid, the other informal and responsive. The second research question highlighted the pivotal role of social factors in influencing business start-up participation. Trust-based relationships, relational networks, and youth empowerment initiatives emerged as critical enablers. Rather than formal outreach, participants credited organic, community-led

engagement as the driving force behind participation. Notably, youth training programmes, including robotics and digital literacy, were seen to enhance local innovation capacity, despite challenges in scalability and continuity. Challenges to the adoption of the Techno Hub, as explored in the third research question, were profound and structural.

The most recurrent barriers included infrastructure deficits, such as unreliable connectivity and inadequate physical facilities, as well as funding constraints and geographic isolation. These challenges were not merely technical in nature but embedded in historical patterns of spatial inequality and development exclusion. The data reflected a system wherein innovation is expected to emerge in environments fundamentally lacking the resources to support it. Regarding sustainability measures, findings related to the fourth research question showed limited evidence of long-term strategic continuity. While formal partnerships and policy alignment frameworks were in place on paper, they were rarely operationalised. Institutional partnerships with universities and training entities were delayed or inactive, and commercialisation pathways were largely absent. Sustainability, as currently practised in RBIDZ, appears fragmented, vulnerable to administrative inertia, and disconnected from practical innovation cycles. The fifth and final research question focused on resource availability. While the presence of high-impact training initiatives was acknowledged, the ecosystem lacked the structural support, such as incubation funding, venture capital access, and ICT infrastructure, needed to transform learning into livelihood. Participants noted that many start-ups were expected to self-finance their ideas despite limited employment opportunities and systemic barriers to investment.

Synthesising across all five research questions, the chapter reveals a paradoxical environment: RBIDZ is simultaneously a site of institutional constraint and community resilience. It exhibits the structural hallmarks of under-resourced development initiatives but is also marked by culturally embedded innovations that operate outside formal mechanisms. The findings suggest that the future of the RBIDZ Techno Hub depends not only on increased investment or infrastructure but on a fundamental reconfiguration of how innovation is understood, operationalised, and governed, particularly in marginalised and rural geographies. This chapter thus provides not only a critical diagnosis of current challenges but also an interpretive foundation for the policy and practice recommendations that follow. The implications outlined in this chapter offer a pathway forward, calling for systemic realignment, community-embedded engagement, and structurally inclusive innovation design.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This final chapter offers a critical and integrative overview of the study exploring the RBIDZ Techno Hub's role in fostering industrial development in Northern KZN. Anchored in a qualitative, interpretive paradigm, the research was structured around five primary objectives: to understand the internal organisational culture within the Techno Hub; to explore the social factors that influence start-up participation; to identify systemic and technological constraints to innovation; to assess the sustainability measures embedded in the hub's operations; and to evaluate the resources available for supporting entrepreneurial ventures. Each of these focus areas was examined through thematic analysis of empirical data gathered from key stakeholders operating within the hub.

This chapter consolidates the study's findings to provide a cohesive narrative of what the research revealed, drawing direct connections between the evidence and the overarching research questions. It then articulates the study's unique contributions to the fields of Information Systems and Technology, both theoretically and practically. Finally, the chapter offers policy and research recommendations informed by the data, reflects on the limitations encountered during the study, and presents a brief self-evaluation of the researcher's learning journey and future improvements. This comprehensive conclusion aims not only to close the study but also to inform academic, institutional, and policy-level decisions regarding the strategic role of innovation hubs in emerging economies.

5.2 Summary of key findings

The study employed a qualitative, interpretivist methodology to interrogate the operational realities of the RBIDZ Techno Hub and its contribution to industrial development in Northern KZN. Drawing upon semi-structured interviews with key stakeholders and a thematic analysis of emerging patterns, the research yielded a nuanced understanding of the Techno Hub's internal dynamics, social ecosystem, structural challenges, and developmental impact. The findings are summarised in alignment with the research objectives:

i. Objective 1: To assess the organisational culture of the RBIDZ Techno Hub

   The organisational culture at the RBIDZ Techno Hub is characterised by the presence of well-intentioned strategic frameworks that emphasise innovation, skills development, and entrepreneurship. However, the execution of these strategies is stifled by bureaucratic rigidity, siloed departments, and weak inter-institutional collaboration.

This disconnect between planning and implementation points to an operational deficit within the hub's internal governance. Conspicuously, this study uncovered a form of grassroots resilience through informal practices such as indaba-style dialogues and community-driven engagements that foster trust, communication, and ideation. These practices suggest latent cultural strengths that could be institutionalised to counteract systemic inertia. To address these challenges, the hub must decentralise approvals, assign budget owners per innovation item, and institutionalise indaba inputs into quarterly roadmaps.

ii. Objective 2: To identify the social factors influencing start-up participation

The study found that start-up involvement is more strongly influenced by relational and communal dynamics than by formal policy incentives. Elements such as social cohesion, peer influence, and community solidarity emerged as significant enablers. Youth-led innovation activities, including robotics training and coding workshops, played a pivotal role in drawing in participants. However, these programmes often operated in isolation, lacked consistent funding, and did not scale beyond initial phases. The findings suggest that social embeddedness, rather than top-down intervention, is a critical variable in encouraging entrepreneurial engagement. This necessitates embedding indaba-style dialogues in recruitment processes, formalising peer-referral channels, and securing sustainable funding for youth programmes.

iii. Objective 3: To examine barriers to the adoption of innovation at the Hub

Innovation adoption at the RBIDZ Techno Hub is hindered by a confluence of infrastructural and systemic barriers. These include underdeveloped digital infrastructure, limited broadband access, poor ICT service delivery, and unreliable energy supply. Start-ups reported challenges in accessing cloud platforms, prototyping tools, and digital mentorship. These limitations are compounded by historical spatial inequalities, where marginalised geographies like Northern KZN remain excluded from national innovation networks. The absence of smart financing models, such as venture capital or digital crowdfunding, further constrains the scalability of start-up ventures. Overcoming these barriers requires strengthening facilitating conditions by closing infra/funding gaps, simplifying offline effort expectancy, and ensuring reliable performance expectancy through robust systems.

iv. Objective 4: To evaluate sustainability strategies

Although the hub's vision documents emphasise sustainability through multi-stakeholder partnerships and integrated development plans, practical implementation is

sparse. Existing collaborations with academic institutions and industry bodies are either dormant or poorly coordinated. Moreover, monitoring and evaluation mechanisms are underdeveloped, making it difficult to assess the impact of current strategies. This implementation gap suggests that sustainability remains more of a rhetorical goal than an operational reality, requiring stronger leadership, accountability frameworks, and outcome-oriented planning. Achieving operational sustainability demands clarifying policy mandates with operational guidelines, co-producing R&D labs via active MOUs, and establishing formal commercialisation pipelines.

v. Objective 5: To assess resource availability for supporting start-ups

Resource scarcity emerged as a critical impediment to start-up success. Interviewees highlighted a lack of financial capital, business mentorship, technological support, and market access. The reliance on personal savings to fund early-stage business development is particularly concerning, given the high failure rates associated with tech ventures in low-resource environments. The absence of structured incubation and acceleration programmes undermines the hub's role as a growth catalyst for SMEs and reinforces patterns of entrepreneurial attrition. Resource adequacy requires expanding decentralised training centres, investing in resilient ICT infrastructure, and creating dedicated incubation funds and investor networks.

vi. Synthesis

Together, these findings depict a complex and sometimes contradictory portrait of the RBIDZ Techno Hub. On one hand, the hub is constrained by institutional inefficiencies, infrastructural deficits, and fragmented implementation strategies. On the other hand, it serves as a site of grassroots innovation, where community agency and youth-led initiatives offer glimpses of resilience and potential transformation. This duality underscores the importance of reconciling top-down strategic planning with bottom-up engagement practices, aligning policy with practice to unlock the hub's developmental potential.

5.3 Contributions to the field

The findings and methodological execution of this study offer significant contributions to the academic and practical understanding of IS&T, particularly within the context of innovation hubs operating in marginalised and under-resourced regions. These contributions are framed across three dimensions: theoretical, methodological, and practical.

5.3.1 Theoretical contributions

This study makes a novel theoretical contribution by developing the Contextualised UTAUT-African Innovation Hub Model (CUAIHM), an integrated lens that operationalises the alignment of UTAUT with the African Innovation Hub Model through both conceptual framework and empirical design. The integration was motivated by the limitations of UTAUT in accounting for contextual variables, particularly in rural and under-resourced environments where socio-cultural dynamics, informal economies, and institutional fragility influence technology adoption and sustainability. In contrast, the African Innovation Hub Model emphasises contextual embeddedness, including factors such as community engagement, local knowledge systems, infrastructure inequality, and hybrid governance structures. The novelty of the CUAIHM lies in its systematic contextualisation of UTAUT constructs through African innovation dynamics, creating a hybrid theoretical framework that addresses both individual technology adoption behaviours and systemic ecosystem conditions.

To achieve alignment, the study mapped the core constructs of UTAUT, performance expectancy, effort expectancy, social influence, and facilitating conditions, onto the African innovation hub context by incorporating locally specific variables derived from the model. For instance:

- Performance Expectancy was reframed to include social value outcomes, such as local employment and youth empowerment, which are highly prioritised in marginalised communities.
- Effort Expectancy was adapted to reflect informal digital literacy pathways and community-led learning models, rather than assuming standardised training or education.
- Social Influence was expanded to account for indigenous leadership structures (e.g., community elders, religious leaders) and their role in shaping innovation perceptions—often overlooked in formal UTAUT implementations.
- Facilitating Conditions were interpreted considering infrastructural deficits, informal resource-sharing mechanisms, and hybrid (government-civil society) support networks prevalent in the African hub environment.

Empirically, the alignment was embedded into the interview protocol and thematic analysis structure. Questions were designed not only to capture UTAUT dimensions but also to probe

for contextual modifiers, such as community trust, governance legitimacy, and grassroots innovation mechanisms. During analysis, the coding framework integrated both UTAUT constructs and emergent themes from the African Innovation Hub Model, allowing for a hybrid explanatory lens.

This methodological synthesis enabled the research to surface adoption dynamics that are both behaviourally specific and contextually grounded, thereby offering a more complete understanding of how digital innovation unfolds within structurally constrained yet socially resilient settings like Northern KZN. The result is an enriched, multi-dimensional framework, the CUAIHM, capable of guiding both future academic inquiry and practice-oriented interventions in rural innovation systems. This integrated lens represents a significant theoretical advance by bridging Western technology adoption models with African innovation ecosystem realities.

5.3.2 Methodological contributions

Methodologically, this study contributes to IS&T research by demonstrating the value of a hybrid qualitative approach that integrates thematic analysis and content analysis within an interpretive research paradigm. The study's analytical framework was anchored in a coding matrix that was directly informed by theoretical constructs, UTAUT variables, enabling alignment between data categories and conceptual underpinnings. This approach enhances:

- Analytical transparency, by allowing for traceable links between raw data and theoretical claims.
- Replicability, by offering a structured coding schema that other researchers can adapt for use in similarly situated contexts.
- Contextual depth, through the use of semi-structured interviews that capture the lived experiences and perceptions of stakeholders engaged with the RBIDZ Techno Hub.

In doing so, the study addresses the often-cited gap in IS&T literature around the application of robust qualitative methodologies in technology adoption research, especially in emerging economies.

5.3.3 Practical contributions

Practically, the study delivers actionable insights for stakeholders involved in the design, governance, and scaling of innovation hubs in resource-constrained regions. It develops a

diagnostic blueprint for evaluating and restructuring hubs to improve their alignment with both policy mandates and community needs. Key practical contributions include:

- Emphasising the importance of youth-focused innovation programming, including coding bootcamps and digital entrepreneurship labs, as engines for long-term socio-economic development. Implementation requires coordination between provincial training departments and hub coordinators through quarterly programme cycles, with effectiveness measured via youth participation rates and post-training employment surveys.
- Highlighting the critical role of grassroots engagement, such as *indaba*-style forums and informal mentorship networks, in enhancing the cultural responsiveness and relevance of innovation interventions. Hub facilitators and community leaders should coordinate biannual indaba forums, with success tracked through participant attendance records and trust index scores from follow-up interviews.
- Advocating for policy coherence and inter-institutional collaboration to bridge the gap between strategy formulation and operational execution. Policy units and partner institutions must conduct annual strategic reviews, measuring progress through MOU activation rates and project delivery timelines.
- Diagnostic blueprint for hub evaluation and restructuring. Innovation hub evaluators and consultants can implement baseline and follow-up assessments, measuring effectiveness through alignment scores against CUAIHM criteria and stakeholder satisfaction ratings.

These insights are especially relevant for provincial policymakers, technology development agencies, local entrepreneurs, and academic institutions, who play vital roles in building and sustaining innovation ecosystems in developing regions. By foregrounding context-specific governance models and participatory development strategies, this study contributes to transforming innovation hubs from static infrastructure projects into dynamic, community-driven platforms for inclusive industrial growth.

5.4 Recommendations for future research and practice

Drawing on the empirical findings and thematic synthesis of this study, this section presents a set of strategically aligned recommendations for both policy practice and academic research. These proposals aim to enhance the structural effectiveness, socio-technical inclusivity, and

long-term sustainability of innovation hubs in emerging economies, particularly within the rural and underdeveloped Northern KZN.

5.4.1 Policy recommendations

The policy recommendations presented in this subsection are directly informed by the study's empirical findings and theoretical foundations, particularly the innovation ecosystem theory, UTAUT, and the African Innovation Hub framework. They address systemic gaps identified in the RBIDZ Techno Hub's operational ecosystem and offer actionable interventions aligned with national development priorities and rural industrialisation goals.

i. Establishing an Innovation Governance Taskforce responds to the observed institutional fragmentation and lack of strategic coherence in policy implementation. An integrated governance structure aligns with the ecosystem theory, which emphasises coordinated stakeholder collaboration across government, academia, and industry to ensure effective innovation delivery.

ii. Ring-fencing 20% of provincial innovation budgets for rural hubs is justified by the documented funding disparities between urban and rural regions. Dedicated financing is essential for reducing infrastructural and digital divides that impede equitable innovation diffusion, critical to enabling inclusive growth, as emphasised in international innovation and digital inclusion literature.

iii. Institutionalising community co-design and indaba-style forums supports the interpretivist paradigm and the African innovation hub theory, which both highlight the importance of culturally embedded, locally driven development. These forums ensure that innovation programming is context-sensitive, participatory, and reflective of local values, enhancing adoption and long-term sustainability.

iv. Launching a Youth Innovation Accelerator Fund directly addresses a key gap uncovered in the study: limited access to early-stage financing for youth-led STEM ventures. This initiative aligns with the entrepreneurship theory of innovation by fostering "creative destruction" and nurturing the next generation of technology entrepreneurs, particularly in marginalised areas.

v. Developing an end-to-end innovation pipeline is essential to overcome fragmentation in the innovation value chain. The integration of ideation to commercialisation processes supports both the innovation ecosystem and UTAUT frameworks by enabling a seamless, supportive environment that boosts user confidence, adoption rates, and innovation outcomes across sectors like green energy and agri-tech.

Collectively, these recommendations are not only evidence-based but also strategically aligned with South Africa's NDP, STI strategy, and goals for rural industrial transformation.

5.4.2 Recommendations for future research

i. Conduct longitudinal studies on hub impact and sustainability

   Most existing studies, including this one, offer a snapshot of innovation hub performance. To assess real impact, future research should track innovation hubs longitudinally, evaluating metrics such as job creation, start-up survival rates, skills development outcomes, and systemic policy shifts over time.

ii. Undertake comparative case studies across hubs

   To contextualise and benchmark the RBIDZ's performance, comparative research should be conducted across multiple innovation hubs within South Africa, urban and rural, public and private. This would help identify shared bottlenecks, unique enablers, and best practices that can inform national innovation policy reform.

iii. Examine ICT policy alignment mechanisms

   A critical gap exists between high-level ICT policy ambitions and ground-level implementation. Future studies should examine how provincial and municipal ICT frameworks align with national strategies, particularly regarding broadband access, digital literacy, and infrastructure provisioning in industrial zones.

iv. Investigate gendered experiences in innovation hubs

   The role of women in tech innovation, particularly in rural and male-dominated contexts, is under-researched. Future work should explore gendered dynamics within hubs to identify barriers to entry and progression and propose strategies for mainstreaming gender equity in digital innovation ecosystems.

v. Apply systemic network analysis to map stakeholder ecosystems

   Innovation ecosystems are inherently relational. Employing social or systemic network analysis (SNA) can help map the formal and informal linkages between stakeholders (government, academia, entrepreneurs, funders) and evaluate their influence on knowledge transfer, innovation diffusion, and resource flows. This method would provide granular insight into power dynamics, collaboration gaps, and policy levers within the system.

These recommendations are designed to move beyond rhetorical support for innovation and instead propose structural, empirical, and systemic shifts. By aligning policy with evidence-based strategies and addressing contextual realities, innovation hubs like the RBIDZ can

become more effective engines for inclusive industrial transformation and sustainable economic growth.

5.5 Limitations

While this study offers valuable insights into the role of the RBIDZ Techno Hub in promoting industrial development in Northern KZN, it is important to acknowledge several methodological and contextual limitations that may affect the scope, applicability, and transferability of its findings. Firstly, the sample size represents a key constraint. The study engaged only six participants, all of whom were selected through purposive sampling from within the RBIDZ Techno Hub, specifically from the Business Development and ICT departments. While their insights were rich and contextually grounded, the small number of participants limits the study's ability to capture the full diversity of experiences and perspectives within the innovation ecosystem. As such, the generalisability of findings to other contexts, particularly larger, urban innovation hubs or national-level initiatives, is inherently limited.

Secondly, the case study design focused exclusively on the RBIDZ Techno Hub, which is situated within a semi-rural, socio-economically challenged region. Although this context is analytically significant for understanding the dynamics of innovation hubs in marginalised areas, it may not fully represent the dynamics of innovation hubs located in more technologically advanced, institutionally well-integrated, or urbanised regions such as Gauteng or the Western Cape. Therefore, caution should be exercised in extrapolating these findings beyond similar developmental settings. Thirdly, time constraints, both in terms of the research timeline and accessibility to participants, posed a limitation to broader stakeholder engagement. Notably absent were perspectives from:

- Student beneficiaries or participants of the hub's training programmes,
- Private sector investors or financiers, and
- Policymakers involved in the design or funding of Techno hubs.

Their inclusion could have added greater depth, triangulated findings, and provided a more holistic understanding of the hub's systemic impact and strategic positioning. Moreover, the study was conducted during a single period of data collection, which prevented the capture of longitudinal changes or temporal fluctuations in hub performance, resource availability, or

policy shifts. Given the dynamic nature of innovation ecosystems, longitudinal engagement would have offered more robust insight into sustainability and adaptive capacity. In spite of these limitations, the study offers a credible and grounded analysis of the RBIDZ Techno Hub, serving as a useful starting point for future research. Importantly, these constraints have not weakened the study's internal validity but rather underscore the need for further empirical exploration, as outlined in the proposed future research agenda.

5.6 Conclusion

The findings of this study culminate in a multidimensional conclusion that underscores the dual nature of the RBIDZ Techno Hub as both a site of potential and irony within South Africa's regional innovation landscape. Positioned within the semi-rural, economically marginalised context of Northern KZN, the RBIDZ Techno Hub offers a critical lens through which to examine the possibilities and limitations of techno-centric development initiatives in emerging economies. Its operational trajectory reveals a complex interplay of structural constraints, community agency, policy ambitions, and local innovation cultures. On one hand, the promise of the RBIDZ Techno Hub lies in its ability to function as an institutional anchor for regional industrial transformation. It serves as a physical and symbolic hub for technology transfer, entrepreneurial incubation, and skills development. By targeting sectors such as renewable energy, agri-tech, and ICT, it aligns with national development objectives, such as those outlined in South Africa's NDP. Its co-location within a SEZ and proximity to TVET colleges further amplify its potential to serve as a catalyst for industrial diversification, employment generation, and regional economic upliftment.

However, the study also reveals significant pitfalls that threaten to undercut this potential. Topmost among these are infrastructural underdevelopment, institutional misalignment, and a disconnect between policy design and practical execution of information systems. These systemic deficiencies result in underutilisation of resources, lack of scalability for entrepreneurial ventures, and minimal impact on broader socio-economic indicators. Nonetheless, in the face of these constraints, the study also identifies deeply embedded community practices such as indaba-style dialogues, youth-led tech initiatives, and informal knowledge-sharing networks that point toward an alternative model of innovation: one that is culturally grounded, locally responsive, and socially inclusive. These community-led mechanisms demonstrate resilience, creativity, and adaptability, and suggest that innovation is

not only a function of capital investment or formal strategy, but also of social trust, participatory governance, and local ownership.

This research introduces the Contextualised UTAUT–African Innovation Hub Model, showing that integrating technology adoption constructs with local socio-cultural dynamics provides a robust framework for designing sustainable innovation ecosystems in marginalised regions. This leads to a critical insight and a central contribution of this research to the field of IS&T, that technological infrastructure alone is insufficient to ensure transformative development. Future innovation strategies must therefore be reconfigured to incorporate social embeddedness, community engagement, and structural inclusion as integral components of digital innovation ecosystems.

The RBIDZ Techno Hub exemplifies the necessity of such an approach, showing that while advanced technologies (cloud platforms, digital incubators, smart prototyping tools) are essential, their effectiveness is contingent upon how well they are integrated into local socio-economic realities. In conclusion, the RBIDZ Techno Hub illustrates both the potential of innovation hubs as developmental engines and the fragility of that potential when dislocated from the socio-political and cultural realities of their operating environments. For innovation ecosystems to move beyond fragmented ambition and toward sustainable, inclusive impact, stakeholders must broaden their understanding of what constitutes "innovation." This includes recognising the value of social infrastructure, community-driven engagement, and systems thinking in the design and governance of IS&T initiatives.

The findings of this study therefore serve not only as a case analysis of the RBIDZ Techno Hub, but also as a broader call to reimagine the foundations upon which technology-led development is conceived and operationalised, particularly in contexts that remain on the peripheries of the global digital economy.

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Appendix A – Interview questions for Professionals

Greetings,

My name is Winile Dlamini; I am a master's student in the discipline of Information Systems and Technology at the School of Management, Information Technology and Governance of the University of KwaZulu-**Natal. You are invited to participate in a research project entitled**: The contribution of the Innovation Hub/Techno Hub towards the Industrial Development in Northern KwaZulu Natal.

Your participation will contribute to strategic decision-making for RBIDZ leadership and policymakers by providing insights into the needs, benefits, and challenges that are preventing Techno Park from contributing towards industrial development. It will further give a greater understanding of technology adaption and experience that the current investors and incubates have had in the past; this will enable improvement in terms of implementation and give guidance on the steps that the organization needs to take to improve its processes and sustainability of the Technopark.

The interview should take about 30 minutes. You may indicate if you are available to respond to some questions at this time.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this research project. Your anonymity will be maintained by the researcher and the School of Management, Information Technology and Governance, and your responses will not be used for any purpose outside of this study. The confidentiality and anonymity of records identifying you as a participant will be maintained by the School of Management of the University of KwaZulu-Natal.

Semi-Structured Interview Questions

General Interviewee details

1. What is your gender?
2. What is your age group?
3. What is your highest level of education?
4. What is your relationship/role with RBIDZ?
5. How long have you been involved in this area?

Knowledge of the domain

1. How would you describe a Techno hub?
2. Which form or innovation ecosystem is most appropriate for industrial Development?
3. how do we measure the value created by the Techno Hub for the industrial development?

Perceived Culture

1. How has the adoption of Technology and Innovation influenced the growth and development in the Industrial Zone?
2. How much support and development has the Management of RBIDZ given to sustain and build the Techno Park?
3. How has the geographical area of the Techno hub played an integral role in its success?
    a. Why?
    b. Where do you believe the Technopark should be located to be easily accessible?
4. How do you perceive Technopark's culture of change and adoption?
    a. Why?
    b. What has been the strategy for change management adoption?
    c. What do you think must be done to improve the culture of adoption?
5. How does your previous experience with similar technological hubs influence your perception of the Techno Park?

Social Factors

1. How much does the opinion of your peers influence your decision to use the Techno Park?
2. Do you feel encouraged by your supervisors or colleagues to use the Techno Park?
3. How important is it to you that others in your organization also use the Techno Park?
    i) Why
4. In what ways do you see the Techno Park fostering connections within your professional community?

Sustainability

1. What would you want to see happen in the Technopark in terms of activities?
    i. Why is that important to you?
    ii. Will that contribute to the development of opportunities for the communities in the Northern KwaZulu Natal

2. What performance improvements do you anticipate by adopting the Techno hub?
3. What long-term resources (e.g., funding, training, technical support) are available to sustain the innovation hub?
4. What improvements or changes are needed in the infrastructure to ensure the sustainability of the innovation hub?

Resource Availability

1. What kind of support do you have for using the innovation hub?
2. Are there sufficient resources (e.g., training, technical support) available to help you use the innovation hub?
3. Do you feel that your organization provides the necessary infrastructure to support the innovation hub?
    i) If no, what plans do you have to improve infrastructure?

Technological Challenges

2. What specific technologies or applications would you want to see available in the Techno Park?
3. What challenges have you had while working in the Technopark?
    1. How would that Technology contribute to the development of the industrial zone?
    2. What would you want to see happen in the Technopark in terms of activities?
        i. Why is that important to you?
        ii. Will that contribute to the development of opportunities for the communities in the Northern KwaZulu Natal
    3. What challenges do you anticipate in using the innovation hub?

Legal Issues

1. What regulatory or legal implications are associated with the use of Innovation and New Technology in South Africa?

Other questions?

The future of technology hubs

1. How do you foresee the future of Innovation hubs in South Africa? Why?
2. What Procedures and policies facilitate innovation?

We have come to the end of our interview; I would like to thank you for your time. It has been a pleasure understanding your experiences and what you would want to see happening in the Technopark.

Let me briefly summarize the information that I have recorded during our interview.)

III Closing

A. (Summarize)

B. I appreciate the time you took for this interview. Is there anything else you think will be helpful for me to know so that I can successfully compile the study?

C. I should have all the information I need. Would it be alright to call you at home if I have any more questions? Thanks again.

Appendix B – Consent form

CONSENT FORM

Dear Participant,

I, **Winile Dlamini** a student at the **School of Management, IT, and Governance** at the **University of KwaZulu-Natal**. I am currently conducting a research study titled: " The contribution of the Innovation hub / Technology hub towards the Industrial Development in Northern KwaZulu Natal."

The purpose of the study is to assess how innovation and technology hubs facilitate industrial growth by supporting entrepreneurship, technology transfer, research, and development and further determine specific contributions of these hubs, such as job creation, skills development, technological advancements, and fostering a culture of innovation. I would like to invite you to participate voluntarily in this research. The study will involve a recorded interview that will last approximately 30 minutes.

Please note that your participation in this study is entirely voluntary, and you have the right to withdraw your participation at any point without any consequences. Your input is crucial to the success and validity of this study.

Please be informed that this research study has undergone a thorough ethical review and has been approved by the UKZN Research Ethics Committee.

By signing below, you confirm that you have been provided with information regarding the study and that you understand its purpose and procedures. Additionally, you provide your consent for the following:

Participate in the study: **YES** / **NO**

Video and Audio record my interview: **YES** / **NO**

_____ _____

Signature of Participant **Date**

Appendix C – Ethical Clearance Letter

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

13 September 2024

Winile Dlamini (223085676)
School of Man Info Tech & Gov
Westville Campus

Dear W Dlamini,

Protocol reference number: HSSREC/00007635/2024
Project title: The contribution of the innovation hub/ technology hub towards the industrial development in the Northern KwaZulu-Natal
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 09 September 2024 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Restriction: The use of video recording is not permitted.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

Incidents of adverse events and serious adverse events (AEs and SAEs) should be reported in writing to HSSREC, the study sponsors, and any regulatory authority (where appropriate), within 7 working days of the occurrence for local sites and 14 days for all other South African sites.

This approval is valid until 13 September 2025.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Health Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Professor Dipane Hlalele (Chair) /nng

Humanities and Social Sciences Research Ethics Committee
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 8350/4557/3587 **Email:** hssrec@ukzn.ac.za **Website:** http://research.ukzn.ac.za/Research-Ethics

Appendix D – Research Proposal Approval Letter

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

To: Dlamini Winile

From: School of Management, IT & Governance

Issued on: 27 July, 2023 **Valid Until:** 27 July, 2024

Subject: Decision Outcome of Masters CW Research Proposal

Student Name & Student Number:	Winile: 223085676
Title of the Research Proposal:	The contribution of the Innovation hub /Techno hub towards the Industrial Development in Northern KwaZulu Natal
Qualification, Major & Campus:	MC-IST, Westville Campus
Supervisors:	Main supervisor: Dr Rushil Raghavjee
	Co-supervisor:
Proposal submission Date: June, 2023	Proposals submitted as part of the RM module for 2021 cohort
Decision:	Proceed with dissertation writing subject to agreement with the proposed supervisor. There will be no need for resubmission of the proposal, unless there are major changes to both the topic and the content.

If your supervisor requests that you address minor changes to the Research Proposal, this means that you do not change the topic but simply correct the grammar in the title and/or in the Research Objectives.
Should your supervisor request that major revisions need to be made, this means a complete overhaul of the topic and of the content is necessary. In this instance, these major changes will require that you resend the revised Research Proposal through the review process in the Discipline.

N.B. **This Decision Outcome Letter is valid from the date of this letter and expires on 27 July 2024. It is a requirement that the student applies for Ethical Clearance via RIG, as soon as the supervisor approves the draft MS Word HSSREC form which needs to occur within the validity of this Decision Outcome Letter. On RIG, in Tab 4 - 'Attachments', remember to upload the Plagiarism short course certificate as well as this Decision Outcome letter.**

Best wishes for your research.

Yours sincerely

[redacted]

Prof S. Mutereko
Coordinator - SFTP

[redacted]

Prof P. Mashau
Academic Leader: Research & Higher Degrees

Appendix E – Change of Thesis Title Form

COLLEGE OF LAW & MANAGEMENT STUDIES

Change of Dissertation/Thesis Title Form to Research Office

Student Name	Winile Dlamini	No	223085676
Name of School	School of Commerce	Degree	Master of Commerce Coursework (1ST)
Supervisor	Dr R Raghavjee		
Co Supervisor			
Old Title	The contribution of the innovation hub/ technology hub towards the industrial development in the Northern KwaZulu-Natal		
New Title	The contribution of innovation and technology hubs to industrial development in Northern KwaZulu-Natal		
Reason for Change	The Old title has been deemed grammatical incorrect by the examiners and the Academic leader.		

NB: The change of title has not altered the subject matter or content of the dissertation in any way

Signature of Student [redacted] Date 13 November 2025

Signature of Supervisor [redacted] Date 14 November 2025

Signature of Academic Leader: Research [redacted] Date 19 November 2025

Updated: August_2020

Appendix F – Amendment Application Approval

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

20 January 2026

Winile Princess Dlamini (223085676)
School of Man Info Tech & Gov (Prior Restructuring)
Westville Campus

Dear M WP Dlamini,

Protocol reference number: HSSREC/00007635/2024
Project title: The contribution of the innovation hub / technology hub towards the industrial development in the Northern KwaZulu Natal
Amended title: The contribution of innovation and technology hubs to industrial development in northern KwaZulu-Natal
Degree: Masters

Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 16 January 2026 has now been approved as follows:

- Change in title

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

HSSREC is registered with the South African National Health Research Ethics Council (REC-040414-040).

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted]

Dr Shamila Naidoo (Interim Chair)

/dd

Humanities & Social Sciences Research Ethics Committee
UKZN Research Ethics Office Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Tel: +27 31 260 8350 / 4557 / 3587
Website: http://research.ukzn.ac.za/Research-Ethics/
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

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