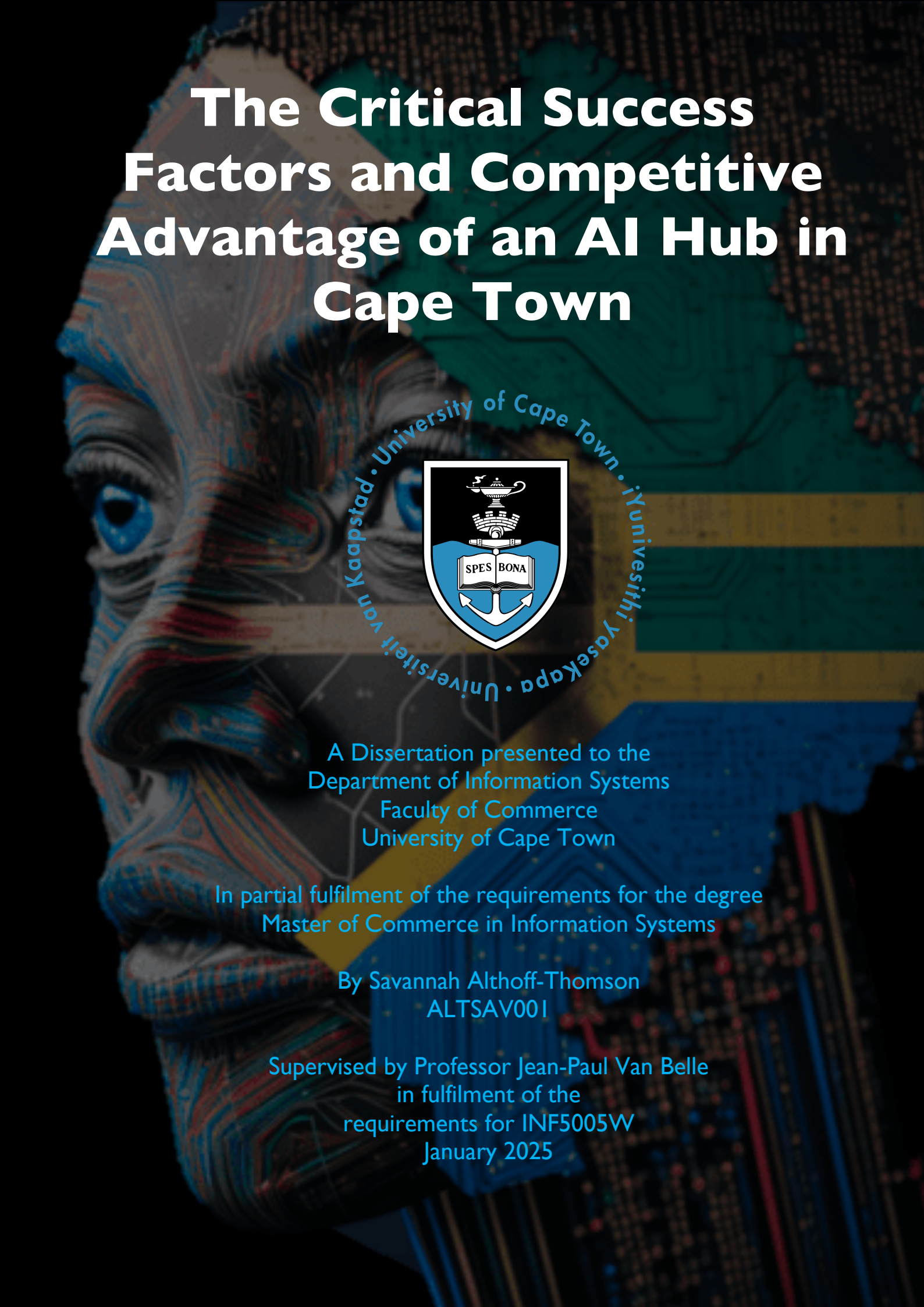

The Critical Success Factors and Competitive Advantage of an AI Hub in Cape Town

A Dissertation presented to the
Department of Information Systems
Faculty of Commerce
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In partial fulfilment of the requirements for the degree
Master of Commerce in Information Systems

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Supervised by Professor Jean-Paul Van Belle
in fulfilment of the
requirements for INF5005W
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To my beloved University of Cape Town, that has nurtured, educated, and challenged me – this dissertation is my tribute.

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To my steadfast father, Michael Thomson, who always told me I could do anything I wanted, because I would be the best at it – your unwavering faith has spurred me on.

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To impact.com, for the generous sponsoring of my master's degree, and their belief in my potential – thank you.

Abstract

Background: Despite South Africa's ambition to become a global 4IR leader through AI advancements, little research has been done to examine national AI capacity, capability, and competitiveness. AI offers even the least developed countries valuable opportunities to harness potential and gain a competitive edge, simultaneously restructuring their economies and driving digital transformation. However, foreign AI applications adopted in Africa may lack contextual relevance and fail to harness the unique resources and skills in the local landscape. The development of an AI hub in Cape Town could address these issues – alongside the contextualisation of knowledge and technology creation, an AI hub offers the distinct opportunity to harness AI competitive advantage through aligning interventions with strategically valuable national resources and capabilities.

Objective: The objective of this study is to explore the critical success factors and competitive advantage of an AI hub in Cape Town.

Methodology: This study was interpretivist, deductive, and followed a qualitative approach, interviewing AI-knowledgeable South African stakeholders from diverse sectors using purposive sampling and semi-structured interviews. This study was guided by Porter's Diamond of National Advantage and Cluster Theory as the theoretical frameworks, informing the interview guide and the thematic analysis.

Findings: Vision, bottom-up hub functions, collaboration, proximity, funding, leadership and location emerged as major critical success factors for an AI hub in Cape Town. These critical success factors are moderated by government involvement and rapid AI change. In discussing the potential competitive advantage of an AI hub, and our unique resources and capabilities, participants overwhelmingly pointed out the ability to solve African use cases using artisanal capabilities, the need to create and safeguard South African data, and the harnessing of our diversity and culture. Using deductively derived themes, the study confirmed the relevance and interdependence of the constructs in Porter's Diamond of National Advantage in a developing context. The framework is enriched by the emergent sub-themes. The physical proximity inherent in Cluster Theory was extended to include digital proximities.

Contribution: Considering theoretical contributions, the research foregrounded the capacity, capability and competitiveness of South Africa in the 4IR, adding to the literature on hubs in developing contexts and Porter's frameworks. Moreover, it addresses the government proposal to establish an African AI Institute. Practically, the study provides a starting point for the conceptualisation and competitive advantage of an AI hub in Cape Town. Actionable

recommendations to specific stakeholders groups on their role in nurturing South African AI are outlined, catalysing the advancement of AI in Africa.

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Abbreviations

AI	Artificial Intelligence
4IR	Fourth Industrial Revolution
SA	South Africa
CT	Cape Town
PC4IR	Presidential Commission on the Fourth Industrial Revolution
UCT	University of Cape Town
CoCT	City of Cape Town
PGWC	Provincial Government of the Western Cape
ICT	Information and Communication Technology
UNESCO	United Nations Educational, Scientific, and Cultural Organisation
IBM	International Business Machines Corporation
MIND	Machine Intelligence and Neural Discovery
BRICS	Brazil, Russia, India, China and South Africa
FinTech	Financial Technology
PAN	Policy Action Network
RBV	Resource Based View
SSM	Soft Systems Methodology
VSD	Value-Sensitive Design
POPI	Protection of Personal Information
STEM	Science, Technology, Engineering and Math

Chapter 1: Introduction

1.1 Background

In 2020, the Presidential Commission on the Fourth Industrial Revolution recognised the need to adapt to industry changes, highlighting the impetus to "identify *policies, strategies, and plans* that are needed to position *South Africa* as a *leading country* in the evolution and development of the *4IR*" (PC4IR, p. 131) [emphasis added]. Five years later, SA is far from PC4IR aspirations – the country cannot compete with the technological prowess of developed counterparts. Nevertheless, the 4IR offers even the least developed countries valuable opportunities to harness potential and gain a competitive edge, simultaneously restructuring their economies and driving digital transformation (Nsakanda, 2021). Considering SA economies, AI has the potential to "add more than $250 billion, or 15% of current gross value" by 2035 (Mzekandaba, 2023, webpage). Moreover, the PC4IR (2020) noted that a failure to respond to the 4IR could threaten SA industries, and further endanger the ability of citizens to participate as equals.

Chilunjika, Intauno and Chilunjika (2022) argue that the 4IR is manifested through Artificial Intelligence (AI), foregrounding its centrality. AI is flourishing through the diffusion of technologies, substantial breakthroughs in algorithmic capability, volume and richness of available data, and quantum leaps in computing power (Strusani & Houngbonon, 2019). AI is far from its theoretical conceptions of the 1960s, as private investment in 2025 totalled $158 billion, more than triple the investment from 2020 (Thormundsson, 2024).

The PC4IR similarly highlights the centrality of AI, citing it as a "*bedrock* technology in the 4IR" (2020, p. 50) [emphasis added]. This is foregrounded through recommendations made by the PC4IR (2020) to establish a National AI Institute, and recognition regarding the need for storage of large amounts of data. However, the report extensively looks at other countries for guidelines in developing AI capacity, echoing Sutherland's (2020, p. 238) assertion that "Africa has almost exclusively *been a taker of advanced technologies* and of related policies, often with *limited adaptation to national requirements*" [emphasis added].

The limited adaptation of AI can have significant consequences, where the conditions on which models are trained do not address the complexities SA grapples with, resulting in decision-

making that hinders development goals. As highlighted by Gwagwa et al. (2020, p.12) "applications of AI deployed in Africa tend to originate from outside the continent and thus *lack contextual relevance*" [emphasis added]. Should context go unaddressed, instances of foreign-controlled tools in African settings risks neo-colonial underpinnings (Gwagwa et al., 2020).

Unfortunately, this contextual relevance is often ignored due to solution complexity, and arguably the limited economic incentive for multinationals to tailor to the African landscape (Price, 2019). However, the risks of ignoring the 4IR and constituent AI applications demonstrate the necessity of nurturing ecosystems favourable to the development and research of AI on the African continent (Kiemde & Kora, 2021). The development of an AI hub could offer a starting point – they foster *locally responsive, contextual solutions* through building collaborative communities with entrepreneurs at the centre, and attracting diverse members with heterogenous knowledge (Atiase, Kolade & Liedong, 2020). Organisations have called for the establishment of African AI centres, foregrounding the need to mobilise 4IR collaboration between government, industry, academic, and entrepreneurial stakeholders, as well as international players (AI4D, 2020; Jegede & Ncube, 2021; Mathenjwa, 2023). Moreover, Mzekandaba (2023, webpage) notes that "of all the eight recommendations contained in the summary report and recommendations of the PC4IR, the *proposal to establish the Artificial Intelligence Institute of South Africa is by far the most strategic.* It holds the greatest potential for economic impact" [emphasis added].

Cape Town has been called 'Silicon Cape' and the 'tech hub of Africa' due to its vibrant start-up ecosystem and progressive local government, demonstrating its positioning for the establishment of an innovative AI hub on the continent (Pollio, 2022). Surpassing the contextualisation of knowledge and technology creation, an AI hub offers the distinct opportunity to harness AI competitive advantage through aligning interventions with strategically valuable national resources and capabilities (Atiase, Kolade & Liedong, 2020; Littlewood & Kiyumbu, 2018). This would not only reduce the reliance on multinational AI companies, but would also increase the power, reputation and bargaining position of SA in the African and global AI landscape.

1.2 Problem Statement

As highlighted by Jegede & Ncube (2021, p. 676), despite SA's strong interest in taking a global position in the 4IR, little to no research has been done to examine whether the country has the capacity and capability. By extension, although several studies have focused on the impact of foreign AI tools in African settings (Chilunjika et al., 2022; Gwagwa et al., 2020; Kiemde & Kora, 2020; Strusani & Houngbonon, 2019), little research has been conducted to understand the impact of the African context on AI development, and whether AI could truly be competitively enhanced or developed "in Africa by Africans for Africans" (Kiemde & Kora, 2020, p.4) [emphasis added]. Moreover, Christopher (2021) notes that few studies have addressed the global competitiveness of SA's ICT industry, considering the strategic fit between internal characteristics and external market factors. In the context of national advancement, competitive advantage can be defined as *industries that perform activities more efficiently or uniquely than competitors through continuous innovation* (Porter, 1985; Porter, 1990). This national competitive advantage is typically driven by strong domestic rivalry, demanding local customers, the availability of advanced factors of production, and local synergies and capabilities that competitors cannot easily replicate (Porter, 1990; Porter, 1998).

Moreover, despite the contextual and competitive benefits of hubs for Africa, Simuka & Chinakidzwa (2022, p.15) foreground that "research remains concentrated in developed countries". Building on this observation, Smit (2010) highlights that while localised clusters are a feature of advanced economies, they lack in developing countries, limiting productivity. Kolade et al. (2021) stands out as a research paper that explores the topic of viability and sustainability of tech hubs in Africa, defining critical success factors as the *essential requirements, conditions, or practices that influence whether a tech hub thrives or fails in the African context.* Isagah & Musabila (2020) highlight the need for further research into how African governments can establish AI hubs that address local communities. As a tech leader in Africa and a 'business gateway to the continent', the potential of SA to harness transformative AI using hubs presents an African opportunity to engage with the 4IR in a way which truly addresses context. SA has historically been on the backfoot of technological development in comparison to Western standards (Gwagwa et al., 2020). The flourishing of AI and its promised benefits could be the leapfrog for Africa to set itself apart (Gwagwa et al., 2020). Based on the identified gaps, there is a clear need to consider the critical success factors of an AI hub in CT

to address contextual concerns. Moreover, the competitive factors within the national landscape must be explored to create strategic alignment of hub interventions.

1.3 Necessity for Research and Value

Through addressing the identified gap, this research will summarise the AI landscape in SA, consider the success factors of (AI) Hubs in the under researched context of CT, and foreground the competitive advantage SA has in the AI landscape. This research aims to *provide value to diverse stakeholders involved in the AI landscape in SA*, and *aid government in delivering on their PC4IR promises through establishing an AI hub in CT*. This research adds to the scarce body of literature on AI and (South) Africa, providing insights which could contribute to related research nationally and in developing countries. Moreover, the lack of contextual relevance of imported AI applications is foregrounded to demonstrate that global rapid AI development may hinder SA's development goals and threaten the rights of citizens if left unaddressed. Consulting diverse stakeholders provides a holistic view on the success and competitive advantage of an AI hub in SA, and facilitates recommendations for advancing the state of AI in SA based on stakeholder type. This research is a rallying call to SA AI stakeholders, not only to participate in the advancement of AI in providing more value to fellow citizens, but to celebrate and harness the unique national affordances of a landscape which demands innovation.

1.4 Research Questions and Objectives

The objective of this study is to understand the viability of establishing an AI hub in CT which nurtures contextually responsive AI solutions for competitive advantage, to create AI "developed in Africa by Africans for Africans" (Kiemde & Kora, 2020, p.4). With a view to addressing the critical gap in research and exploring the relationship of contextual factors to AI, the following questions guide the research:

RQ1: What are the critical success factors for sustaining an AI hub in CT?

RQ2: How could an AI hub in CT achieve competitive advantage in the global AI landscape? And in particular, what are SA's unique resources and capabilities in developing AI?

The research objectives align with the research questions, and are therefore detailed as follows:

RO1: Understand the critical success factors for sustaining an AI hub in CT.

RO2: Explore how an AI hub could achieve competitive advantage in the global AI landscape.

1.5 Organisation of the Dissertation

The dissertation is organised by chapters. Chapter 2 provides a literature review of scholarly publications, defining key terms, outlining the AI landscape in SA and CT, and highlighting the relationship of AI with context and competitive advantage. The literature review explores the success factors of hub organisations and argues the contextual and competitive advantages of an AI hub. Chapter 3 outlines and justifies the theoretical frameworks of the study based on the research questions. Chapter 4 details the research methodology and demonstrates the study's trustworthiness. Chapter 5 reports on the findings and analysis, *organised by the research questions and their relevant themes*. Chapter 6 discusses the research findings, *reorganising themes into the theoretical frameworks* to demonstrate the applicability of Porter's theories to the context of the study. Chapter 7 presents the proposed framework as a result of the deductive study, confirming the relevance and interdependence of concepts in Porter's theories while adding new dimension. Chapter 8 provides recommendations to interviewed stakeholder groups, grounding the study in practical suggestions. Chapter 9 concludes the study, and considers the implications, contributions and limitations, as well as suggestions for future research.

Chapter 2: Literature Review

This literature review aims to synthesise literature, identifying the relationships between published knowledge contributions while relating them to the insufficiently researched context of Africa and SA (Gwagwa et al., 2020). This review provides a holistic understanding of the key topics and their gaps to create a foundation for answering the research questions.

(AI OR Artificial Intelligence OR Technology) AND (Cape OR Africa OR South Africa) AND (Hub* OR Cluster OR Silicon) AND (Competitive Advantage OR Success Factors OR Advantage OR Context*)*

Figure 1 - Search string applied in literature review

Taking an iterative disposition, this review applied the search string (Figure 1) to databases of UCT's Primo and Google Scholar. The timeframe was restricted to seven years, including published material from 2018 to 2025. Papers outside of this timeframe were considered given their well-established theories or historical information. The inclusion criteria was defined by the search string as keywords, and availability to the researcher through institutional access. Although every effort was made to use peer-reviewed articles, and accredited journals, conferences, or reports, the poorly researched context of SA resulted in the use of other sources to bolster published knowledge. Moreover, to ensure the relevance of the literature review in the rapidly developing AI landscape, news articles and AI reports have been included. Given that this literature review is based on an earlier publication by the authors, papers in this structured review are also included (Althoff-Thomson & Van Belle, 2024).

2.1 Defining AI

Diverse definitions of AI can be attributed to arguments regarding what constitutes intelligence, the varied adaptations in industry, the lifecycle of AI, and historic conceptualisations (Chilunjika et al., 2022). UNESCO (2021, p. 17) defines AI as "machines capable of imitating certain functionalities of human intelligence, including such features as perception, learning, reasoning, problem solving, language interaction, and even producing creative work", underscoring system autonomy. Mikalef & Gupta (2021, p. 3) consider the impact of pre-programming, defining AI as "the ability of a system to identify, interpret, make inferences, and learn from data to achieve predetermined organisational and societal goals". This paper embraces a combination of definitions, defining AI as *machines capable of imitating certain functionalities of human intelligence in line with predetermined organisational and*

societal goals, including features such as identifying, learning, reasoning, and making inferences based on data.

2.2 Implications of AI

AI systems can be classified according to their ability to simulate human intelligence, labelled as weak, advanced, or autonomous (Verganti et al., 2020). Although AI is still in early stages, weak AI can already "create significant change when replicated at scale" (Verganti et al., 2020, p. 213). As these systems are scaled, advantages and issues will amplify, stressing the need to address AI proactively (Gwagwa et al., 2020).

Kiemde and Kora (2020, p. 1) highlight that "AI offers seemingly limitless opportunities for improving production and innovation in healthcare, agriculture, education, transportation, and governance" – the benefits for these sectors are extensively highlighted in their paper. AI removes limitations faced by organisations because of its scalability, people-centredness, scope, abductions, iterative nature, and continuous learning, perpetually optimising products, and lifecycles (Verganti et al., 2020). In considering the provision of services in public institutions, the reduction of excessive paperwork, automation of administrative tasks, and heightened transparency will significantly enhance efficiency (Chilunjika et al., 2022; Isagah & Musabila, 2020).

Strusani & Houngbonon (2019) stress the significance of AI in supporting emerging markets. Isagah & Musabila (2020) argue that Africa is the home of AI technologies, given the plethora of local issues that can be addressed through its implementation. AI can provide financial services, and more accurately forecast loan risks for the long-term growth of industries (Karabo & Mafu, 2021). AI can remove literacy barriers, reducing poverty through prosperity and democratising access to information (Strusani & Houngbonon, 2019). AI is particularly beneficial in addressing information asymmetries in contexts with limited data and gaining insights from unstructured data to create tailored solutions for the underserved (Strusani & Houngbonon, 2019).

However, the potential of AI to increase bias and inequality, spread misinformation, and reduce human agency and freedom is well cited (Chan, 2023; Gwagwa et al., 2020; Gwagwa et al., 2021). AI reproduces representation gaps and biases in the datasets it is trained on (Gwagwa

et al., 2020). The effects of these representation gaps are already evident in facial recognition, where systems have more effectively identified white male faces than black female ones, demonstrating intersectional issues (Gwagwa et al., 2021). This is owed to algorithms trained on datasets from the global North, which overwhelmingly represent one population group (Chan, 2023). Additionally, AI is predominantly English speaking and trained in this language (Chan, 2023). In SA, where there are 11 official languages, individuals are marginalised by AI deployments (Gwagwa et al., 2020).

The concern regarding the effect of automation on unemployment is rife, and particularly pronounced in SA, where AI implementation could worsen the staggering unemployment rate (Chilunjika et al., 2022). However, it is predicted that tasks will become automated, rather than entire jobs, and that this process will be gradual (Gwagwa et al., 2020). Moreover, Gwagwa et al. (2020) highlights how AI can create more jobs, and afford workers the assisted capabilities to move into a space between high-skill and low-paying jobs.

Africa suffers from a data deficiency, in which most data is not digitised or held by private companies exclusively (Kiemde & Kora, 2020). Moreover, 'data blindness' occurs where data is not collected from individuals who fall outside of a formal lens, excluding the informal work which makes up a significant proportion of the SA economy (Gwagwa et al., 2020). The data challenge is compounded by the limited data infrastructure and data knowledge in Africa. As highlighted by Gwagwa et al. (2021, p. 17), "African organisations do not have sufficient infrastructure, resources, and data-management protocols in place to operationalise the creation of adequate datasets".

2.3 South African AI Landscape

SA is ranked 68th out of 181 countries on the Global AI Readiness Index – nine places down compared to 2020 rankings (Rogerson et al., 2022). This demonstrates the accelerated pace of AI research and deployments globally, with USA and the global North topping the index alongside East Asia. These measures are based on government, the technology sector, data, and infrastructure as key AI enablers. However, these rankings must be considered critically, given that global reports are often based on national self-assessment which is prone to overestimation (Weissglass, 2022). Similarly, SA is 69th on the Global Innovation Index, and is ranked as the top innovation economy in sub-Saharan Africa, demonstrating its strong potential to lead AI advancements which cater to this region (World Intellectual Property

Organisation, 2024). Moreover, despite placing last in the Global AI Vibrancy ranking (Figure 2), SA is the only African country out of 36 countries included in this index, demonstrating the potential for leading the continent (Fattorini, et al., 2024).

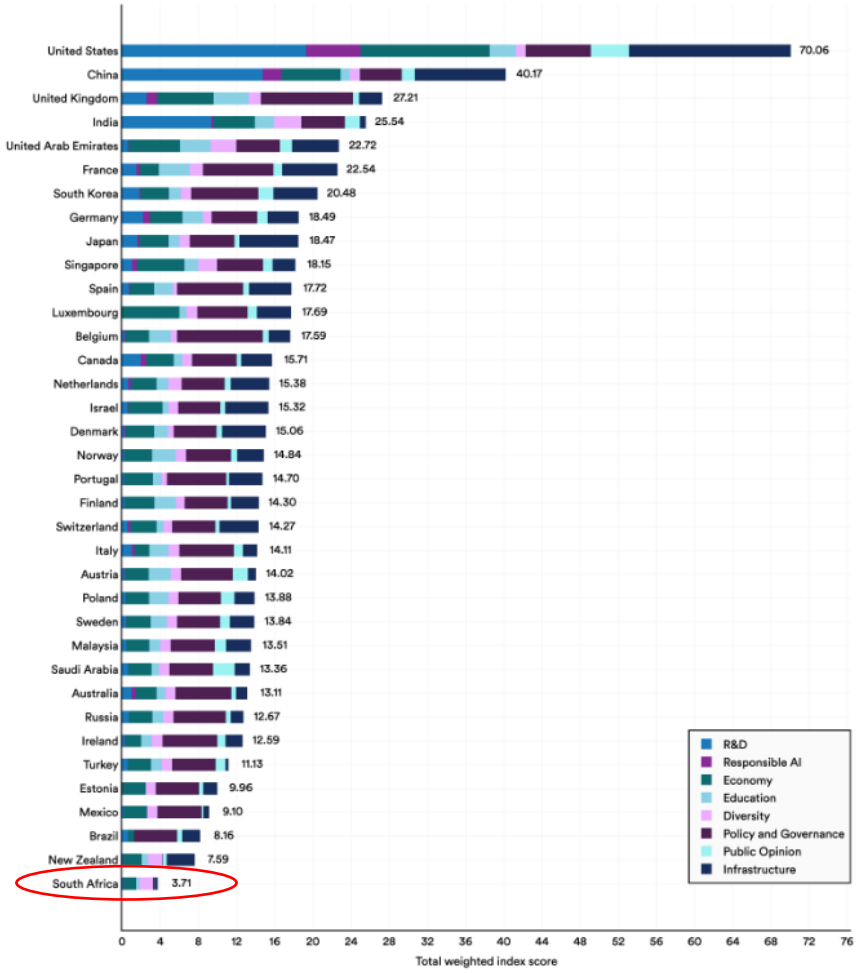

Figure 2 - Global AI Vibrancy Ranking, 2023 (Fattorini et al., 2024), emphasis added

Trends in the literature regarding AI and Africa treat the continent as homogenous, despite the vastly differing states of national technological advancement (Gwagwa et al., 2020). To use a critical example, data centres are foundational infrastructure for the development of AI – SA holds half of the 80 data centres in Africa (Kiemde & Kora, 2020). However, development of data centres has largely been driven by foreign investors, with implications for control over local markets and concern regarding the ownership of AI resources (Gwagwa et al., 2021). Additionally, Kiemde & Kora (2020) highlight how energy challenges in Africa prevent populations from accessing digital services, which slows AI emergence. In SA, the frequency of loadshedding amplifies this challenge, given that power outages affect industry and government operations alongside limiting consumers (Rogerson et al., 2022). Broadband

access is a continental challenge, as it limits market size and technology uptake, owed to high licensing fees and taxes (Kiemde & Kora, 2020; Gwagwa et al., 2021).

Many research centres in Africa are privately owned, such as IBM's research centre in Johannesburg, limiting their impact in the public sector (Okolo, 2020). However, SA's Centre for Artificial Intelligence Research exemplifies localised and interdisciplinary government efforts to develop AI expertise (Gwagwa et al., 2021). Through linking nine research groups across six universities, it advises on national AI policy and roadmaps. The University of Pretoria pilots the Intelligent Systems Group, which aims to create intelligent systems applicable to the SA context (Kiemde & Kora, 2020). The University of Witwatersrand has recently launched the Machine Intelligence and Neural Discovery (MIND) centre, with a focus on fundamental AI research tailored to Africa's unique challenges (MIND Institute, 2024). Nevertheless, the AI journal publications from the sub-Saharan region (Figure 3) demonstrate the inferior state of AI research in comparison to other regions (Zhang, et al., 2022). The same trend can be seen in AI conference publications, journal citations, and patents (Zhang, et al., 2022).

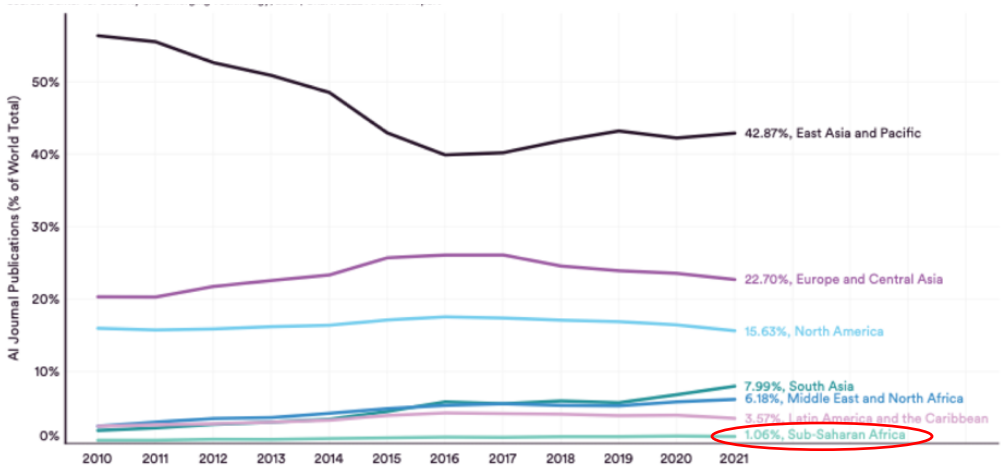

Figure 3 - AI Journal Publications (% of world total) by region, 2010-2021 (Zhang et al., 2022), emphasis added

The University of Pretoria is also involved in the national PAN (Gwagwa et al., 2021). In 2020, PAN published an AI and data series on interfaces with topical issues such as crime prevention and equity, demonstrating "the importance that the South African government places on establishing structures to expedite the development of policy that underpins the implementation and eventual scaling of AI in South Africa" (Gwagwa et al., 2021, p. 14). Additionally, the PC4IR (2020) foregrounds mandates to build AI expertise and policy capacity. Yet, these policy efforts are largely derived from high-resource countries, despite the leading example of Mauritius, which exemplifies African AI efforts in the establishment of a council and strategy

(Gwagwa et al., 2020). Moreover, these efforts do not compare with the action of other regions (Figure 4). Rogerson et al. (2022, p. 36) highlight that "any AI strategy or legislation [SA] puts forward has the potential to serve as model legislation for other countries with less internal capacity", demonstrating the importance of policy intervention.

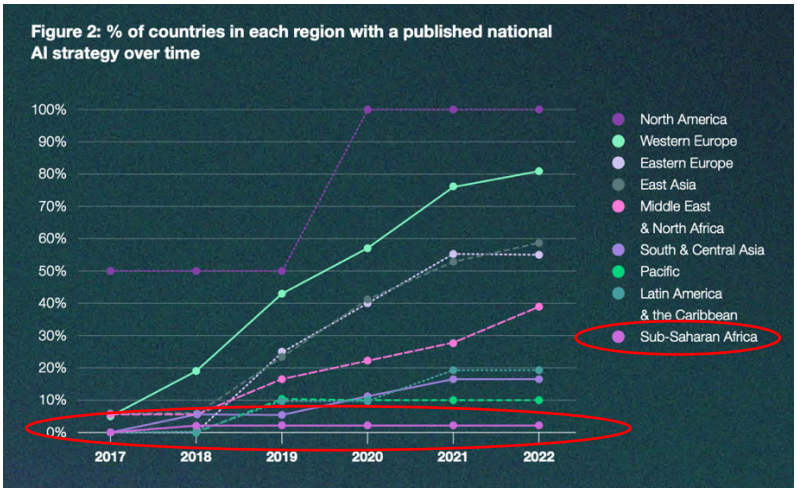

Figure 4 - Regions with National AI Strategy over 2017-22 period (Rogerson et al., 2022) [emphasis added]

Despite lack of specific legislation, existing laws in SA regulate AI development (Chan, 2023). The Protection of Personal Information Act (POPI) mandates minimum standards regarding accessing of information related to identity to protect the privacy of consumers (Western Cape Government, 2022). It ensures that AI development, by foreign or local companies, does not impede on the rights of individuals through unauthorised use of personal data to train models. The National Health Act and Medicines and Related Substances Act provide a foundation for addressing AI challenges related to healthcare, but are not comprehensive enough to prevent AI harm (Naidoo, 2024). Gwagwa et al. (2021) highlight that the approach to policy in SA has been cautious, favouring STEM development initiatives.

Pollio (2022) highlights that CT is often described as the Silicon Cape of Africa. The Silicon Cape Initiative (2018) exemplifies this status and aims to be an inclusive ecosystem for tech-enabled startups in CT. Pollio (2022) foregrounds that CT has a strong regional advantage due to the unwitting alignment of local developmental governance, large corporations, tech entrepreneurs and colonial legacies. Both Microsoft and Amazon chose CT as the first node for cloud computing on the continent, demonstrating the suitability of CT for AI development and innovation. Moreover, the CoCT has recently implemented a crowdsourcing data strategy to create wider access to quality data, complementing its existing Open Data Initiative (Diphoko, 2024). In comparison with other SA cities, CT is positioned to host an AI hub.

Although SA suffers from a 'brain-drain', in which the few skilled individuals work for foreign companies as they offer better opportunities, this issue is less pronounced in the CT landscape where foreigners are shown to be competing for work visas (Eisenburg & Associates, 2024; Weissglass, 2020).

SA was the first country in sub-Saharan Africa to foster competition in its mobile sector (World Bank Group, 2017). In 1994, MTN and Vodacom were introduced as private competitors, and transformed the mobile sector through service offerings which considered the developing context (World Bank Group, 2017). Today, the mobile broadband coverage in SA is the highest in sub-Saharan Africa, and significantly surpasses global averages. To use another example, SA is ranked as the most sophisticated banking sector in the sub-Saharan region and has been at the forefront of financial developments globally (Gwatidzo & Simbanegavi, 2024; World Bank Group, 2017). Driven by financial inclusion, the banking industry in SA has created innovative finance applications which cater to emerging markets. They introduced transactional accounts accessible to the country's underpriveleged and unbanked, and moved towards electronic payments for social grants (Gwatidzo & Simbanegavi, 2024). Moreover, the FinTech sector has made significant strides in offering solutions which overcome geography, identification, and cost barriers, creating accessible, affordable and user-friendly financial services on digital platforms (Anand, 2024). The innovation of these mobile and finance companies in catering towards the developing context of SA has allowed them to translate their business model to other developing countries. This demonstrates the success of SA innovations which emerge from local needs, strengthening the case for AI innovation in this landscape.

The BRICS partnership of emerging economies could result in adoption of SA business models across the globe. Moreover, the BRICS movement to 'dedollarise' these emerging nations could result in a decreased reliance on developed nations (Greene, 2023). In SA, a disproportionally high share of exports are invoiced in US dollars, and 90% of all current foreign exchange transactions have the dollar on one side (Greene, 2023). The trade alliance between BRICS emerging countries, and the potential for a shared currency, could result in the export of SA AI resources, models or techniques which more accurately cater to the developing context than global North products.

2.4 AI Contextual Awareness

AI is most often developed in high-resource countries, given the availability, quality and longitudinal nature of large datasets which justify investment (Price, 2019). Contextual bias is an "unaddressed kind of bias in the legal AI literature", emerging when algorithms are directly translated between contexts (Price, 2019, p. 67). Context refers to an awareness of interrelated situational conditions that can change at any time (Lawless et al., 2019).

Translational challenges with AI decision-making systems have been noted in population, resource, and morality differences, building on the intersectional bias present in datasets (Price, 2019; Van Berkel et al., 2022; Weissglass, 2020). Populations will have different ethnicities and socioeconomic conditions – when AI is trained on one type of population, it will not accurately provide recommendations for different populations, limiting generalisability and usefulness (Price, 2019). There is a risk of real harm in medical settings, where recommendations are made that do not consider consequential genetics (Price, 2019; Weissglass, 2020). Further, technology cannot be external to differences in moral standards across populations, as it is created in social settings with embedded goals and interests (Chan, 2023).

Moreover, "broad disparities in economic context require consideration be given to resource availability across contexts" (Weissglass, 2020, p. 203). The 'best' option in a high-resource setting will not necessarily be the 'best' option in a low-resource setting (Price, 2019). AI trained in high-resource environments may learn based on the availability of expert human capital, providing recommendations which requires these individuals (Price, 2019; Weissglass, 2022). Low-resource contexts may not have the necessary human capital. AI may also recommend more costly options based on the availability of resources it is trained on (Price, 2019). In the long term, these patterns could have anti-frugal effects which further entrench poverty in low-resource conditions (Price, 2019).

In considering contextual bias, Price (2019) admits caveats – the reliance on context may be overdetermined in specific cases where decisions are highly standardised. Nevertheless, Van Berkel et al. (2022) highlight the necessity of exploiting contextual information in AI decision-making processes to enable a human-centred perspective. Value-sensitive design (VSD) aims to create ethical models through upstream amendments and requires that developers explicitly determine the embedded social values (Chan, 2023). The curation of diverse and ethical

training datasets forms part of VSD and addresses issues of bias before AI is deployed (Chan, 2023). Price (2019) similarly foregrounds public investment in data infrastructure to create representative data. However, Price (2019) confesses that this solution will be costly and face difficulties in navigating regulations, suggesting that private entities could invest in exchange for access to collected data.

2.5 AI Competition and Advantage

The global AI competition is fierce, with an 'arms race' between China and the United States setting a rapid innovation pace (Stanford University, 2024). Porter (1985, p.60) posits that "technology affects competitive advantage if it has a significant role in determining relative cost position or differentiation", underscoring that adopting AI does not directly translate to increased productivity. Porter (1985) notes that maximising competitive advantage must purposefully engage either technological leadership or followership (Figure 5).

	Technological Leadership	**Technological Followership**
Cost Advantage	Pioneer the lowest-cost product design Be the first firm down the learning curve Create low-cost ways of performing value activities	Lower the cost of the product or value activities by learning from the leader's experience Avoid R&D costs through imitation
Differentiation	Pioneer a unique product that increases buyer value Innovate in other activities to increase buyer value	Adapt the product or delivery system more closely to buyer needs by learning from the leader's experience

Figure 5 - Technological Strategy and Competitive Advantage, adapted from Porter (1985, p.68)

Considering developing countries, national strategies to maximise technological competitive advantage are often deprioritised in the face of more pressing issues (Strusani & Houngbonon, 2019). Moreover, in a globalised world, leveraging AI is not only about national competitiveness, but global competitiveness (Christopher, 2021). Emerging technologies in SA are "mainly manufactured or developed abroad and supplied by multinationals" (Christopher, 2021, p. 160), demonstrating technological followership and significant dependence on foreign companies. The emphasis on strategically valuable resources in fostering competitive advantage by Christopher (2021) supports SA's position as an AI follower when considering the consequential shortages of national infrastructure, quality data and talent. Moreover, the large labour force traditionally exploited in the development ladder by emerging economies is not as advantageous in the age of AI (Strusani & Houngbonon, 2019). Nevertheless, SA has

historically been able to build competitive advantage through cost advantage and tailoring to the local context, learning from leaders' experiences (Christopher, 2021; Porter, 1985). A key example is the FinTech sector, where mobile money and low-cost financial services have capitalised on the low-income market through the wide penetration of cellphones and the ability to adapt products more closely to local buyer needs (Strusani & Houngbonon, 2019). This competitive advantage in technological followership proved effective in the translation of SA FinTech techniques and applications to other African countries.

Karabo & Mafu (2021) note that attempts to find new innovative ideas are central to fostering global competitiveness in AI, aligning with Porter's (1985) dimension of differentiation. Gwagwa et al. (2020) note that AI is being used innovatively in SA to address health, agriculture, public transportation and language translation. Christopher (2021) argues that the SA technology industry is both dynamic and competitive, with several competing firms emphasising low-cost and high-quality services. To use a key example, *Luno* (n.d.) is a cryptocurrency investment app founded in SA. Pivoting from the success of the digitalisation of finance and reshaping traditional financial services, Luno aimed to make investment more accessible, transparent and safe. Today, Luno is available in 40 countries, and is used by millions of customers worldwide. Alongside other success stories, the competitive advantage of Luno demonstrates technological leadership inspired and supported by the SA technology landscape. While historically competitive advantage in SA has been built through followership, the 4IR and constituent AI afford enhanced opportunities to pioneer and 'leapfrog', becoming technological leaders.

2.6 Hub Organisations

'Hub' organisations are proliferating across Africa and have been argued to drive economic growth (Littlewood & Kiyumbu, 2018). However, these hubs are widely defined despite the global infancy of research on hub organisations. Littlewood and Kiyumbu (2018) differentiate hubs from incubators or accelerators, defining their key functions as providing co-working spaces and digital resources, building collaborative communities, localising knowledge exchange and entrepreneurial culture, and congregating individuals to foster ideas. In discussing African technology hubs, Atiase, Kolade & Liedong (2020) foreground the importance of hubs in knowledge, job, and value creation, maintaining that incubators can be contained within hubs. Kolade et al. (2021) provide a broader scope of hubs, extending their

key functions to include advising on effective resource use, creating opportunities for new products and services, and aiding in outlining strategies which are appropriate for scaling.

However, Toivonen & Friederici (2015) provide the key features which characterise hubs within the parameters of this research – *building collaborative communities with entrepreneurial individuals at the centre, attracting diverse members with heterogeneous knowledge, facilitating collaboration in shared spaces, and localising global entrepreneurial culture*. Emulating Silicon Valley, hubs achieve these functions through providing spaces where "people with different ideas and varying levels of skills and expertise can collaborate to catalyse innovation and create new forms of knowledge" (Atiase, Kolade & Ledong, 2020, p.3). This type of hub can be defined as a 'cluster' hub – geographically proximate groups of companies, organisations, and institutions with common or complementary functions (Porter, 1998). In the African context, this hub is exemplified by the Silicon or Digital Savannah located in Nairobi.

When considering Africa, scholars suggest that the overarching value created by hubs is their ability to *contextualise* knowledge and technology creation, in ways that foreign products and services are less suited and accessible (Atiase, Kolade & Liedong, 2020; Kolade et al., 2021; Littlewood & Kiyumbu, 2018; Simuka & Chinakidzwa, 2022). Their proximity to industry and active engagement with the public sector allows hubs to *align their interventions with critical industry requirements and social needs*, creating pivotal social and economic value (Atiase, Kolade & Liedong, 2020). This alignment is particularly relevant when considering the need to straddle the unique boundary between formal and informal businesses in Africa, and the creativity required in leveraging unique resources and skills to drive *competitive advantage* (Atiase, Kolade & Liedong, 2020; Littlewood & Kiyumbu, 2018). For instance, addressing the needs of low-income consumers in Africa drives innovation with a focus on local resources from grassroots, possibly creating *less expensive and more sustainable solutions* than innovation counterparts (Atiase, Kolade & Liedong, 2020). Further, Kolade et al. (2021) highlight that the African market can take advantage of the developing state of technological and industrial growth that limits the reliance on outdated technology.

Similarly, the collaboration and entanglement of diverse stakeholders is foregrounded as essential to the success of hubs (Atiase, Kolade & Ledong, 2020; Crupi et al., 2020; Simuka & Chinakidzwa, 2022). Hubs are usually spearheaded by the public sector, who encourage the

involvement of external stakeholders (Atiase, Kolade & Liedong, 2020). Multi-actor perspectives aid in conceptualising holistic path complexity of new technologies through their understanding of diverse income generation models and market needs (Hervas-Oliver et al., 2020; Simuka & Chinakidzwa, 2022). Moreover, the involvement of diverse stakeholders in networking enhances social relations, creates partnerships, and bolsters transdisciplinary knowledge creation (Simuka & Chinakidzwa, 2022). This collaboration is crucial in Africa, where institutional voids require social capital as a response to the lack of market intermediaries (Atiase, Kolade & Liedong, 2020). Despite the hyper-connectivity which characterises the technological world, de Falco (2020) argues the importance of geography, asserting that physical proximity is key to effective research collaborations, and incentivises stakeholders to innovate through interpersonal contact and the exchange of tacit knowledge, alongside coordination and transportation costs.

Figure 6 - Main stakeholders of a typical hub, adapted from Zamiri et al. (2021)

Abrahams (2020) foregrounds the necessity of hubs having innovation specialisations to align their stakeholders and functions effectively. This creates a cognitive proximity of hub users (Littlewood & Kiyumbu, 2018). A hub specialising in AI could harness contextual capabilities, and aid in the creation of responsible African AI. Directly, this can be achieved through the piloting of data collection projects to create African datasets, addressing concerns regarding population representation, data access, and resource availability issues (Kiemde & Kora, 2020). Moreover, hubs could participate in enriching crowdsourced data collected by other stakeholders with contextual information (Van Berkel et al., 2022). Similarly to Weissglass (2020), Karabo & Mafu (2021) offer the solution of collecting data through social media using widespread mobile networks. However, Simuka & Chinakidzwa (2022) identify the challenge

of hubs using data effectively, given the poor knowledge about data use in SA (de Falco, 2022). Nevertheless, given that the creation of adequate datasets is foundational to the development of responsible and contextual AI, hubs could offer a starting point (Gwagwa et al., 2021).

2.6.1 Hub Success Factors

Hubs face challenges in their effectiveness and sustainability. Hubs are often funded by the public sector, and this dependence can be detrimental if governments deprioritise hubs (Abrahams, 2020). The difficulty of demonstrating hub impact makes generating funding unfeasible, and the intense competition for credit makes loans unlikely (Atiase, Kolade & Liedong, 2020). Moreover, charging members fees can be argued to defeat the purpose of hubs, as this would limit accessibility (Atiase, Kolade & Liedong, 2020). Additionally, hubs can face challenges in attracting enough critical mass to make entanglement effective, necessitating strategies to maximise involvement (Atiase, Kolade & Liedong, 2020; Littlewood & Kiyumbu, 2018). Dada & Van Belle (2023) comprehensively analysed literature on the success factors of innovation hubs, foregrounding the cruciality of leadership, entrepreneurship, and training (Figure 7).

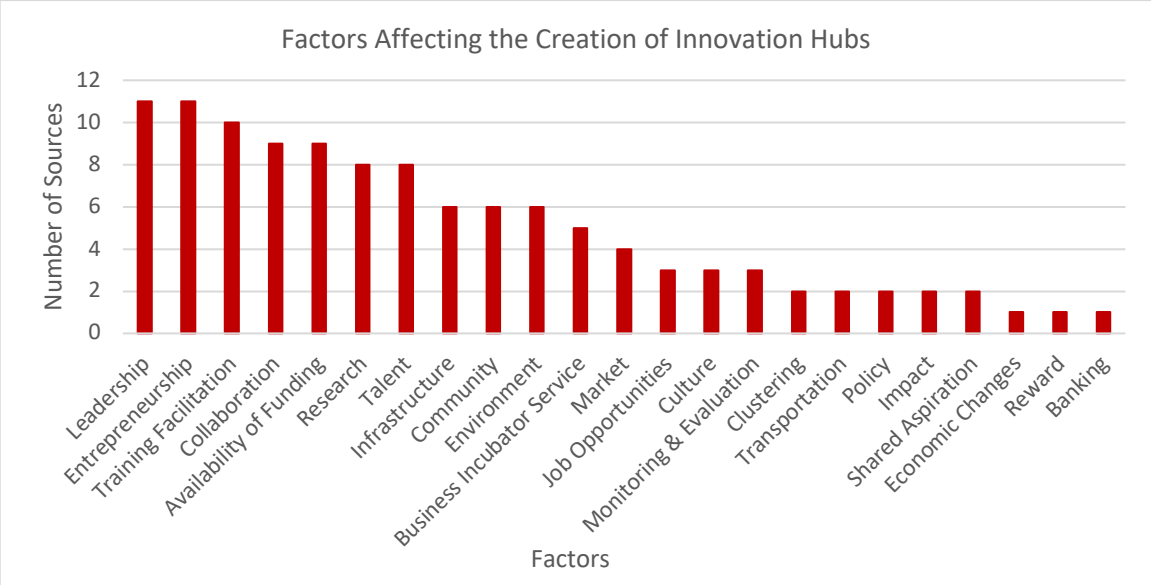

Figure 7 - Factors affecting the creation of innovation hubs, adapted from Dada & Van Belle (2023)

According to Kolade et al. (2021), hubs in Africa doubled from 2016-2019, but 110 hubs closed operations. Learning from the most successful example of a technology hub, de Falco (2022) highlights key success factors of Silicon Valley. He foregrounds the inimitable and mutually reinforcing relationship between smaller entrepreneurs and technology giants, and the pivotal university-industry collaboration (de Falco, 2022). Alongside cooperation, de Falco (2022) highlights the availability of services and infrastructures such as technological support, law

and insurance companies as key to success. The equity of investment capital is key to growth, and a culture of risk-taking and resilience to failure characterises entrepreneurial efforts (de Falco, 2022). Discouragingly, de Falco (2022) admits significant barriers in Africa – he foregrounds the need to connect even the most difficult and poor areas through technology to overcome geographic barriers, to optimise the flow of knowledge between national stakeholders, and to address the economic policies which remain because of neo-liberal incentive structures implemented post-Apartheid. Nevertheless, SA possesses the "dynamic and youthful population" required to create the dynamism and density of markets which characterises talent and entrepreneurial drive in Silicon Valley (de Falco, 2022, p. 680).

Moving from global North models of hubs, Ogonda (2020) analyses tech hubs in Kenya, citing differentiation, coopetition, and collaboration as positively affecting growth. Ogonda (2020) notes that coopetition and collaboration between firms and other hubs can create a competitive edge through stimulating the technology ecosystem and enhancing customer-centric solutions. Simuka & Chinakidzwa (2022) foreground starting with a low profile, developing diverse and balanced competencies, growing organically, maintaining a close relationship with the core organisation, and managing the stakeholder expectations. In interviewing Kenyan stakeholders from the Silicon Savannah, Haikin (2018) identified the need to promote Kenyan success stories, and for hubs to have a commercially sustainable business model to reduce reliance on external funding. Opposing business model formality, Abrahams (2020, p. 20) notes the key to African hub success is "their mutual entanglement in the processes of accessing resources, building value systems, and creating value, irrespective of how fractured and non-linear these processes may be".

2.6.2 Hubs as Contextual Solutions

Addressing contextual relevance in AI systems requires African people with the skillsets to solve problems (Isagah & Musabila, 2020). As highlighted by de Falco (2022), the majority of the African population are young, and can assimilate quickly. Hubs have been touted for their upskilling abilities, achieved through training workshops in development and coding, finance guidance, and core business skills (Abrahams, 2020; Atiase, Kolade & Liedong, 2020; Littlewood & Kiyumbu, 2018). This could widen the access of individuals to different jobs and develop local talent, addressing skilled labour voids (Atiase, Kolade & Liedong, 2020). Hubs additionally teach soft skills and foster trust between stakeholders, creating "communities with shared identity" (Atiase, Kolade & Liedong, 2020, p. 3; Littlewood & Kiyumbu, 2018). Hubs

could determine scarce skills required through interaction with firm stakeholders, advising universities on sought-after technical skills (Atiase, Kolade & Liedong, 2020).

Through hosting forums, these cross-sector partnerships could create the diversity required to address multi-faceted AI contextual challenges, considering limited resources, infrastructure availability and the regulatory landscape (Kolade et al., 2021). Atiase, Kolade & Liedong (2020) note that hubs create access to critical resources through angel investors, venture capital, and public funding, alongside facilitating bricolage to recombine existing resources in overcoming resource constraints.

Jimenez & Roberts (2019) note how innovation models from the global North are frequently uncritically applied in the global South. This unwittingly silences indigenous knowledge, despite the value of these stakeholder epistemologies in contributing to novel and diverse innovation. In this capacity, SA has an opportunity to co-opt existing AI models into the national context, alongside creating new capacities and knowledge which address local needs. Moreover, given that responsible AI guidelines emerge from cultural contexts, stakeholders could consider African principles like Ubuntu and Ujamma to tailor ethical considerations and further the agenda for African AI (Gwagwa et al., 2021).

2.6.3 Hubs Driving Competitive Advantage

Despite the pivotal value of collaboration for competitive advantage in SA, the interactions between actors and stakeholders within the innovation system are weak (Jegede & Ncube, 2021; Mathenjwa, 2023). Collaboration between diverse stakeholders would promote AI innovation and facilitate teaching, research, product development and commercialisation (Mathenjwa, 2023). Given that collaboration is an essential feature of hubs, an AI hub in CT could leverage a concerted collaboration between government, industry, academia and entrepreneurs, to "ensure AI solutions are locally viable to generate economic benefit" (Mathenjwa, 2023, p. 10). The AI hub could leverage national technological expertise and knowledge of local market conditions and customer preferences to build competitiveness through cost advantage and differentiation (Christopher, 2021). As highlighted by Futcher (2018), an outsourcing strategy can also become a competitive advantage. Moreover, an AI hub could foreground and enhance strategically valuable AI resource and capabilities, to bolster the bargaining position of SA when technologies are adopted from competitive leaders.

Considering global competitive advantage and technological leadership, an AI hub in CT could also differentiate AI developments from global North standards to pioneer innovative, sustainable, ethical and accessible African AI. As highlighted by the MIND Institute (2024, webpage), "without strategic investments and collaboration, Africa risks becoming a consumer rather than a creator in the global AI economy". Majorly through supporting and catalysing entrepreneurship, alongside centering competitive national resources and capabilities, an AI hub could stimulate local markets to position SA as an AI creator. Further, innovation success for entrepreneurs is highly dependent on the ability to accelerate product innovation and time to market (Letaba, Pretorius & Pretorius, 2018). Given the rapid pace of global AI innovation, an AI hub could facilitate 'leapfrogging' and innovation catching-up through identifying and taking advantage of temporary windows of opportunity created by technological transitions and shifting innovation landscapes (Letaba, Pretorius & Pretorius, 2018).

2.7 Literature Review Summary

This literature review synthesised and juxtaposed published knowledge contributions on the topics of AI and Hubs in the insufficiently researched context of SA and CT. The review began by defining AI, embracing a definition which moderates system autonomy with predetermined goals. The implications of AI were then discussed, contrasting the seemingly limitless benefits of AI implementation in emerging markets with the potential for increasing bias and inequality, marginalising AI users from the global South, and worsening unemployment. The SA AI landscape was outlined, demonstrating the positioning of SA as an AI player on global indexes and the recognition of CT as the 'Silicon Cape' of Africa with strong regional advantages. However, the inferior state of data infrastructure, energy, AI research centres, AI research publications, and AI regulation demonstrate clear national challenges. Nevertheless, the competitive advantage of catering to the developing context of SA was foregrounded, citing financial inclusion and the BRICS alliance. Research on AI contextual awareness demonstrated translational challenges with AI decision-making systems from the global North, noting resource, morality, and population differences. Research on AI competition and advantage foregrounded strategies of technological leadership or technological followership, making use of cost advantage and differentiation techniques. SA has traditionally been able to build competitive advantage through technological followership, but recent advancements in FinTech demonstrate the potential for technological leadership.

In this research, hubs are defined by clustered and collaborative communities with entrepreneurial individuals at the centre. They model their functions in accordance with essential regional needs and institutional voids for sustainable competitive advantage, providing pivotal value in their ability to contextualise knowledge and technology. Although typically spearheaded by the public sector, hubs require multi-partner collaboration to holistically address contextual challenges. Innovation specialisations make hubs stronger, demonstrating the potential of a hub focused on AI to directly redress contextual bias. Nevertheless, hubs in Africa frequently lose traction, foregrounding critical success factors of funding, critical mass, entrepreneurship, leadership, balanced competencies, and the pivotal university-industry collaboration. The potential of hubs to offer contextual solutions was explored through the ability to upskill local talent, facilitate forums to address multi-faceted challenges, create access to resources, co-opt existing AI models into local contexts, and foreground African responsible AI guidelines. The potential of hubs in driving competitive advantage was then discussed, demonstrating how a concerted collaboration between diverse stakeholders could leverage national technological expertise, knowledge of local market conditions and customer preferences to build competitiveness through cost advantage and differentiation. Moreover, an AI hub could support entrepreneurship and centre competitive national resources and capabilities to position SA as an AI creator, taking advantage of temporary windows of opportunities created by technological transitions.

Chapter 3: Theoretical Framework

The research questions foreground constructs of success factors and competitive advantage within the specific context of an AI hub in CT. In line with these constructs, *Porter's Diamond of National Advantage* (1990) and *Cluster Theory* (1998) were selected as the theoretical frameworks for the study. This chapter outlines the process of theory selection, describes the chosen theories, and highlights previous studies which have made use of the chosen theories.

3.1 Theory Selection

Given the novelty of the research topic, several theories and frameworks (Appendix A) that emerged during the literature review were critically considered. The study explores the critical success factors and competitive advantage of a CT AI hub, with a view to the unique resources and capabilities CT (and by extension, SA) has in the global landscape.

The Resource-Based View (RBV) focuses on how *individual* organisations can foster a sustainable competitive advantage through leveraging their unique, rare, inimitable, non-substitutable and strategically valuable resources and capabilities (Barney, 1991; Collis & Montgomery, 2008; Wernerfelt, 1984). However, RBV has a limited focus on external factors and competitive environments, making it unsuitable for the study which emphasises cross-stakeholder collaboration through exploring AI hubs. Moreover, there is limited emphasis in this theory on *national* competitive factors, making it unsuitable. Nevertheless, the qualities of strategically valuable resources and capabilities are useful to the study, and similarly demonstrated in the Diamond of National Advantage.

Soft Systems Methodology (SSM) was similarly considered, owed to its strengths in acknowledging problematical situations, complex stakeholder relationships, and the encompassing cultural context (Checkland & Poulter, 2007). However, SSM as a framework is most effective when modelling with real-world data – there is no existing AI hub in CT. Moreover, SSM does not provide analysis of competitive factors, or consider factors outside of stakeholder management, making it unsuitable.

The Technological Innovation Systems (TIS) Theory is used to identify the performance of specific innovation systems like AI, assessing shortcomings and providing policy suggestions (Hekkert et al., 2007). While widely used, the theory has been criticised for inward-orientation,

lack of contextual consideration and limited view of competitive factors, rendering it unsuitable.

3.2 Diamond of National Advantage and Cluster Theory

Porter's (1990) Diamond of National Advantage demonstrates the contributing factors which allow regions to outperform others within industries, focusing on four determinants*: factor conditions, demand conditions, firm strategy, rivalry and structure*, and *related and supporting industries* (Figure 8). These factors depend on and influence each other, and competitive advantage cannot be achieved through one factor. This framework is useful in identifying sources of national competitive advantage that "firms can leverage to enhance internationally competitive positions" (Smit, 2010, p. 123). Instead of focusing on short-term indicators, Porter's framework is a long-term approach focused on the productivity of regions or clusters. This framework will be used to understand the potential success of an AI hub in CT through providing guidance in developing questions and undertaking analysis, given its strengths in facilitating a multi-dimensional perspective, emphasis on contextual factors, prioritisation of geographical clustering and focus on competitive advantage. Many of the hub success factors identified in the literature review corroborate with determinants, demonstrating the suitability of this framework in guiding the study. Moreover, Christopher (2021) argues that Porter's theories are highly relevant to SA, as the ICT industry is dynamic and competitive, with several competing firms.

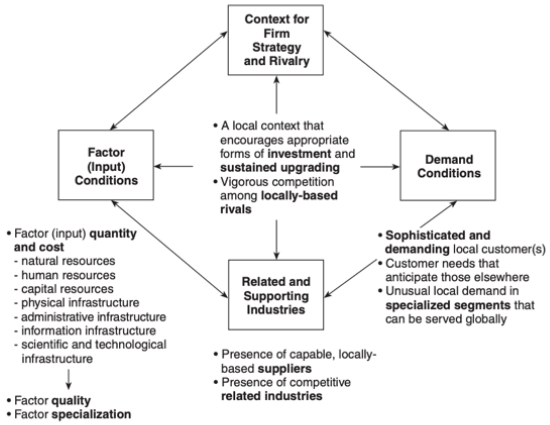

Figure 8 - Porter's (1990) Diamond of National Advantage

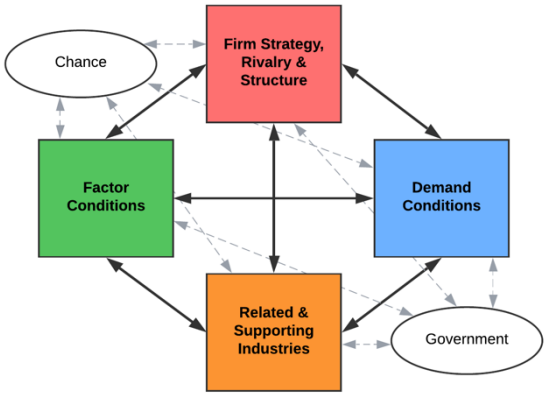

Figure 9 – Diamond of National Advantage, adapted from Porter (1990)

The constructs of the framework (Figure 9) were used as a foundation to understand the potential success factors of an AI hub, and to elucidate how CT could enhance its (inter)national competitiveness through an AI hub. Moreover, it demonstrated the relationships

and dependencies of these constructs. Porter (1990) foregrounds additional factors of government and chance, which do not create lasting competitive advantages but support and complement the system of national competitiveness (Smit, 2010). Table 1 outlines Porter's competitive factors, their definitions, and their applicability to the research questions.

Table 1 - Applicability of Porter's (1990) constructs

Competitive Factor	Porter's Definition	Applicability
Factor Conditions	The availability, cost, quality and specialisation of key production factors within a region: • Human resources • Physical resources • Knowledge resources • Capital resources • Infrastructure (information, physical, administrative) These categories can be further sub-divided: • Basic factors are inherited and require little new investment for production • Advanced factors created or upgraded through reinvestment and innovation to specialised factors, forming the basis of competitive advantage	The availability of key AI production factors within SA and CT: • Existing basic factors (i.e. data centers) • Advanced factors (i.e. public datasets)
Demand Conditions	The local demand for industry's product or service which forces home countries to continually innovate and upgrade. This demand can anticipate and lead international demand, create industry segments with a significant share of home demand, and cater to sophisticated and demanding buyers.	Local demand for AI products and services within SA and CT. Demand for AI products or services which are unusual and may create specialised segments that can be served globally.
Context for firm strategy, rivalry and structure	The conditions governing how companies are organised, created, managed and rivalled. These conditions are largely determined by national environments, and heavily influenced by government.	The interaction of stakeholders within the AI hub, and which government policies encourage or constrain that interaction.
Related and supporting industries	The presence of local suppliers, related industries and infrastructure, as well as their competition and collaboration. As the world becomes increasingly integrated, this results in intense specialisation and clustering of competitive advantages.	The presence of different types of AI stakeholders within CT and SA, and how they could mutually support each other within an AI hub to create intense specialisation and national competitive advantage.
Government	The role of the state in shaping the business environment, through policies, regulations and support mechanisms.	The role of the SA government, and PGWC, in supporting the AI business environment and AI hub.
Chance	The events that have an impact on competitive advantage and require adaptation.	SA or global events that have an impact on competitive advantage and require adaptation.

Porter (1998) extends on the Diamond of National Advantage to include clusters. Clusters are geographically proximate groups of companies, organisations, and institutions with common or complementary functions (Porter, 1998). *Cluster Theory* posits that when related organisations are clustered together, they benefit from enhanced competitiveness as a result of increased productivity and innovation, alongside stimulating new business ventures (Porter,

1998). As highlighted by Porter (1998, p.11), "the enduring competitive advantages in a global economy are often heavily local, arising from concentrations of specialised skills and knowledge, institutions, rivals, and sophisticated customers in a particular nation or region". Porter foregrounds that these clusters are a prominent feature of almost any advanced economy, but lack in developing countries, which limits national productivity growth (Smit, 2010). Consequently, exploring the actual and potential national competitiveness of AI in the developing context of CT through an AI hub offers both a critical evaluation of AI in CT and justifies the creation of an AI hub as a starting point to compete globally.

However, in an increasingly connected world, the physical proximity inherent in Cluster Theory has been challenged by affordances of digital platforms (Evers et al., 2010). The characteristics and benefits of successful cluster initiatives include knowledge spillovers, access to suppliers, customers and infrastructure, collaboration opportunities, increased productivity and capacity for innovation, specialisations and a concentration of skilled labour (Porter, 1998). Although Cluster Theory pertains most closely to *Related and Supporting Industries* in the Diamond of National Advantage, it highlights the manifestation of interactions between all factors. This research will make use of Cluster Theory to enhance understanding of Porter's Diamond Framework in relation to the success and competitive advantage of an AI hub in CT.

3.3 Studies using the Selected Theories

Porter's (1990) theories are well-regarded in information systems research, especially in relation to management strategy and competitiveness (e.g. Simuka & Chinakidzwa, 2022; Smit, 2010). In the existing literature, Porter's Diamond of National Advantage (1990) is most often used to analyse the competitiveness of a sector within a country, based on locational advantages, both in emerging and developed markets (e.g. Erboz, 2020; Kharub & Sharma, 2017). In this context, Chobanyan & Leigh (2006) analysed Armenia – they concluded that while the framework was a valuable starting-point for analysing emerging markets, it underestimated the role of government in fostering competitiveness. Mapuranga (1990) used the framework to analyse the international competitiveness of Zimbabwe, but concluded that the model did not consider the moderating effect of powerful international trade partners.

The diamond framework has also been employed to analyse the success of clusters and technology hubs (e.g. Calinescu, 2023; Wonglimpiyarat, 2005). Wonglimpiyarat (2005) used the concepts as a foundation for analysing the success of Silicon Valley, foregrounding

effective use of knowledge and funding resources, as well as a culture of willingness to accept risk – they did not extend on the framework. Nevertheless, the literature on (innovation) hubs primarily uses case studies as a framework, especially in the poorly researched African context (e.g. Abrahams, 2020; Littlewood & Kiyumbu, 2018). Moreover, the literature which does address Africa and hubs majorly focuses on their success factors, rather than considering how the hub could build competitive advantage for 'leapfrogging' and sustainability.

In contrast, Cluster Theory (Porter, 1998) is used across the literature on hubs, given that proximity is central to clusters like Silicon Valley (e.g. Doloreux & Frigon, 2022; Götz, 2021). Götz (2021) performed a study on the role of clusters in advancing Industry 4.0 in Germany, aligning with Porter's (1998) claims on the benefits and effectiveness of clusters. Calinescu (2023) analyses Sweden's AI and big data cluster using both Cluster Theory and the Diamond of National Advantage, considering how Sweden can enhance its competitiveness. They did not extend on these frameworks, but concluded that clusters demonstrate the diamond framework in action, highlighting their mutual dependencies.

3.4 Theoretical Framework Selection Summary

Considering the research questions, Porter's (1990) Diamond of National Advantage was selected based on the applicability to exploring national sources of competitive advantage in emerging markets, and the flexibility of the framework in analysing the success and productivity of clusters. Porter's (1998) Cluster Theory was selected based on the relevance to hubs in the literature, and the exemplification of the Diamond of National Advantage. While alternative frameworks such as RBV, SSM and TIS offer valuable insights into internal resources, stakeholder dynamics, and performance of innovation systems, their limitations in analysing industry-level competitive advantage and exploring contextual success factors made them unsuitable for the study. The selected frameworks collectively provide a comprehensive lens for exploring the critical success factors and competitive advantage of national AI hubs, especially within the interconnected and evolving landscape of technology innovation in CT.

Chapter 4: Research Methodology

The research methodology is the detailed plan of how research is conducted, for the purpose of identifying the processes taken to action the study, and to ensure the validity of the study. This chapter will detail and justify the methodological approaches and design choices.

Table 2 – Summary of research methodology

Research Concepts	Research Methodology
Philosophy	Interpretivism
Purpose	Exploratory
Approach	Deductive
Strategy	Qualitative
Time Horizon	Cross-sectional
Data Collection	Semi-structured interviews
Data Analysis	Thematic analysis
Unit of Analysis	AI-knowledgeable SA stakeholder

4.1 Epistemology

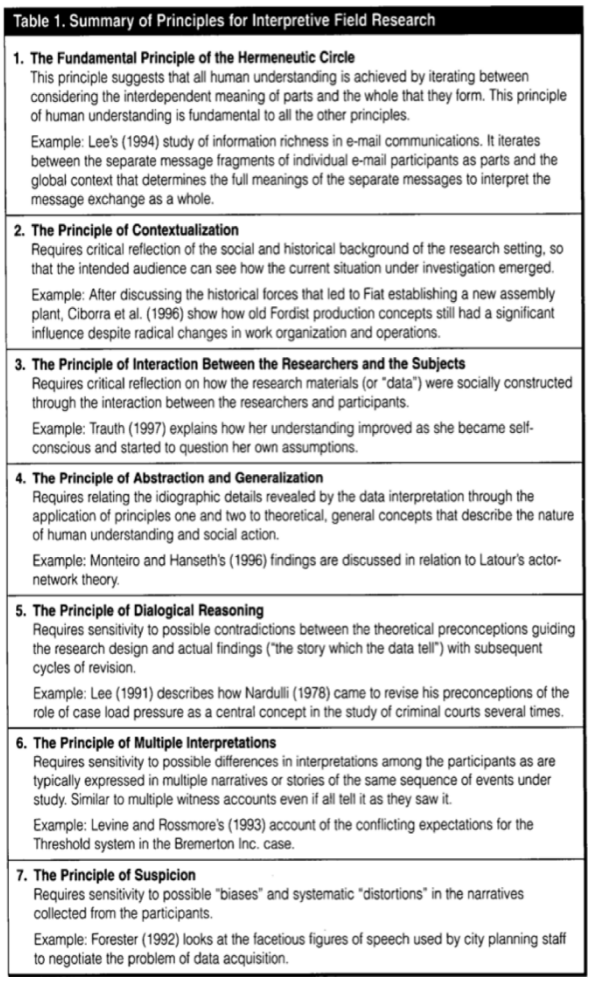

Table 1. Summary of Principles for Interpretive Field Research

1. **The Fundamental Principle of the Hermeneutic Circle**
   This principle suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.
   Example: Lee's (1994) study of information richness in e-mail communications. It iterates between the separate message fragments of individual e-mail participants as parts and the global context that determines the full meanings of the separate messages to interpret the message exchange as a whole.
2. **The Principle of Contextualization**
   Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.
   Example: After discussing the historical forces that led to Fiat establishing a new assembly plant, Ciborra et al. (1996) show how old Fordist production concepts still had a significant influence despite radical changes in work organization and operations.
3. **The Principle of Interaction Between the Researchers and the Subjects**
   Requires critical reflection on how the research materials (or "data") were socially constructed through the interaction between the researchers and participants.
   Example: Trauth (1997) explains how her understanding improved as she became self-conscious and started to question her own assumptions.
4. **The Principle of Abstraction and Generalization**
   Requires relating the idiographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action.
   Example: Monteiro and Hanseth's (1996) findings are discussed in relation to Latour's actor-network theory.
5. **The Principle of Dialogical Reasoning**
   Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings ("the story which the data tell") with subsequent cycles of revision.
   Example: Lee (1991) describes how Nardulli (1978) came to revise his preconceptions of the role of case load pressure as a central concept in the study of criminal courts several times.
6. **The Principle of Multiple Interpretations**
   Requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.
   Example: Levine and Rossmore's (1993) account of the conflicting expectations for the Threshold system in the Bremerton Inc. case.
7. **The Principle of Suspicion**
   Requires sensitivity to possible "biases" and systematic "distortions" in the narratives collected from the participants.
   Example: Forester (1992) looks at the facetious figures of speech used by city planning staff to negotiate the problem of data acquisition.

Figure 10 - Summary of principles for interpretive field research (Klein & Myers, 1999)

Interpretivism aims to understand context and how information systems influence or are influenced by this context (Klein & Myers, 1999). This approach assumes that knowledge is only gained through social interactions, highlighting the subjectivity implicit in knowledge creation (Klein & Myers, 1999). Klein & Myers (1999) outline principles for interpretive field research (Figure 10). This research used these principles for the conduct and reporting of the research, alongside post hoc evaluation. The principle of contextualisation was addressed through the elucidation of the social and historical background of SA in the literature review, which highlights how the dilemma of AI development has emerged (Klein & Myers, 1999). Particularly relevant is the principle of multiple interpretations, given that this research aims to interview multiple stakeholders regarding their perspectives on AI hub development and potential competitive advantage.

4.2 Purpose

The goal of this study is to explore the feasibility and viability of an AI hub, and how an AI hub could foster competitive advantage in CT and SA. Exploratory research is particularly useful in new areas of inquiry, to understand the extent of a problem and generate some initial ideas (Bhattacherjee, 2012). There is a significant lack of research on the critical success factors for AI-specialised hubs, especially in emerging contexts. Further, limited research has been conducted to explore the potential competitive advantages of AI in SA, making exploratory research suited to the study. Exploratory research aids in understanding the feasibility and viability of the issue being researched (Bhattacherjee, 2012). It answers *what, how* and *when* questions, and facilitates a foundation for future research through providing a starting point for an under-researched problem (Bhattacherjee, 2012).

4.3 Approach

Deductive reasoning can be defined as a "theory testing process which commences with an established theory or generalisation, and seeks to see if the theory applies to specific instances" through analysing empirical data against the theory (Hyde, 2000, p. 83). Although deductive reasoning is most commonly associated with quantitative research, it offers significant advantages in qualitative studies by strengthening the credibility of research findings. Findings which confirm the theory enhance confidence in the validity of theory concepts and relationships, while contradictory findings supplement the theory (Hyde, 2000). Deductive reasoning is particularly relevant to the interdisciplinary nature of information systems. Dominant theories are often borrowed from other disciplines that do not adequately consider the dual socio-technical nature of the field, warranting analysis of these frameworks in specific information systems and technology contexts (Díaz Andrade, 2023). Deductive reasoning is well-suited to this novel and ambitious study as it provides a grounding framework, distinctly scoping and anchoring the research. Moreover, like many theoretical frameworks, Porter's Diamond of National Advantage and Cluster Theory do not arise from the African or developing contexts, necessitating an analysis of validity against real-world data to supplement the diversity and applicability of these frameworks.

While abductive approaches were considered due to strengths in finding surprising elements of empirical data which cannot be fully explained by pre-existing knowledge, the rigour of this approach is better suited to the breadth of a PhD study (Díaz Andrade, 2023). While an inductive approach does generate new knowledge, the usefulness of this knowledge may be

limited due to the unique context. Through foregrounding theories, deductive reasoning provides a strong frame of reference upon which to build diverse knowledge.

4.4 Strategy

This research relied on the in-depth analysis of literature and interviewing of multiple stakeholders, making the strategy qualitative (Bhattacherjee, 2012). As succinctly stated by Kaplan & Maxwell (2005, p. 30), the goal of qualitative research is "understanding issues or particular situations by investigating the perspectives and behaviour of the people in these situations and the context in which they act". A qualitative research strategy is particularly helpful when exploring the influence of social, organisational and cultural contexts, making it suited to this study which focuses on context-specific phenomena (Kaplan & Maxwell, 2005). Moreover, it aids in understanding and improving processes as they develop and emerge, reflecting the goals of the study in addressing AI in SA before the technology becomes more widely disseminated (Kaplan & Maxwell, 2005). Although qualitative research does not produce a highly reliable, comprehensive set of conclusions, it allowed participants to raise issues which mattered most to them, which uncovered phenomena and dimensions the existent literature has not considered (Mashizha, 2014).

4.5 Timeframe

The cross-sectional timeframe collects all data at one point in time, making it suitable to this research which explores the *current* state of AI development and the present feasibility and competitive advantage of establishing an AI hub. Moreover, as a rapidly developing technology, longitudinal study could have created contradictions in sets of data regarding AI as it is continuously modified and new challenges emerge.

4.6 Data Collection

In qualitative study, rigorous data collection procedures are the main contributing factors to quality and trustworthiness (Kallio et al., 2016). With a view to this trustworthiness, the data collection procedures are outlined.

Instrument

Kaplan & Maxwell (2005, p. 32) foreground that qualitative research typically involves systematic and detailed study of individuals using interviews to elicit "detailed, in-depth accounts of the interviewee's experiences and perspectives on specific issues, situations, or events". In line with qualitative underpinnings, the research instrument for this study was an interview guide. As highlighted by Kallio et al. (2016, p. 2955), the quality of the interview

guide "fundamentally influences the results of the study" – consequently, careful attention was paid to its development. Due to its deductive nature, the questions in the interview guide were based on concepts from the guiding theoretical frameworks (Appendix B), with distinct questions for different stakeholder groups informed by the literature. Open-ended questions allowed the researcher to gain maximum data from the interviews (Turner, 2010). McNamara (2023) makes suggestions for effective interview questions which were implemented in the development of the interview guide: open-ended wording (participants should be able to choose their own terms when answering); neutral questions (avoiding evocative, judgemental wording); questions asked one at a time; clear wording with appropriate terms; and caution asking 'why' questions which may infer cause-effect relationships. Further, a pilot study for the interview instrument was conducted (Appendix C).

Sampling

Well-conducted sampling enhances the validity of a qualitative study (Robinson, 2014). The target population for this research is AI-knowledgeable SA stakeholders. While insights on CT were requested in the interviews, interviewing SA stakeholders was necessary to provide an adequate sampling frame. Moreover, insights from the context of SA were relevant to CT. The inclusion criteria were defined by stakeholder's involvement with SA organisations and knowledge of AI, respectively demonstrating *geographical* and *psychological* sample homogeneity (Robinson, 2014). The exclusion criteria were defined by an inability to converse in English, no knowledge of AI, or SA stakeholders who work for overseas companies. Suri (2011, p. 66) notes the importance of purposeful sampling, in which key individuals aid in identifying "information-rich cases". The author foregrounds snowball sampling, where key informants give details of other cases in the field (Suri, 2011). This type of sampling can commit expert bias but is "particularly useful for capitalising on expert wisdom", and identifying issues highly valued by different stakeholders (Suri, 2011, p. 69). Given the wide inclusion of stakeholders within hubs (Figure 6), this research began with purposively identifying an information-rich case in the broad stakeholder groups of *industry, academia, entrepreneur* and *government*, and employed snowball sampling to find additional research participants.

Research participants were identified through LinkedIn search features using the inclusion criteria as keywords, and with a view to a diverse sample of stakeholders by age, gender, race and industry. Potential participants were sent a private message with request for their participation and email address (for further information and letter of consent). Participants

recommended through snowball sampling were directly contacted via email. Participants who agreed to participate and signed the consent form were interviewed online on MS Teams. Over 60 potential participants were approached, resulting in a sample of 17 participants. Participants were evaluated based on stakeholder type, job titles, years of (AI) experience and their qualification, to ensure their suitability to the sampling frame (Table 3, listed in order of interview sequence). However, race and gender variables were redacted, as they can be assumed to have no a priori correlation to the research focus.

The semi-structured interview gathered textual information through responses to open-ended questions, which allowed the researcher to record personal comments and observations with a view to creating rich, thick data (Bhattacherjee, 2012). Moreover, it facilitated clarification and follow-up, ensuring participants viewpoints were accurately captured. The open-ended nature of questions allowed participants to contribute as much detailed information as they desired, creating the opportunity to fully express viewpoints (Turner, 2010). This was useful in maximally furthering knowledge where limited existing information is available. Nevertheless, this interview method has weaknesses in the analysis phase, given that open-ended questions result in varied responses which made the extraction of common themes more difficult (Turner, 2010). However, it is argued that this could reduce bias in the study (Turner, 2010).

Table 3 - Participant demographic information, listed in interview sequence

P #	Stakeholder Type	Job Title	Years of Experience	Years of AI Experience	Highest Qualification
1	Industry Entrepreneur	Mobile Developer	10-15	1	Honours in Mechanical Engineering
2	Industry	Head of Strategy	25-30	8	Masters in Information Systems and Business
3	Industry	Data Science Strategist	10-15	9	PhD in Ethics; MBA
4	Industry Entrepreneur	Global Manager & Lead AI Engineer	5-10	6	Masters in Computer Science and Financial Engineering
5	Industry Entrepreneur	Managing Director	25-30	6	TFX Certification
6	Industry	Business Operations Manager	10-15	5-10	(Incomplete) BSc in Computer Science
7	Academia Government	Research Group Leader	10-15	10-15	PhD in Computer Science
8	Industry	CEO	25-30	8	GIBS Business School
9	Academia Entrepreneur	Professor of Computer Science	20-25	17	PhD in Informatics
10	Academia Government	Security Researcher	15-20	1	PhD in Cyberterrorism
11	Industry	Head of Cloud Data & AI	25-30	20-30	BCom in Computer Science
12	Academia	Professor of Mathematical Ethics	25-30	10	PhD in Mathematical Logic
13	Industry Academia	Business Intelligence Manager & Data Engineering Lead	10-15	12	BCom in Information Systems
14	Entrepreneur	Computer Vision Engineer	1-5	1	BSc in Mechatronic Engineering
15	Industry	Market Development Consultant for Africa	25-30	5-10	PhD in Market Development
16	Industry Government	Performance Director	20-25	1	PhD Programme Evaluation
17	Academia Government	Senior Researcher	20-25	16	PhD in Geoinformatics

Data Saturation

Fusch & Ness (2015) recommend a sample size of 15-20 interviews for a qualitative study. However, as highlighted by Robinson (2014), sample size changes with evolving considerations of ease of recruitment and time. Alongside these considerations, the sample size was further determined by theoretical saturation in each stakeholder group, in which further data collection did not bring incremental benefit to data analysis (Strauss & Corbin, 1990). The number of interviewees were plotted on a graph against emergent sub-themes to determine when the theoretical saturation had been reached in the overall sample, with data collection taking place concurrently with data analysis (Figure 12). The data saturation graph demonstrates that interviews could have ceased after the tenth interview, but the second half of interviewees served to validate the findings.

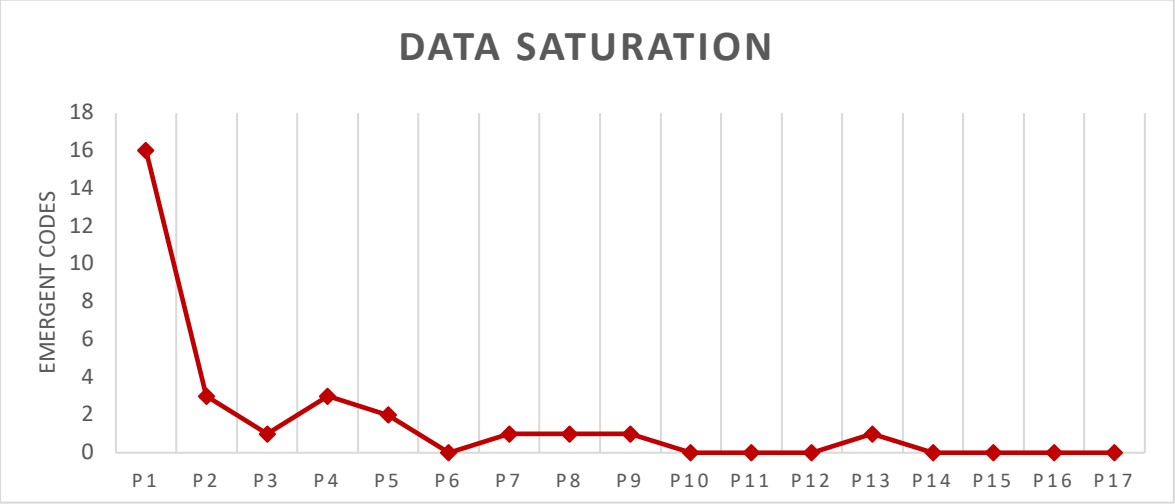

Figure 11 - Data saturation graph

4.7 Data Analysis

This research made use of thematic analysis because of strengths in "capturing the complexities of meaning within a textual data set" (Guest, MacQueen, & Namey, 2019, p. 9). Braun & Clarke's (2006) well-regarded approach to thematic analysis was used, as recommended by Scharp and Saunders (2019) for novice researchers. The six steps in Figure 13 were iterated to uncover common and unique themes in participant responses.

Phase	Description of the process
1. Familiarising yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking in the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells; generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Figure 12 - Phases of thematic analysis (Scharp & Saunders, 2019)

Immediately after interviews, the researcher created transcriptions using anonymous identifiers and incorporated notes taken, aided by transcription tools. Transcriptions were read twice after transcription, to create *familiarity with the data*.

To *generate initial codes,* transcripts were uploaded to NVivo 14 analysis software. Sub-themes (codes), were identified by re-reading interview transcripts and organising excerpts into groups relevant to the research questions.

Table 4 - Emergent sub-themes and descriptions

Sub-themes	**Description**
Funding	The availability of funding in the SA landscape, for the AI hub and for venture capital
Leadership	The leadership attributes required to make an AI hub in CT successful
Location	The wider factor conditions in CT which may influence the success of an AI hub
Vision	The potential specialisation of an AI hub in CT
Data	The availability of data and data capabilities in SA
Hub Functions	The functions suggested by participants for the AI hub
Demand	The demand and specialised need for tailored AI products in CT
Transferability	The ability to transfer competitive aspects of SA use cases to other contexts
Culture	The manner in which organisations interact, collaborate and compete with each other, alongside their shared value systems
Hub Collaboration	The incentive for diverse stakeholders to collaborate within an AI hub
Proximity	The need for the AI hub to be a physically proximate entity
Government Involvement	The influence of SA and local government in supporting or challenging the establishment of an AI hub
Rapid AI Change	The role of rapid AI change and development in influencing the AI ecosystem in SA

Searching for themes involved deductively identifying concepts in Porter's (1990) Diamond Framework (Table 5). Sub-themes were mapped to themes according to their alignment with Porter's (1990) definitions (Table 1).

Table 5 - Themes and constituent sub-themes

Themes	**Sub-themes**
Factor Conditions	Funding
	Leadership
	Location
	Vision
	Data
Demand Conditions	Hub Functions
	Demand
	Transferability
Firm Strategy, Structure & Rivalry	Culture
Related & Supporting Industries	Hub Collaboration
	Proximity
Government	Government Involvement
Chance	Rapid AI Change

Under *factor conditions,* funding, leadership, location, vision and data exemplified the key production factors for a successful AI hub in CT. While funding and location made up basic factors, as they already exist in the landscape, leadership, vision and data were identified as advanced factors which form the basis of competitive advantage for the hub. Under *demand*

conditions, hub functions and demand demonstrated the local demand for AI products in CT which require innovation, while transferability indicated how an AI hub could foster competitive advantage and lead international demand. Considering *firm strategy, structure and rivalry*, culture was the only identified sub-theme which signalled how stakeholders within the AI hub may collaborate or compete. Amongst participants, no government policies encouraging or constraining interactions between stakeholders were mentioned and therefore did not justify the creation of this additional sub-theme. The theme of *related and supporting industries* incorporated Cluster Theory in line with Porter's (1998) assertions. Hub collaboration indicated how stakeholders would collaborate within an AI hub, and proximity realised the physical and digital nature of this collaboration. Considering moderating factors, the role of *government* in supporting the AI business environment and AI hub was captured by government involvement. Further, *chance* events that have an impact on competitive advantage were exemplified by rapid AI change, given that this change is unpredictable in its advancement and shapes the competitive environment in CT. Once these themes had been identified, transcripts were revisited to confirm the alignment of codes, moving to the phase of *defining and naming themes* to generate a thematic map.

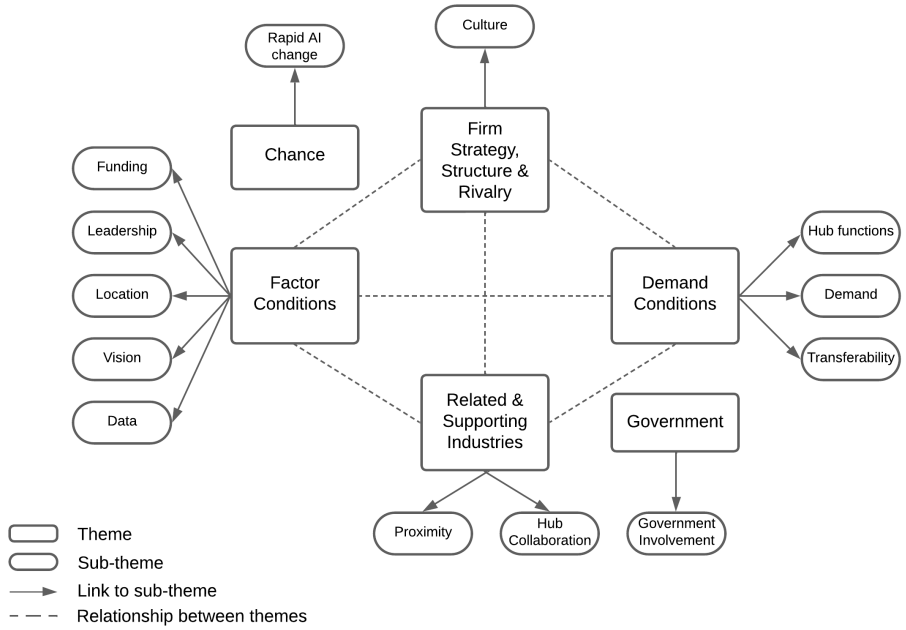

Figure 13 - Thematic map

4.8 Reliability, Validity and Trustworthiness

The value of qualitative research depends on reliability, validity, and trustworthiness (Golafshani, 2003). These concepts manifest differently in quantitative and qualitative

research, with the former relying on statistical tests, and the latter relying on concepts of credibility, dependability, transferability and conformability (Golafshani, 2003).

Credibility was enhanced through hour-long interviews to ensure viewpoints were fully expressed, and the validation of participant responses through performing seven more interviews (Figure 12) than required by data saturation (Nowell et al., 2017). Dependability was established through clearly documenting the research process, justifying decisions made with regard to the research design (Chapter 4), and pilot study (Appendix C) of the semi-structured interview (Nowell et al., 2017). An audit trail in the form of methodological choices (Table 2) and thematic analysis (Figure 13) was provided, to summarise decisions made by the researcher. Transferability in qualitative research relies on case-to-case transfer – in this study, the context is described in detail by the literature review, providing sufficient information to make comparisons with other contexts (Nowell et al., 2017). Moreover, thick descriptions and detailed quotes are used in analysis, to provide other researchers with a means to judge transferability of this research to their case (Nowell et al., 2017). Confirmability was enhanced through the use of direct quotations from several participants, selected based on their representation of the sample, to demonstrate the link between the concept and data (Elo et al., 2014). All interviews were transcribed verbatim and checked against recordings. Contrasting viewpoints in the data were highlighted, and debated against the scholarly literature and current news, mitigating subjectivity. Participants were selected with an emphasis on different stakeholder viewpoints while maintaining a representative sample of the AI-knowledgeable population, reducing the possibility of bias in interpretation. Further, the link between identified sub-themes and their relevance to themes was explained, to ensure transparency and interrogate potential bias.

4.9 Data Integrity

Every research project carries the risk of losing collected data, and compromising the confidentiality of participants. Data collection only proceeded once ethics approval had been granted by UCT's Commerce Ethics in Research Committee (EiRC) (ERA: COM/00380/2023, Appendix D). Participation was solely voluntary and contingent on informed consent. Participants are anonymous and given identifiers. The interviewer additionally asked for consent to record and transcribe the interview for review purposes during the interview. Once the consent to record had been obtained, the interviewer began recording and automatic transcription.

4.10 Ethics

Given the involvement of human participants, the development of this research has adhered to key UCT policies on research ethics (EiRC, 2020). The research design and research instrument were submitted to the EiRC for approval before data collection commenced. There were no recommended adjustments from the committee (Appendix D). Additionally, this research has considered the ethical guidelines outlined by Arifin (2018) for qualitative studies. In line with ethical principles of autonomy, participation in the study was entirely voluntary, and contingent on informed consent. Informed consent requires that participants are "adequately informed about the research, comprehend the information and have a power of freedom of choice to allow them to decide whether to participate or decline" (Arifin, 2018, p. 30). This was obtained through an informed consent form sent to potential participants prior to the interview, but could be withdrawn at any point throughout the interview (Appendix E). Participants were asked for consent to use their position, qualification, and work experience.

Strict adherence to anonymity and confidentiality was maintained – anonymous identifiers were used in transcriptions. During interviews, the researcher used earphones in a private space without access by outsiders (Arifin, 2018). All data was stored on a password-protected computer and only shared with the research supervisor through a password-protected OneDrive folder. All collected data will be stored for a maximum of five years. No emotional or otherwise burden was foreseen to be placed on participants. However, had participants experienced distress or intervening conditions during the interview, they were given the option to withdraw at any time (Arifin, 2018).

Further, the threat of pandemic prevention requirements to research was mitigated through the conducting of online interviews. No budget was required by the researcher, as UCT provides student access to NVivo and the Microsoft 360 suite.

Chapter 5: Findings and Analysis

This chapter presents the key findings from the collected qualitative data. In line with the deductive approach, Porter's Diamond Framework (1990) and Cluster Theory (1998) were used as foundations for analysis. The developing context of SA provided new dimension to constructs of the chosen theories, while confirming their relevance and interdependence. Additionally, new sub-themes emerged which contextualise these frameworks. This chapter *is organised by the two research questions,* discussing the emergent sub-themes. Considering the first research question, the chapter begins by discussing the critical success factors for sustaining an AI hub in CT highlighted by participants. To explore the second research question, the potential competitive advantage of an AI hub in CT is then discussed, emphasised by SA's unique resources and capabilities in the AI landscape. Following this chapter, the next two chapters will link these sub-themes to the themes of the study, connecting the research findings with Porter's Diamond Framework (1990) and Cluster Theory (1998).

5.1 Critical Success Factors for Sustaining an AI Hub in Cape Town

In discussing critical success factors, *almost all* participants saw the potential, and realistic likelihood of success, for an AI hub in CT. While one participant gave a dissenting view of the potential success, there is a clear need and desire to steer the rapid, global development of AI to serve the needs of SA citizens and to align with the promises of the PC4IR (2020). This chapter begins with the *major* critical success factors of vision, hub functions, collaboration, proximity, funding, leadership and location. Following this, the *moderating* factors of government involvement and rapid AI change are discussed.

5.1.1 Vision

The importance of vision for the AI hub was prominent in participants responses, with particular emphasis by industry stakeholders. Seven participants highlighted the need for a well-conceptualised and well-scoped vision, noting "*you don't just dive into something […] you need a clear vision and strategy"* [P4, Industry/Entrepreneur]. The importance of vision in an *AI* hub is amplified by the cross-disciplinary and broad applications of AI - "*Everything now has been washed AI […] every single problem in the world that we face can be solved with AI."* [P8, Industry]. However, as highlighted by P4 [Industry/Entrepreneur], *"you can't touch everything. If you're all over the place at the same time, you end up doing nothing"* [P4, Industry/Entrepreneur]. In line with suggestions by Abrahams (2020) to have an innovation

specialisation within a hub, the nature of AI necessitates focus on specific sectors or issues to provide manageable scope. This scope is essential to goal setting and assessment of hub progress.

> "*Regular assessment as well, where you make sure that you periodically evaluate the hub progress against a set of goals, because if you don't have a set of goals, you'll just go south*" [P4, Industry/Entrepreneur].

This vision emerged as key to external perceptions of the hub which may influence local and international confidence/participation. One participant spoke on their lack of confidence in existing hub organisations based on broad vision - "*I'd be sceptical if it achieves anything because it looks like its pulling in too many directions*" [P9, Academia]. Further, the vision of the AI hub would undoubtedly define the marketing and branding which would attract stakeholders and talent.

> *"For your hub to eventually hit the four corners of the globe, you need the proper marketing and branding because that will position your hub as a leading centre of excellence in AI and can attract talents and investment"* [P4, Industry/Entrepreneur].

In providing recommendations for the focus of an AI hub in CT, two major suggestions emerged which broadly align with the conventional wisdom highlighted by one participant in relation to Silicon Valley: *"Build it and they'll come. Or does it exist and they build it because they've got it already"* [P5, Entrepreneur]. In the latter case, and leveraging off the maturity and demand of the AI landscape in CT, participants majorly suggested focusing on the well-established, innovative finance sector [P4, Industry/Entrepreneur; P9, Academia; P10, Academia/Government; P12, Academia; P15, Industry].

> *"FinTech is an area where AI is moving quickly in Africa […] Looking at FinTech and understanding how would the AI make that space even bigger, so that CT becomes the leading FinTech space in the world"* (P4, Industry/Entrepreneur)

The FinTech sector has seen significant innovation, investment and growth in CT which rivals international competitors. When considering the facilitators of competitive advantage in Porter's Diamond Model (1990), the demand, factor conditions, and presence of related industries are well-supported by the finance industry as a focal point of the AI hub. The focus on existing innovative sectors was also exemplified by recommendations to centre the health

[P2, P10, P12] and agricultural sectors [P2, P6, P15, P17]. Nevertheless, this emphasis overwhelmingly serves industry stakeholders, which may create an imbalance in hub priorities across stakeholders.

Considering the former, other participants foregrounded a vision aligned with the needs of SA citizens. Mirroring suggestions by Simuka & Chinakidzwa (2022) for successful African hubs, the participant with a PhD in Programme Evaluation stated:

> *"You probably have to grow this incrementally. I can't see how one could go big from the start. It's almost like you need to say, you know, maybe there's two or three or four things that we want to focus on in terms of data and AI and how it can help the government or, you know, make this country better in general"* [P16, Industry/Government].

Building on this community orientation, two participants noted the importance of creating an AI hub vision from the 'bottom-up' through consulting diverse stakeholders in the local landscape. This recommendation aligns with the definition of hubs foregrounded by Atiase, Kolade & Liedong (2020).

> "*Basically building the hub capabilities based on real world problems and challenges […] The whole bottom-up sort of approach rather than let us create a hub and hope that it will land and kind of connect with different problems that exist in different sectors"* [P17, Academia/Government].

Moreover, one participant noted how the bottom-up approach may facilitate a vision underscored by passion, providing a more meaningful story through which to encourage collaboration: *"You can tell the difference when there's a community passionate about something or if it's just the generic platitude"* [P9, Academia]. The passion behind this vision could differentiate the AI hub from other AI hubs, attracting investment by cutting through the plethora of AI stories dominating global media.

5.1.2 Hub Functions

With a view to the 'bottom-up' vision recommended by Atiase, Kolade & Liedong (2020), participants were asked to provide examples of the support and functions an AI hub could offer to serve the needs of the SA AI ecosystem. Should the AI hub choose to specialise in an industry or AI technology, many of these functions can be translated. For example, a hub specialisation on the finance industry would necessitate stimulating AI business ventures related to finance. This would maintain the alignment of hub functions with critical industry

requirements and social needs, cited as key to hub success (Atiase, Kolade & Liedong, 2020). Participant's suggestions are broadly summarised in the table below.

Table 6 - Examples of AI hub functions in CT by participants

Examples of AI Hub Functions in CT	**Supporting Quote(s)**	**Participants**
Create access to data	*"Help lobby for more open access to data that government and other parties have"* [P2, Industry] *"To empower people with open source models and datasets, but also to ensure open source datasets cannot be manipulated for negative or terrorist based agendas"* [P6, Industry]	P17, P7, P12, P13, P14, P17
Educate and upskill citizens on AI development, benefits and harms, especially in relation to job security	*"Curating content […] Helping people to know where is the best place to start based on what they're trying to do, and what's the kind of learning path based on what role they are in and where they are trying to get to"* [P2, Industry] *"We can provide programming so we can look at like upskilling students with work experience"* [P13, Industry/Academia] *"I think for me when one brings something like an AI hub into South Africa, there needs to be a lot of discussion around what are the other alternatives for those people that might be out of what AI is taking over, what are those people going to do?"* [P15, Industry]	P1, P2, P10, P13, P17, P5, P6, P9, P15
Create access to talent	"*An AI hub can increase the number of jobs available, because there will always be constant hunger for talent, especially in the IT space*." [P1, Entrepreneur]	P1, P11, P13, P14, P5
Stimulate new AI business ventures and entrepreneurial efforts	*"Sort out the unpromising startups from the promising ones, and then invest in the right places"* [P12, Academia] *"[Entrepreneurs] need constant support in what they do […] there are people with great ideas. But how to really commercialise the idea and how to take them to another level"* [P15, Industry]	P12, P15, P4, P11, P13, P9
Provide an AI knowledge repository	*"Some sort of repository where we contain all of the AI knowledge specific to South Africa"* [P14, Entrepreneur]	P14, P17
Assess contextual and ethical impacts of AI applications	"*We need to distinguish between what is generally applicable anyway and what is particular to the South African context*" [P3, Industry] *"It's very important for you to do a thorough initial investigation before deploying, what could go wrong"* [P1, Industry/Entrepreneur]	P1, P3, P6, P13, P17, P7
Crowdsource solutions to problems and use cases	"*Let's say the public health sector's got a particular problem like uh, that they want to explore and see how AI can play a role in that. They can pose that and crowdsource solutions to that problem."* [P2, Industry]	P2, P17, P13, P4, P7
Inform AI and AI-related regulation	*"The moment you have a hub and the moment you have international entity coming in, it will drive the development of policies and regulatory frameworks to promote that ethical AI development and usage while safeguarding against like the misuse"* [P4, Industry/Entrepreneur]	P10, P12, P4, P2, P7, P8

5.1.2 Collaboration

In line with the literature, the collaboration of stakeholders was foregrounded as essential to the success of the AI hub by all participants. This collaboration is underscored by the need for a critical mass of stakeholder involvement in the AI hub.

> *"You have to have enough people there that the weight can be somewhat distributed […] One person by themselves will get burnout […] If you've got a handful of people that can work together, that have a similar mindset, pushing in the same kind of direction, that's when you can grow things."* [P9, Academia]

The emphasis on shared mindset and direction amongst stakeholders was mentioned by another participant, who noted that *"stakeholder collaboration will unify the vision"* [P4, Industry/Entrepreneur]. Speaking on the necessity of collaboration for AI in CT, one participant highlighted that *"there's a shortage of skills, and so we've ended up collaborating with other companies on some projects"* [P2, Industry]. This demonstrates the essential role of collaboration and critical mass in resource-constrained and developing environments, where institutional voids can be overcome through social capital (Atiase, Kolade & Ledong, 2020).

Moreover, in the face of rapidly developing AI and global competition, *"collaboration determines your time of execution […] you really need to understand collaboration, otherwise you'll be left behind"* [P4, Industry/Entrepreneur]. In line with Cluster Theory, collaboration was predicted to enhance the productivity of the AI hub.

> *"It's about working together, learning from each other, collaborating, trying to advance the technology […] It adds to the diversity, the capability, the whole ability to build and complete the project."* [P10, Academia/Government]

Mirroring findings by Simuka & Chinakidzwa (2022), diverse stakeholders were highlighted as essential to an AI hub as *"there are a lot of users and use cases for AI, so it's really important to be inclusive and involve a lot of people"* [P7, Academia/Government]. All participants mentioned the importance of academic, government, industry and entrepreneurial stakeholders being part of the hub, to provide diverse perspectives and mitigate the risk of harmful AI deployment. Two participants highlighted the need for citizens as stakeholders, noting that they were the *"last bastion against harm"* [P12, Academia], would ultimately determine the adoption and use of AI technologies, and were essential to critical mass. Extending the scope of diversity, two participants from academia foregrounded the need to have other African countries represented to strengthen the collaborative knowledge.

> *"Particularly in the African context, networking is critical […] things are happening in parallel all over the continent. If you tapped into these things, you get an idea of what is working, what isn't working […] it helps to be able to support each other and troubleshoot as you go along."* [P9, Academia/Entrepreneur]

Collaboration of diverse African countries with the CT AI hub was viewed by both participants as essential to competitiveness.

> *"What we need to do is start working together on the continent. In isolation, what country will be able to compete with the global North on this continent? It's not possible."* [P12, Academia]

Two participants saw global North stakeholders as essential to collaboration, to *"stay abreast of international development and opportunities within that sphere"* [P4, Industry/ Entrepreneur], to enhance knowledge transfer, and to attract investment.

The balance of these diverse stakeholders within the AI hub is crucial to encouraging and maintaining collaboration. One industry participant spoke extensively on the impact of this balance on their desire to participate.

> *"I sometimes worry that it's too start-up based […] Which is not necessarily something we will be part of because we are established in the business […] The other fear I have is that it just becomes another AI conference for academics […] One has to make sure that you have the proper representation, and not overpowering representation of one sector or academy or the industry or the start-ups"* [P3, Industry].

Two participants noted that a balance and critical mass of stakeholders was not sufficient in encouraging collaboration, saying *"you can tell me to collaborate and I just won't"* [P7, Academia/Government] and *"the main challenge is going to be OK, let us design how these different role players are going to interact with each other"* [P10, Academia/Government].

With a view to effective and balanced collaboration, participants were asked to provide recommendations on maximising involvement in the AI hub based on their stakeholder type. Considering *industry* stakeholders, three participants suggested hosting events which provided proximity to talent, such as hackathons or career fairs/conference days, noting that *"with industry you always have to kind of offer them something in return"* [P12, Academia]. Three participants recommended hosting forums or events where industry can discuss AI challenges

and opportunities across sectors, especially in relation to ethical use of AI and cybersecurity – *"Those are really difficult topics. They're no easy answers to them and there's an industry benefit"* [P2, Industry]. However, two participants discussed the hesitancy of industry to participate based on competition.

> *"If I send my people to the hub to be involved in projects, are they not at risk of being poached by this other company that sees them as really good AI resources? Or if we come up with an idea, and we'd like to use it in our projects, and now we've just given it to the collaborative group?"* [P11, Industry]

Another participant extended this hesitancy to government and academic stakeholders, noting that willingness to share information and data *"would probably be the biggest issue"* [P14, Academia/Government]. Nevertheless, the chance to discuss opportunities, problems, and best practices superseded concerns over risking IP in the competitive landscape.

> *"I don't think industry will want to share proprietary information. So in terms of like what type of bots they will be working with or what type of AI they will be building etcetera. But in terms of things like best practice of training on data, or data segregation, which is widely available information already."* [P6, Industry]

This demonstrates the need for the AI hub to design forums and speaking events within a *"safe space"* [P11, Industry], considering which information and resources stakeholders would be willing to share and mitigating opportunities for talent poaching. Moreover, the AI hub must emphasise *"co-opetition, not competition only"* [P3, Industry].

Considering *entrepreneurs,* four participants discussed the importance of networking *"to grow your connections and potential work"* [P6, Industry], both in terms of relationships with big industry and collaborating with other entrepreneurs. To attract entrepreneurs, the AI hub should *"bring you the ability to bring your idea to life*" [P4, Industry/Entrepreneur], providing meeting spaces, technical resources, regulatory advice, and *"constant support"* [P15, Industry] in operationalising businesses. Two participants highlighted the availability of a critical mass of entrepreneurs in CT – *"There are people with great ideas. But how to really commercialise the idea and how to take them to another level"* [P15, Industry]. Given that entrepreneurs are central to the success of existing hubs (Toivonen & Friederici, 2015), and arguably have the most to gain from an AI hub, encouraging their collaboration is essential. Moreover, *"people love seeing impact"* [P2, Industry]. In line with suggestions by Haikin (2018) for hubs in the

African context, these entrepreneurs will likely provide the success stories which draw funding and interest in collaboration.

Considering *academia*, two academic participants noted that researchers had a responsibility to contribute to an AI hub – *"I think from an ethical perspective all researchers should contribute to that and create that environment. It's not the sole responsibility of government to create these sorts of things"* [P17, Academia/Government]. Given that academics operate between the public and private sector, and their significant contributions to the public welfare, participants suggested that they may be predisposed to collaborating in an AI hub. One participant suggested *"funding for conferences"* [P7, Academia/Government] as a drawcard, while another noted that the innovation and research within an AI hub would mean *"universities will want to be a part of it"* [P4, Industry/Entrepreneurs]. While academic participation in the hub was mostly viewed as inevitable, the success of Silicon Valley has often been attributed to the pivotal university-industry collaboration, notably in the generation of innovative ideas and proximity to highly educated graduates (de Falco, 2022). Strategies to maximise the involvement of academic stakeholders are necessary to balancing the *"exploitation-exploration"* [P9, Academia/Entrepreneur] trade-off within the AI hub.

Given that *citizens* will ultimately determine the adoption of SA AI products, their collaboration and contribution to an AI hub is essential. There is a distinct need to address the fear over AI worsening the crippling unemployment rate to ensure AI demand is not hindered by conflations of its potential. In line with Chilunjika et al. (2022), eight participants discussed the potential for AI to exacerbate the unemployment problem. In developing ethical guidelines emergent from local contexts, one industry participant highlighted that *"we also need to find ways of incorporating AI and the human side […] If you look at unemployment, if you really fast track AI in everything that we do, we are going to leave a lot of people behind"* [P15, Industry]. However, participants had contrasting views on whether AI would replace the low-skilled labour in SA. While one participant agreed with Chilunjika et al. (2020) that white collar jobs are at risk [P14], another participant [P4] foregrounded the fear of blue collar workers.

> "*Because remember, the majority of South Africans are working in manual labour, and that's something that AI is currently tied into. So even if AI is 100% brought into South Africa, only a few white-collar jobs are taken away*."
> [P14, Entrepreneur]

> *"If AI comes and start operating in areas such as customer support […] That part of the population is eventually cut off. Unlike AI coming into a position that require a top degree […] His job might not necessarily be replaced, but he might eventually convert his position to something else in the company where he can be more useful, right?"* [P4, Industry/Entrepreneur]

An industry participant took a broader perspective of the unemployment problem, noting that the decision not to use AI also carries risk.

> *"There's this fear that if we modernise economies that we exacerbate the employment problem. But if we retain the current employment models that we have, I firmly believe that we're unable to retain the employment numbers that we've got. So either way, there's risk."* [P8, Industry]

Regardless, another participant stressed that the fears of job loss are particularly pronounced in SA, where 'black tax' means workers have *"a huge responsibility, so the thinking is very different. It's not about taking risks"* [P5, Entrepreneur]. Given that citizens are crucial stakeholders in adopting a new technology, they may *"pushback if you now suddenly have these robotics replacing certain jobs and sectors"* [P10, Industry/Academia]. An AI hub in CT is well-positioned to pioneer responsible AI standards through considering the relationship between AI and job security, educating citizens on how to upskill themselves. Given that the challenge of unemployment is pertinent around the globe, an AI hub in CT could provide a foundation for competitive advantage through defining how labour forces, especially in developing contexts, will be shaped by this technological revolution. One participant foregrounded that addressing unemployment was essential for an AI hub in CT – *"There needs to be a lot of discussion around what are the other alternatives for those people that might be out of what AI is taking over, what are those people going to do?"* [P15, Industry]. This could mobilise the South African workforce to embrace AI, increasing efficiencies and productivity. As highlighted by an industry participant, "*every time we create a job enabled by technology, we create approximately four jobs […] Our focus shouldn't be necessarily protecting heavy labour jobs in the short term. Our focus should be on how can we transition to an economy that enables new technology jobs.*" [P8, Industry].

5.1.3 Proximity

Given the tension pointed out by Evers et al. (2010) regarding Porter's (1998) Cluster Theory and the affordances of new digital platforms, participants were asked whether they considered

proximity a critical success factor of an AI hub. Six participants foregrounded a hybrid approach, citing the enhanced opportunities for connection, focus, learning, and collaboration.

> *"What normally happens is that companies feed from each other. Talent moves from one company to another, and knowledge sharing will take place. Universities can easily get students to do internships in that area which is not far away, and in turn, it attracts more talent to that area. People don't have to travel far to do meetings. As much as we are in a digital age, we still get a lot of like physical interactions. It is important for them to be close to each other. But what remote working has shown us is that like most things are possible online. I think some sort of hybrid approach would be best."* [P1, Industry/Entrepreneur]

This quote demonstrates the importance of physical proximity for all stakeholders to facilitate knowledge spillovers and a concentration of skilled labour, as well as increased capacity for collaboration and innovation, aligning with Porter's (1990) predicted benefits. Nevertheless, two participants pointed to the convenience of an online model, arguing that *"there's no reason why with a technological advance like an AI hub, you would need a physical space"* [P16, Industry/Government]. With the availability of on-demand infrastructure online, another participant highlighted that *"it doesn't matter where you are […] as long as you can have access to infrastructure that allows you to do the tasks that you need to do, I don't think locality or even physical extent plays a role"* [P17, Academia/Government]. Although the online model facilitates a bigger network of people, and by proxy may create more frequent and diverse collaboration, connections made in-person were suggested to create stronger relationships. However, an online model would allow a wider network of national and international people to take part in the AI hub.

> *"I think with virtual environments, you can meet more people in a short period of time. While in the physical space, you can go deeper in terms of the relationship. I definitely remember my experience with someone in physical more than online and its more beneficial."* [P3, Industry]

In arguing for a physical presence, one participant noted that *"online works best only when we've already established things"* [P4, Industry/Entrepreneur]. For an innovative and novel endeavour such as establishing an AI hub, a physical location is *"a good way to boost the presence of the organisation"* [P10, Industry/Academia]. Foregrounding local conditions, one participant stressed that *"we do not necessarily have the infrastructure to do everything […] in this virtual world, we need physical buildings"* [P15, Industry]. They noted that any efforts

to bring citizens from rural or informal settlements to the hub would require a physical building with access to the internet. For entrepreneurs, the physical space would also widen access to crucial resources for AI-related innovation.

While physical proximity is essential to maximising cluster benefits and catering to the resource-constrained context, an online component can widen the access to hub participants and maintain connections, enhancing collaboration and productivity. Moreover, for a technological advance such as an AI hub, an online platform is necessary for information sharing, and to further bolster its presence – to suit the SA population, this online platform would have to have a responsive design, available on mobile and desktop.

5.1.4 Funding

In line with the literature, seven participants noted the necessity of funding for hub success and sustainability – *"you need to have money"* [P10, Academia/Government]. De Falco (2022) notes that funding is critical to support the hub functions and to provide entrepreneurs with capital. These functions were reflected by participants, who noted the need to pay for AI hub personnel and to provide start-up capital. However, this funding was cited as unlikely to come from the public sector, contrasting Abrahams (2020).

> *"Commitment is a short-term issue in government […] Yes, you've got your three-year framework of a budget, but you're actually just working from year to year. So within a government context, that's why I'm saying the funding won't happen."* [P16, Industry/Government]

The sustainability of hub funding is crucial to the ability to support start-ups, based on de Falco's (2022) conceptualisation – "*You need some form of investment for the first five years to keep a start-up afloat, you know, to have some possibilities"* [P12, Academia]. However, one participant argued *"you need less capital to start an AI business in South Africa than you probably would in most places […] the barriers to entry are much lower"* [P11, Industry], demonstrating the wider reach of investment and the enhanced potential of an AI hub to stimulate the AI start-up ecosystem in CT.

Participants expressed differing views on the likelihood of external funding. Three participants foregrounded the difficulty of the investment landscape in CT and Africa more broadly. Speaking on their experience of pitching to overseas investors, one participant noted *"it's a super conservative investment culture"* [P9, Academia]. This opposes the risk-taking culture

that characterises Silicon Valley (de Falco, 2022). Contrastingly, two participants did not perceive investment as a challenge, owed to the AI 'boom' and eagerness to invest in Africa – *"There is a lot of investment and people are ready to throw money at Africa for anything related to AI"* [P12, Academia]. Nevertheless, this may have been due to their positioning in academia, where funding for AI research has seen a significant increase and is less risk-based.

5.1.5 Leadership

Five participants pointed to leadership as central to the success of an AI hub, commenting *"it all comes back to who's leading it"* [P16, Industry/Government] and *"good leadership is absolutely critical"* [P9, Academia]. This leadership would play a central role in managing the vision, encouraging stakeholder collaboration, and fostering accountability within the AI hub.

In considering the characteristics of leadership for an AI hub, one participant emphasised the need for a championing leader with *"the right kind of inspiration"* and "*skin in the game*" [P9, Academia], whose passion for the vision of the AI hub was genuine and who was *"well-connected"* [P16, Industry/Government]. Extending on this characteristic, another participant foregrounded the need for *"a leadership mindset that is open to exploring, to doing things differently, that is critical"* [P8, Industry]. The rapid development of AI and the accelerated rate of change necessitates responsive leadership that critically considers the 'bigger picture' of AI deployments. Additionally, encouraging stakeholder collaboration requires an understanding of different disciplinary AI 'languages', demonstrating the need for a multidisciplinary leader.

> *"When somebody from industry talks about fairness and when [an academic] talks about fairness, it's a completely different thing […] You need to have representatives from everywhere and then try and find a middle way and build a new vocabulary."* [P12, Academia]

However, the issue of sourcing this leadership talent was foregrounded by another participant, who pointed to the significant skills gap in SA. Nevertheless, CT may suffer less from this 'brain drain', evidenced by the concentration of local startups and mature private sector [P8, Industry]. Further, two participants highlighted the significance of leadership in relation to setting goals and the accountability of hub stakeholders: *"Clear deliverables, clear KPIs […] holding people accountable to what they're supposed to do"* [P7, Academia/Government].

5.1.6 Location

The success of an AI hub in CT sits within the larger context of the factor conditions in the region or country – *"There's a lot of external factors, that don't necessarily have to do with the technology itself, that will also contribute to the success or possibility of success for an AI hub"* [P12, Academia]. Four participants emphasised that CT was the technology hub of Africa, and that it was *"the one place were tech shoots up first before the rest of South Africa adopts it"* [P4, Industry/Entrepreneur], indicating the advanced state of adoption and innovation. These perspectives align with Pollio's (2022) conceptualisations of CT as the 'Silicon Cape' of Africa. Two participants pointed out how this positioning provides better access to investment and foreign currencies, which may reduce the challenge of generating hub funding: "*Cape Town being the tech hub of Africa, money has been pumped into Cape Town when it comes to advancement of tech and the AI side of things"* [P4, Industry/Entrepreneur].

Seven participants foregrounded the suitability of CT based on its proximity to talent, commenting that *"we do have a lot of talent"* [P12, Academia] and *"we do have a lot of critical mass, we train a lot of people across the country in various aspects of AI"* [P9, Academia/Entrepreneur]. This talent was cited as *"on par"* [P4, Industry/Entrepreneur] with developed counterparts, but limited in quantity. Nevertheless, one participant foregrounded the advantage in the African landscape.

> *"We do have a lot of expertise, you know, it's small compared to maybe your big centres elsewhere in the world, but we're considerably bigger than anything else in Africa and again, that gives us some huge advantages."* [P9, Academia]

Further, one participant highlighted that people from across SA are attracted to CT, which may indicate a greater concentration of local talent – *"A lot of the talent from the Joburg and Durban and the other metropolitans are moving more towards Cape Town because a lot more innovation happens here"* [P4, Industry/Entrepreneur]. Moreover, several participants pointed to lifestyle, noting that *"what Cape Town brings is lifestyle and what lifestyle does is attract talent to Cape Town"* [P4, Industry/Entrepreneur]. This attraction extends to international talent – *"You got people from the rest of the world wanting to come and live in Cape Town"* [P8, Industry]. One participant noted that the availability of talent encourages international investment, stating that *"it'll make the country more attractive to invest, because once they see the talent it will be easier for them to create a remote office. Or even a translation of their whole business"* [P1, Industry/Entrepreneur]. If an AI hub can attract talent to CT, this may have a knock-on effect for international funding and local presence.

Several participants foregrounded a *"noticeable skill shortage among professionals in the field of AI in South Africa"* [P4, Industry/Entrepreneur], making a distinction between access to a talented critical mass and access to highly skilled professionals.

> *"I think we have got good capabilities. The risk that we have is those capabilities get shopped all over the world. Every country is short on that type of capability. And so there's poaching across organisations, there's poaching across countries, there's poaching across lifestyles."* [P8, Industry]

The advantages that CT has in attracting talent are hobbled *"because of the difficulty for employees to get visas in South Africa"* [P12, Academia]. Since the time of interview, the SA Department of Home Affairs has announced their clearing of the visa backlog, but citizens still have concerns over the quality of these accelerated decision-making processes (Eisenberg & Associates, 2024). Nevertheless, three participants used examples of overseas companies, highlighting the cost effectiveness of starting or growing a business in CT.

> *"Amazon is investing heavily into Cape Town itself because the talent here is on the same par as internationally. And with that said, it's also a lot cheaper. So, I would say South Africa's definitely on the same level as other countries globally, in terms of skills and capability."* [P4, Industry/Entrepreneur]

Participants had contrasting views on the availability of infrastructure in CT to support the success of an AI hub. Two participants agreed that *"we don't have infrastructure"* [P12, Academia], aligning with assertions by Kolade et al. (2021). Nevertheless, two participants pointed to the use of smartphones in SA, saying that *"with particularly the smartphones and internet infrastructure getting more pervasive, the barriers are dropping"* [P9, Academia/Government]. This demonstrates the decreasing role of infrastructure as a success factor, supported by digital infrastructure available online to support AI solutions – *"We have to rely on cloud based computing resources from Google and Amazon"* [P17, Academia/Government]. Moreover, companies with enough capital have circumvented physical infrastructure shortages through building their own capabilities in CT, evidenced by Amazon's decision to build data centres using renewable energy sources to address the volatile 'load shedding' across SA [P5, Entrepreneur] (Pollio, 2022).

One participant foregrounded the suitability of the CT climate for data infrastructure, noting that *"the Cape has the perfect conditions to run data centres in a great climate at a low cost, so we may not be as cold as Canadian mountains, but we have […] enough wind to sustain*

that" [P13, Industry/Academia]. Given that *"AI's need energy"* [P13, Industry/Academia], the move to alternative, renewable sources of energy in CT may provide more sustainable factor conditions for competitive advantage. Nevertheless, participants cited the availability of energy in SA as an ongoing challenge.

Two participants pointed to the research landscape in SA with contrasting views. While one participant emphasised that *"you wouldn't think of South Africa at the forefront of AI research"* [P11, Industry], referring to the global landscape, another participant stressed the maturity of SA research in the African context.

> *"In South Africa, like our bigger advantage is we're research-wise, the strongest in Africa by far. And I think that's like the big thing that we should be exploiting to some extent like you know, we've got the potential to be having the bigger ideas and making the bigger innovations."* [P9, Academia/Entrepreneur]

Considering (South) Africa, three participants highlighted the progressiveness of the CoCT and PGWC, suggesting the potential for a more collaborative government than elsewhere in supporting an AI hub and aligning with Pollio's (2022) assertions.

> *"The Western Cape will have the appetite already from the perspective of, we want to be first in everything […] Probably the City of Cape Town would be quite receptive. I would think they are just you know, so advanced […] The social media links and their wide advertising of what they're doing."* [P16, Industry/Government]

Finally, participants emphasised the high concentration of related and supporting industries for an AI hub, especially with regard to the number of tech start-ups in CT, mirroring Pollio's (2022) observations.

> *"Cape Town has a lot of tech start-ups, and is recognised for its innovation within the tech space, and it also has all these educational institutions […] You're not going to go put a hub into a place out of nowhere […] Cape Town houses numerous businesses and start-ups and multinational companies as well, that indicate a favourable environment for technology businesses, and the government support"* [P4, Industry/Entrepreneur]

Another participant built on the presence of this ecosystem in CT, drawing on their travels around Africa – *"I've been to a lot of African countries. There's a lot of entrepreneurship, but*

I think you might find that the environment doesn't have a full ecosystem to support the AI hub. I always say South Africa is really broad in its offerings" [P15, Industry]. CT, as a developed city in a developing country, provides the enabling and contrasting ecosystem which may position it as an AI leader on the continent.

5.1.7 Government Involvement

Despite the notion that hubs are usually driven by the public sector, and the promises of PC4IR, government collaboration in the AI hub was cited as a major challenge by the majority of participants. The under-representation of government in the sample illustrates a potentially lacking viewpoint, but it simultaneously seems to demonstrate the difficulty of engaging government in this, corroborating the views of participants. Speaking on their experiences in establishing the PC4IR, one industry participant noted:

> *"There was a lot of debates and conversations. I'm no longer involved. But I also don't see any outcomes coming from that environment. I don't see an incentive. I don't see a drive. I don't see government trying to establish that hub that you refer to."* [P8, Industry]

Building on the lack of motivation in addressing the 4IR, and by extension AI, another participant noted *"the biggest obstacle here is government uptake and sponsoring and creating an environment that is future-facing"* [P17, Academia/Government]. This may be due to a lack of AI knowledge – *"They have no clue […] they literally rely on industry to define tech to them so that they can eventually speak about certain things"* [P4, Industry/Entrepreneur]. Moreover, the high risk factor of AI in social terms may limit their involvement, as *"uncertainty will prevent government from becoming involved […] they don't want to shoot themselves in the foot, because they're not sure what this means yet"* [P4, Industry]. This perspective on limiting risk was confirmed by one participant, who said *"government will probably take it once they see it doing well in private, and they see the impact of it and more, the monetary value from it"* [P13, Industry/Academia]. This further demonstrates the need for AI success stories, alongside strong marketing and branding capabilities.

One participant who had worked extensively for government foregrounded the cross-disciplinary nature of AI as an impediment to collaboration, highlighting that *"as soon as you start going transversely across departments […] it gets even more complicated because you're going to be needing data from different departments and then all of them have to buy in"* [P16, Industry/Government]. In encouraging government participation beyond social responsibility,

the participant suggested choosing hub vision and functions which align with national and provincial mandates – *"Picking something where there is interest […] Where there is definitely alignment in terms of, this will really help us and where it's under almost direct control or mandate of a specific department"* [P16, Industry/Government]. Despite the challenges of collaborating with government, their buy-in and collaboration is essential to *"write litigation"* [P6, Industry/Entrepreneur], *"feed into government decision making"* [P17, Academia/Government] and provide access to census data [P6, Industry]. Moreover, one participant highlighted the essential role of government stakeholders to hub success, saying *"if there's not a big player like government saying this is useful to us, then I think it will be difficult"* [P16, Industry/Government].

Considering the role of government in creating AI legislation, six participants highlighted the slow progress in comparison to global developments, mirroring claims by Rogerson et al. (2022) – *"Our legislation is not on par with other countries, so we do lag behind"* [P5, Industry/Entrepreneur]. These participants foregrounded the danger of leaving AI development unregulated in SA, noting that *"government doesn't work on legislation to protect people, to make people aware. And before we know it, we will not be able to get that control back"* [P12, Academia], linking the need for legislation to the threat of technology-enabled neo-colonialism (Gwagwa et al., 2020). While existing SA legislation does regulate AI in certain dimensions, participants noted the need for AI-specific regulations. In contrast, three participants discussed regulation as a potential hindrance to AI innovation, especially for entrepreneurs.

> *"We need regulatory frameworks. But it's important to establish regulations that can guide and control the development of AI and use of AI technology without stifling innovation. That's critical because sometimes you put so much regulation, so much complicated frameworks, and it makes folks like myself, entrepreneurs that have an idea, we fail to innovate because the frameworks and regulation just makes life so difficult for us."* [P4, Industry/Entrepreneur]

Considering that entrepreneurs are critical to innovation and competitive advantage, an AI hub could advise them on existing and forthcoming regulation to ensure that start-ups are legally viable and sustainable. Moreover, an AI hub could advise government on AI regulation based on the needs of entrepreneurs and industry, deriving from foreign examples. One participant suggested adapting regulation from Kenya, opposing the adoption of policies from high-resource countries and aligning with recommendations from Gwagwa et al. (2020).

> *"Kenya at the moment has the best balance of all those factors. So they don't have too stringent regulation, but they have enough regulation to at least make it seem respectable, and they are open. They do everything they can to support mobility of the tech community."* [P12, Academia]

Offering a different perspective, one participant argued that the best way for government to support an AI hub would be to provide tax incentives – *"If government was really serious about supporting 4IRSA-type initiatives, they would create a tax incentive for companies to put their R&D facilities in Cape Town*" [P8, Industry].

5.1.8 Rapid AI Change

Seven participants linked the success of an AI hub with the exponential progress of AI technologies, highlighting the urgent need to stay abreast of developments worldwide. Two participants specifically foregrounded this accelerating development, noting that *"you close your eyes today, you wake up tomorrow morning, there is something new in AI"* [P4, Industry/Entrepreneur] and *"the world is fundamentally changing every six months"* [P8, Industry]. Harnessing change is necessary to staying relevant and competitive, but is also essential to the survival of an AI hub in CT. An academic participant discussed the short-sightedness regarding the exponential growth of AI, noting "*it's only going to be worse every other year from now on"* [P9, Academia], necessitating hub strategies to incorporate changes in the AI landscape. Moreover, one participant foregrounded that *"if we don't embrace it, we will only experience the attack"* [P7, Academia/Government]. This sentiment was mirrored by an academic participant, who noted that "*the problem is if its accelerating and like you know, a huge percentage of Africa don't have access to it, the gap widens"* [P9, Academia]. A failure to address accelerating change within the AI hub may worsen the lives of underprivileged citizens and entrench local issues, reinforcing the digital divide (Strusani & Houngbonon, 2019).

Demonstrating the difficulty of keeping up with AI-enabled change, another participant foregrounded their experience in SA.

> *"So I think there's a lot of forums or you know, different universities, different organizations trying to pull together research or trying to look at the problem. But it's growing so fast that it's difficult to stay ahead […] There is a possibility and there is a capability. It's just that we must get in this wave of many, many, many research topics."* [P10, Academia/Government]

This echoes questions posed by Verganti et al. (2020), exploring how innovation can be applied in a context where the solution keeps evolving. An AI hub and constituent leadership must be keenly aware of global developments, to ensure innovation fostered by the hub remains unique, cost-effective, and competitive. Moreover, it strengthens the need for an AI hub to have a clear vision, to create a scope in which global AI developments can be tracked. One participant highlighted the change factor as essential to innovation success stories, aligning with Letaba, Pretorius & Pretorius (2018).

> *"So if you're looking for success stories, primarily, it's down to getting the right funding, having the right people having the right idea in the right market, and suddenly it's something completely external that you've got no control over. The context changes and the timings right. So if you dig into South African businesses powered by AI, you'll probably find that the successful ones there was something that happened that changed the context globally or locally."* [P5, Industry/Entrepreneur]

This demonstrates the necessity of tracking and exploiting change in the AI landscape, both locally and globally. Considering the views of Letaba, Pretorius and Pretorius (2018), taking advantage of these windows of opportunity could foster innovation catching-up and 'leapfrogging'. An AI hub could aid entrepreneurs in keeping up with these developments and adjusting to them, to ensure that efforts to stimulate the AI ecosystem have the maximum impact.

5.2 Achieving AI Competitive Advantage through an AI Hub in Cape Town

Beyond keeping up with AI advancements overseas and addressing African 'problems' using innovative technologies, an AI hub in CT could differentiate SA from global players, allowing CT to showcase its unique and valuable potential in the AI landscape. The critical success factors discussed in the previous section represent the foundations for achieving and maintaining competitive advantage, highlighting key aspects the national AI hub can leverage to outperform or challenge AI competitors. Although a developing country is unlikely to compete with the prowess of developed nations, SA has the potential to become an African hub for AI, fostering research and development which *genuinely considers and celebrates our context.* In discussing the potential competitive advantage of an AI hub in CT, and our unique resources and capabilities, participants overwhelmingly pointed out the ability to solve African use cases using artisanal or 'artiSAnal' capabilities, the need to create and safeguard SA data,

and the harnessing of our diversity and culture. Throughout this chapter, actual and predicted use cases are used to exemplify this competitive advantage. Although two participants claimed that they could not think of any factors that contributed to competitive advantage, the previous section demonstrates the rich, complex and inspiring landscape of CT which builds on Porter's (1990) factors for competitive advantage.

5.2.1 'ArtiSAnal' AI Demand

Porter (1990) posits that home demand shapes how firms innovate, and plays an essential role in anticipating and leading international demand. The maturity of the SA landscape in creating demand for AI products was demonstrated by participants, who highlighted that *"AI is quite prevalent and more prevalent than we think in South Africa"* [P13, Industry/Academia]. The demand for products tailored to our landscape was demonstrated by two industry participants, who argued that *"we have African problems that are not first world problems, and using AI to solve them is a different perspective"* [P13, Industry/Academia] and *"what we do have is a unique set of problems that are attractive to solve"* [P8, Industry]. Exemplifying the former quote, the participant used the example of navigation apps which may give you the quickest route, but do not consider hijacking hotspots, demonstrating the omission of safety perspectives. Considering the latter quote, one entrepreneur aspired to address the food insecurity in SA, designing an app called 'Buy-ly'. They described it as *"a to-do list, but it gets prices from different [local] stores, and you get a crossover list"* [P1, Entrepreneur]. This perspective on demand aligns with Isagah & Musabila's (2020), who foreground that Africa is the home of AI technologies due to the multitude of local issues it can address. Speaking on their experience of SA clients, another participant highlighted that their needs differentiated from global North models, demonstrating the appetite for tailored solutions.

> *"[International companies] have built those type of tools which are all useful I suppose, but what I generally find is that people want to build their own stuff […] They say yeah, that's very nice, but we actually want something that's a little bit different […] Can you change X, Y and Z to produce a solution for us?"* [P11, Industry]

Although tailoring existing (largely global North) solutions may not provide a significant competitive advantage outside of SA due to the model of technological followership (Porter, 1985), three participants spoke on how these 'artiSAnal' capabilities, cited as a necessity in the SA context, could create competitive skills.

> *"I think that value lies in the teams or organisations that have got an artisanal capability with AI, in other words, they know how to interpret a problem, and they know how to bring different types of platforms or solutions or algorithms together with other disciplines like physics, mathematics, different types of science, et cetera, to then build bespoke solutions to solve very complicated problems. I think that's going to be the huge impact, because what that does is allow businesses to identify efficiencies they're not even aware of."* [P8, Industry]

Creating an AI hub to signpost and indicate AI demand in CT could also attract talented and highly skilled citizens back to SA, enhancing the competitive edge through human capital. An academic participant foregrounded their experience with SA students.

> *"I've seen in my own lab a lot of people that, like I've said, where do you wanna go in the world? And they say they wanna stay here, and people want to come back too. I think if you've got the right kind of, you don't need to have the country running perfectly, you need the right kind of space for someone to feel like they can come back here […] I think people are drawn to exciting initiatives and the idea of like kind of changing the continent and building things up inspires a lot of people. Many people don't want to leave and maybe will feel they have to leave for opportunities."* [P9, Academic/Entrepreneur]

5.2.2 Transferability of South African AI Use Cases

The literature on AI and Africa champions the ability of AI to solve problems in the developing context (i.e. Isagah & Musabila, 2020; Strusani & Houngbonon, 2019; Chilunjika et al., 2022). In considering the value of AI in addressing local 'problems', one participant reframed this narrative based on their conversations with international people.

> *"They said, wow, you're doing AI in Africa […] You should take all the cool stuff in AI and use it to solve African problems. And I said yes, that's true, and also incredibly condescending, because we can build the same science anybody else can."* [P9, Academic/Entrepreneur]

The perceptions on AI in Africa motivate the establishment of an AI hub in CT, not only to localise AI knowledge and deployment, but to demonstrate the unique capabilities and resources SA has in the AI landscape. These competitive advantages are greater than addressing 'problems'. An AI hub in CT could market these competitive advantages, showing

local and international stakeholders the differentiation, transferability, sustainability, and diversity of solving for African use cases.

Four participants discussed how the SA context has inspired more resource-efficient AI solutions, in the development and deployment stages, indicating technological leadership through cost advantage and differentiation (Porter, 1985). In the development stage, two participants foregrounded how the data poor environment inspired different techniques, aligning with assertions by Christopher (2021).

> *"I think being from a data poor environment, it allowed us to kind of be more innovative […] Can we use certain estimation and upscaling techniques to produce this output as quickly and innovatively as possible using the resources that we have?"* [P17, Academia/Government]

Another participant foregrounded similar considerations in research, highlighting how limited computing resources result in more conscious development.

> *"You've got to be more intelligent about what you're doing and how you're building models. You can't like, what happens if I tweak this number and run it for a month and see what happens. That's not a very efficient way to do research."* [P9, Academic/Entrepreneur]

Two participants gave examples in which they used half the resources that would 'typically' have been used to develop the AI solution, in order to suit the constrained context in which the model was being deployed. Another participant noted how due to resource constraints, transfer learning was being used extensively in SA, citing the opportunity to become experts in this field of research. Given that AI technologies are a significant drain on energy resources worldwide, the capabilities and techniques of *"frugal innovation"* [P9, Academic/ Entrepreneur] are a competitive advantage in the global AI landscape. This notion aligns with Price's (2019) arguments regarding consideration of resource availability and the anti-frugal effect of algorithms from developed contexts.

Building on frugal innovation, considerations of end-users in SA could create a competitive advantage through cost advantage of AI solutions. One participant expressed these efforts within their organisation, saying *"we try to make it a low cost solution, bearing in mind that people in South Africa don't have a lot of money"* [P7, Industry/Academia]. Given that competitiveness often comes from "*high value differentiation or low cost production*" [P8,

Industry], the ability to develop AI products at a lower cost point could create a unique selling point for SA.

Considering high value differentiation, AI products built for the developing context of CT could prove more useful to other developing nations than products from the developed context, fostering technological leadership (Porter, 1985). Two participants highlighted their experiences with this transferability.

> *"If you ask me about our unique selling propositions in the AI market, I would say how to apply, operate and monitor the whole cycle of machine learning deployment in the context of the developing country […] When we have conversations with other African countries, they immediately sensed that we have an understanding of the typical challenges […] In a sense being part of the context is actually also the competency."* [P3, Industry]

Considering that Africa has the *"next billion consumers"* [P9, Academic/Entrepreneur], and that roughly 85% of the world population lives in a developing nation (World Data, 2024), understanding the challenges and opportunities of developing contexts could make the CT AI hub a pioneer in AI deployments which address limited perspectives from the developed context. Moreover, the BRICS partnership may encourage these emerging, yet powerful, economies to adopt SA AI products (Greene, 2023). As foregrounded in the literature, the FinTech and mobile sector in SA were able to bring innovation to low-income markets, challenging conventional practices defined by international players (Gwatizdo & Simbangevi, 2024; Strusani & Houngbonon, 2019).

Nevertheless, one academic participant cautioned against treating developing countries as homogenous, stating that *"if you can successfully start something in one country, that doesn't mean the model just rolls out to the rest of the continent*" [P9, Academia/Entrepreneur]. While adjustments must be made to suit national conditions and capabilities, AI developed in CT could more accurately address the context of other African countries than global North models, and capitalise on the developing market.

5.2.3 Creating, Safeguarding and Managing Unique South African Data

Aligning with Kiemde & Kora (2020), thirteen participants emphasised the historic data deficiency in SA. Given that *"the biggest problem with AI and machine learning is the data"* [P2, Industry], addressing this deficiency is critical for the success and competitive advantage

of an AI hub in CT. Three participants pointed to the lack of open source datasets in SA, noting that there is often a *"paywall attached"* to datasets and that people *"make their businesses off it"* [P17, Academia/Government]. Another participant highlighted that SA has *"less access to quality data"* [P3, Industry] than developed counterparts, forcing developers to make use of smaller, more unreliable datasets. Given the well-known saying regarding AI, *"garbage in, garbage out*" [P14, Entrepreneur], the availability, size, and quality of data in SA will contribute towards the ability to build competitive advantage. Although frugal innovation can provide a competitive advantage, limited or no access to data will limit productivity and innovation. An AI hub in CT could centralise access to quality, reliable, open source data through brokering with government and private companies, advancing the productivity of all locals interested in AI. One industry participant mentioned that they had *"heard the Western Cape Government talking about providing open access"* [P2, Industry], highlighting that an AI hub in CT is well-positioned to facilitate this access. This perspective is demonstrated by the wide support the CoCT and the PGWC give to open data initiatives, exemplified by their open data portal (Diphoko, 2024). Contrastingly, a participant who had worked with government noted the difficulty of getting access to their data – *"People are scared their data will be misrepresented and misinterpreted. And I also think it's that general culture of lack of accountability […] Ultimately, the data tells you what the true picture is and people can be exposed"* [P16, Industry/Government]. Moreover, the access provided by government to data is limited, and may suffer from 'data blindness'. An AI hub could similarly encourage industry to provide open access data, and advertise the availability of this data to support AI-related initiatives.

Two participants discussed the issue of low data capabilities in SA, noting that *"often we're faced with that obstacle when we get actually get access to data, there's a lot of work in engineering it to be usable"* [P2, Industry] and that *"people are just simply not sensitised to the fact of how important it is how you manage your data"* [P16, Industry/Government]. These observations align with Simuka & Chinakidzwa's (2022) perspectives on the poor knowledge about data use in SA. Speaking on their experience in working across government districts and departments, one participant stressed the importance of data standardisation.

> *"Different districts had different templates, you know, there was just simply no standardisation of the data, which of course has the knock-on effect of spending a huge amount of time cleaning it […] Everyone uses different timelines. You don't know if it's averages. You don't know if it's at a certain date. It's just very*

> *basic, very basic stuff which heavily impacts the way you then present the data and any conclusions that you can derive from it […] That knock on effect down the pipeline is just huge."* [P16, Industry/Government]

An AI hub in CT could define and publish standards for data management, enhancing the quality of data resources and productivity of the AI pipeline in SA.

Eclipsing the availability and quality of data, two participants had concerns over the volume of data that was required to train AI systems and the limited infrastructure in SA – "*AI uses huge amounts of data, meaning that you need data centres, you need locations where your data can reside"* [P4, Industry/Entrepreneur]. However, all of the data centres in SA are privately owned, creating cost barriers. Moreover, many of these data centres are owned by international companies. Ironically, two participants noted how developed counterparts often have more access to SA and African data than citizens themselves – *"We still need to move towards that point where infrastructure is not relied on from the global North and our data itself is not necessarily a main component from international based censors"* [P17, Academia/Government]. One academic participant spoke emphatically on the need to produce, own and protect our data to prevent foreign control over local markets, echoing Gwagwa et al. (2020).

> *"I am for using our own data and for owning our own data, I'm very much against us giving away our most precious commodity without thinking twice […] We are harming ourselves if we are happy to remain receivers of the signal forever, and to say well, let us share in the benefits please. Rather than saying OK so, let's be fair, we need also access to data. We need ownership of our own data. […] I hear people talk in Silicon Valley and they literally, they see Africa as taking lollipops from a baby. They see us as this treasure of data and they think that it is there for the picking."* [P12, Academia]

Although moving from advanced private and global North data infrastructure may be a challenge from a cost and resource perspective, there is a distinct need to harness the value of our data. Given that foreign and private entities are clearly interested in access to SA data, an AI hub in CT could facilitate brokering between local, data-rich entities and international/private partners. This brokering could create access to funding through taking a percentage, providing a source of income for the success of an AI hub. Further, brokering could provide access to data management resources, enhancing the factor conditions for competitive advantage. As 'data is the new oil' and *"very precious and useful right now"* [P7,

Industry/Academia], retaining agency of our data is critical to combatting neo-colonialist practices and attitudes (Gwagwa et al., 2020). Moreover, clearly defined boundaries in terms of data sharing and ownership may encourage international collaboration in the local landscape.

Building on the need to develop and safeguard our data resources, four participants pointed to the ill-suited nature of AI applications in SA trained on foreign data, noting that *"the context is contained in the data"* [P2, Industry]. Using AI trained on foreign data *"will generate outcomes that are not tailored to the lives that we lead and to our needs"* [P12, Academia]. These perspectives confirm claims in the literature on the lack of contextual relevance in imported AI models (e.g. Kiemde & Kora, 2020; Gwagwa et al., 2020; Price, 2019). Moreover, the lack of contextual relevance was felt by the researcher in creating automatic transcriptions via MSTeams, where participants that spoke with a European accent were transcribed more accurately than participants that spoke with African accents.

As stressed by one participant, *"if we're going to use AI correctly, we have to use it in a South African context and feed it variables that are unique to us, to generate or predict or prescribe what we need it for"* [P13, Industry/Academia]. Creating data which caters to our local context would not only improve the accuracy and usability of AI developed in SA, but would also *"lend to the world's data"* [P13, Industry/Academia], improving the contextual relevance of imported AI. Ideally, an AI hub in CT would manage the entire data lifecycle, creating, storing and managing SA data using infrastructure and resources that are publicly owned, to provide access to data which caters towards the local context, aligning with suggestions by Price (2019). However, *"we don't necessarily have a huge advantage from the infrastructure perspective. But from a collation perspective, we have very unique datasets that are not necessarily available internationally"* [P17, Academia/Government]. Building on this competitive advantage, another participant highlighted *"we have unique data. I think our country's problems are an opportunity to produce data that is not available elsewhere in the world"* [P13, Industry/Academia]. Nine participants gave use cases of these unique data sources in the context of SA, summarised in the table below.

Table 7 - Examples of unique SA data sources by participants

Unique Data Source	Supporting Quote	Participants
High rates of road accidents and poor road conditions	*"I mean self-driving cars, I'm not sure if they would be able to adapt to potholes because potholes is quite a big issue in South Africa and also I mean we also have rural areas and animals"* [P10, Industry/Academia]	P10, P3, P13
Micro-finance and lending	*"That kind of micro lending to get you until payday […] I think on the smaller scale of things which means that you're dealing with smaller payments and smaller transaction sizes."* [P11, Industry]	P11
High rates of medical trauma	*"Our trauma rate, that will apply to AIs that we build here, that will actually be leveraged by the world […] if we built an AI based our trauma experience and sold it to them where they have a lot less trauma. That AI will have a higher success rate to work there because they don't have the hectic trauma that we have"* [P13, Industry/Academia]	P13
High rates of crime	*"Within the South African context, it is such a dangerous place […] a lot of armed robbery and because of that, we try to train or create our AI products in order to solve some of those issues."* [P14, Entrepreneur] "*South Africa is one of the most [cyber-]attacked countries […] so probably AI can learn from this"* [P7, Industry/Academia]	P14, P4, P7
Informal businesses and transactions	*"Macro was offering, you know the bottle store, was offering for Sheebens and you know certain sized bars to give them free software […] to allow them to understand their inventory […] everybody wants access to that to that data."* [P11, Industry]	P11, P3
Biodiversity	*"Biodiversity in these data sets. Very unique carbon based models which only exist here […] UCT is very much creating very unique data sets for ocean based currents, you know some sort of like algal bloom sort of monitoring."* [P17, Academia /Government]	P17
Counter-intelligence	*"Other data sets are very much within the defence environment, which is very strong […] very, very unique counter intelligence data sets which people don't necessarily have access to. Examples of that include like ship detection within, you know, like the SA waters."* [P17, Academia /Government]	P17
Ethnicity and genes	*"How you metabolise the active ingredients in medicine according to your genetic makeup […] there in the gene sequencing we do, we use the so-called African plate, you know, so that it is specific also to African ethnic genetics. Which normally you know these kind of solutions are Euro centric or American centric."* [P3, Industry]	P3

Strategically harnessing, building and marketing these unique sources of data could establish SA as a data power in the global AI landscape, creating competitive advantage and technological leadership through differentiation (Porter, 1985). As a key example, five participants discussed the tension between the multitude of official languages in SA and the lack of data available on these languages. One academic participant pinpointed this tension, highlighting that *"in Africa there are over 2000 languages spoken […] Deep learning type methods need a huge amount of data […] This doesn't exist in like basically any language spoken in Africa unless it is spoken elsewhere in the world"* [P9, Academia]. The issue of data deficiencies is particularly pronounced when considering the oral tradition of African languages, as foregrounded by two participants – *"In South Africa, some of this data is not public. And some of it written down or some of it is passed down as general knowledge between*

people" [P1, Industry/Entrepreneur]. As a result of our linguistic context, one participant highlighted the competitive advantage of building AI expertise on under resourced languages.

> *"We are building a lot of expertise on people doing work focusing on indigenous languages, and this kind of expertise is not necessarily just linked to a particular language, but on the kind of data and the amount of data that you need to start building models for indigenous languages"* [P12, Academia].

This expertise and competitive advantage is exemplified by the SA company Lelapa AI and their flagship product – *VulaVula* translates, transcribes, converses, and analyses speech and text in English, Afrikaans, isiZulu and Sesotho, allowing businesses in Africa to provide customer service which caters to local needs (Lelapa AI, n.d.).

Building on this competitive advantage, another academic participant discussed how working with under-resourced languages could inspire innovative ways of building and training AI systems which could be applicable across the continent and globe.

> *"One approach you could have would be to say, lets generate a Wikipedia amount of data for every language in Africa. Or you say, OK, we've got a different problem. Can we be motivated to find different solutions?"* [P9, Academia]

Additionally, the experiences of the researcher in transcribing interviews evidenced that the issue of representing under-resourced languages extends to transcribing different English accents more accurately. This is essential to ensuring views from all SA stakeholders are included, and could provide a competitive advantage through enriching international AI products with diverse accent data, making English-based models more widely accessible.

Moreover, two participants discussed the language barriers as a result of eleven official languages.

> *"If you can just make communication a bit easier, so that I can speak in my mother tongue and somebody else in Swahili […] But we can have a full-blown conversation, I think that will be a great game changer […] Sometimes you have the most brilliant mind, but this guy struggles to speak in English."* [P6, Industry]

An AI hub could encourage the inclusion of multiple SA languages in local models through data access and considering innovative methods for under resourced languages. Not only would this foster significant competitive advantage, but it could maximise SA access to knowledge

resources and human capital in the long-term. The knock-on effect of AI applications which understand African languages was also highlighted by an academic participant, and exemplifies the importance of context and inclusivity.

> *"If your ChatGPT can understand your language, then it can also do better at understanding your culture, which means it can do a better job of giving you counselling advice, it's more likely it will be culturally sensitive and that kind of thing. And so, like, that's really like the kind of cornerstone of opening up access to everybody."* [P9, Academia]

5.2.4 Harnessing South African Culture and Diversity

When considering the competitive advantage of an AI hub, five participants stressed SA culture, and the emphasis on community and collective progress. Although culture is not necessarily a tangible or measurable competitive advantage, it manifests in the interactions between elements in Porter's (1990) Diamond Framework. One participant labelled this culture as *"the spirit of Ubuntu […] We have more of a community-feel than anywhere I've worked all over the world of like everyone kind of wanting to build and make things better"* [P9, Academia/Entrepreneur]. Community-centred approaches to developing AI such as VSD have been touted for their flexibility and regard for human values, creating more inclusive and sustainable solutions. In the AI 'arms race', where priorities are skewed towards profit, the focus on collective gain could provide a differentiating factor. Given that collaboration is key to competitive advantage, this culture could provide a strong foundation for innovation (Porter, 1985). Building on the impact of locally developed solutions, one participant discussed how the focus on community creates more resilient, bottom-up AI products.

> *"We tend to focus a lot on impactful initiatives where it's not just about one person, it's really about how can we benefit the community […] Also really targeting people who do not have, I think the impact is going to bigger in the end because it becomes less costly."* [P15, Industry]

Moreover, the 'ubuntu spirit' could result in enhanced stakeholder collaboration, further motivating the case for an AI hub in CT. The competitive advantage of this ubuntu collaboration is exemplified by the use case of *MumsConnect,* a SA platform driven by AI and designed *"for pregnant moms who don't necessarily have fast access to hospitals or clinics"* [P12, Academia]. This platform emerged from a need to aid mothers in resource-constrained areas, and capitalised on the high mobile phone coverage in SA. This solution extensively utilised VSD throughout design, and has been touted for its wide reach and innovative features

in low-resource settings (Seebregts et al., 2016). This solution has been implemented across Africa, uplifting families and communities.

Two participants connected this ubuntu culture with the history of SA, asking *"how can we as a community really participate in changing the narrative in our country?"* [P15, Industry]. The drive to change the narrative of our country would encourage participation in and support of an AI hub, based on the potential of AI to further democracy through access to information and remove literacy and language barriers. Building on the slow national progress post-Apartheid, another participant foregrounded the action-oriented mindset of industry players.

> *"I think the way we operate in South Africa and our culture, we skip a lot of the fuzz. We just get down to doing the work […] We're worried about getting this done and then making sure its reusable and scalable. We don't want to be in the same position we are in now."* [P13, Industry/Academia]

The emphasis on impact, iteration and progress demonstrates the suitability of the SA landscape for AI innovation. Moreover, the elevated consciousness regarding potential discrimination and respect for human rights could foster a landscape for AI products which foreground inclusivity. Nevertheless, two participants saw the culture in SA as a barrier to AI innovation, noting that *"a lot of South Africans are quite navel gazing"* [P5, Entrepreneur] and that there was a need to move *"beyond cynicism"* [P8, Industry]. This demonstrates a lack of risk-taking culture, characterised as key to the success and competitive advantage of Silicon Valley (de Falco, 2022). Nevertheless, these observations align with the risk-averse culture post-Apartheid, and conversely may allow SA to build more responsible and human-centred AI products. In a global landscape gripped with concerns over AI undermining human rights, these products may be preferred by cautious adopters.

Dubbed the 'rainbow nation' post-Apartheid, SA and CT have an extremely diverse population. Speaking from experience, one industry participant highlighted that *"diverse data builds better AI, so imagine you have diverse teams building diverse data. You'll get a better perspective"* [P13, Industry/Academia]. The cross-stakeholder collaboration will foster a unique diversity in dimensions of knowledge, race, experience, and wealth. In line with Hervas-Oliver et al. (2020), this diversity will aid in conceptualising holistic path complexities of new technologies, and allow the AI hub to conceptualise 'better' AI.

Chapter 6: Discussion

In this chapter, the research findings are discussed in relation to the selected frameworks, highlighting derived sub-themes. The sub-themes discussed in chapter five are exemplified by concepts in the Diamond of National Advantage (Porter, 1990), with Cluster Theory (Porter, 1998) majorly represented by the *Related and Supporting Industries* construct. The sub-themes discussed in Chapter 5 are reorganised into constructs of the theoretical frameworks to compare contextual findings to existing theories. While many of the sub-themes pertain to more than one construct, confirming the interdependence outlined by Porter (1990), they are organised according to the magnitude of their alignment. The moderating factors of the Diamond Framework are then discussed. The constructs of these theoretical frameworks are enriched by the developing SA context.

Table 8 – Participants' mentions of themes and sub-themes, with themes (framework constructs) mapped to sub-themes emergent in findings and analysis

Themes	Sub-themes	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	Total
Factor Conditions	Funding					X				X	X	X	X				X	X	7
	Leadership								X	X	X				X		X		5
	Location	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
	Vision				X	X		X	X	X	X						X		7
	Data	X	X	X	X		X	X			X	X	X	X	X		X	X	13
Demand Conditions	Hub Functions	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
	Demand	X	X		X	X	X	X	X	X	X	X		X	X	X	X		14
	Transferability	X	X	X	X	X		X	X	X	X	X	X	X	X			X	14
Firm Strategy, Structure & Rivalry	Culture					X			X	X				X		X			5
Related & Supporting Industries	Hub Collaboration		X	X	X	X	X	X	X	X	X	X	X		X		X	X	14
	Proximity	X	X	X	X		X			X	X		X		X	X	X		11
Government	Government Involvement	X	X	X	X		X	X	X		X	X	X	X	X		X	X	14
Chance	Rapid AI Change				X	X			X	X	X	X		X					7

6.1 Factor Conditions

Amongst the research participants, the availability of key AI production factors was discussed in relation to *funding, leadership, and location* as basic factors, and *data* and *vision* as the advanced factors which form the basis of competitive advantage.

Considering basic factors, the need for funding to foster hub success has been well-cited in the literature and was confirmed by participants (Atiase, Kolade & Ledong, 2022; Abrahams, 2020; Dada & Van Belle, 2023; Simuka & Chinakidzwa, 2022). Contrasting previous work by Abrahams (2020), funding for the AI hub will likely need to be private, and provide for both hub functioning and personnel as well as venture capital for entrepreneurs. Although global

funding for AI research and ventures was viewed as available by some participants, the majority believe that CT is challenged by the conservative investment culture in the developing context.

In their review of hub success factors, leadership was highlighted by Dada & Van Belle (2023), confirming the study findings. In line with the demanding landscape of rapidly developing AI, the leadership of an AI hub must incorporate passion, openness, and multidisciplinarity, with the primary goal of encouraging and facilitating stakeholder collaboration. This leadership is essential to managing the vision and continued progress of an AI hub. Further, the 'brain drain' in SA is less pronounced in CT according to participants, supporting the city as a location for the AI hub.

The motivation for CT as the location for the AI hub was demonstrated by its status as the tech hub of Africa, the attraction of talent, the high concentration of related and supporting industries, and the progressive local government, echoing Pollio's (2022) arguments in favour of the Silicon Cape. However, these factor conditions are challenged by the contrasting views on infrastructure, energy availability, openness to foreigners, and AI research capabilities. Nevertheless, location provides the larger context to factor conditions for AI development in CT, and may not directly influence the success or competitive advantage of an AI hub (Porter, 1990). Complementing the limited body of research which considers the specificities of CT as the location for an innovation hub, these factors contribute to the conceptualisation of Porter's framework in a specific developing context.

Considering advanced factors, the importance of data for AI development in SA is extensively foregrounded in the literature (Chilunjika, 2022; Gwagwa et al., 2020; Kiemde & Kora, 2020). Almost all participants pointed to the data deficiency highlighted by authors, stressing the difficulty of accessing data, the lack of data capabilities and standardisation, and the lack of affordable/local data storage in CT. Nevertheless, through upgrading these capabilities through the AI hub, CT could build competitive advantage through their data power, enhancing the agency of their data ownership through brokering with data management partners, and harnessing the unique datasets within the region. While many scholars point to the data access challenge in (South) Africa, limited research considered how the differentiation strategy of unique data in Africa could be used as a competitive advantage in the global landscape.

Further, a clear vision was highlighted as essential to the success of an AI hub. This theme is considered an advanced factor as it forms the basis of competitive advantage for the hub. Dada & Van Belle (2023) label this hub success factor as 'shared aspiration', appearing in 10% of reviewed papers. In contrast, almost half of participants found vision to be central to success, and seperated this theme from leadership, demonstrating the vitality of vision to success, investment, and passion. The importance of vision was demonstrated by the broadness of AI applications, and the need for specialisation to drive progress and international invesment. Five partipants suggested an emphasis on FinTech and AI owed to the maturity of the finance landscape in CT for leveraging competitive advantage. Other participants believed the vision should be modelled from the 'bottom-up', noting that this underlying passion would drive competive advantage through addressing local problems that depart from international focus. While the literature does foreground the importance of vision to hub success, it does not consider how this vision can foster competitive advantage through underlying passion and differentiation with the global landscape.

6.2 Demand Conditions

Participants demonstrated the well-established local demand through discussing how the AI hub could model *functions* to address local needs, the 'artiSAnal' AI *demand*, and the *transferability* of local use cases. This demand demonstrated the need for CT to continually innovate and upgrade industries to retain home demand, and the ability of an AI hub to anticipate and lead African and international demand through addressing local use cases.

Essential functions of creating access to data, educating and upskilling citizens, stimulating new AI business ventures, assessing contextual and ethical impacts, crowdsourcing solutions to use cases, informing AI-related regulation, and providing a knowledge repository were emphasised. Many of these functions are mirrored in the literature, with the stimulation of entrepreneurship cited as most relevant to hubs. This demonstrates the clear demand for AI which addresses the local context, and the desire for innovation.

The demand for 'artiSAnal' AI products was showcased by participants, foregrounding the plethora of opportunities in CT which could be addressed using AI (Isagah & Musabila, 2020). Participants placed a particular emphasis on the need to customise and stitch together different AI products to address local demand, creating bespoke solutions to address complicated use cases. Demonstrating this demand through an AI hub could attract talented SA citizens back to

SA, building competitive advantage through human capital. Although not highlighted in the literature, this artisanal capability could create competitive skills through the ability to combine and leverage different products and platforms. Given that much of AI innovation builds on the capabilities of industry giants like Microsoft and Google, this competitive skill could lead international demand through leveraging off technological leadership.

The transferability of local use cases to the global context was similarly highlighted by participants, but was not evident in the reviewed literature. Addressing local use cases could create competitive advantage through techniques of frugal innovation, cost differentiation, and managing AI lifecycles in developing contexts (high-value differentiation).

6.3 Firm Strategy, Rivalry and Structure

Considering the construct of firm strategy, rivalry and structure within the AI hub, participants largely discussed *culture*. Participants did not point to any government policies that constrained or encouraged the interactions between firms, perhaps signalling the state of AI regulation in SA and the lack of government incentivisation. Moreover, the rivalry between firms was not foregrounded, which may highlight opportunities for the establishment of AI-powered ventures. Nevertheless, this construct did not emerge as strongly as the other three primary constructs from Porter's Diamond Framework (1990).

Although culture is relatively intangible as a competitive advantage, five participants discussed the emphasis on community progress and 'ubuntu' in SA – firms were cited as more willing to enact their corporate social responsibility, and had a heightened consciousness of potential discrimination as a result of our Apartheid history. The power of 'ubuntu' culture in centring citizens was highlighted by Gwagwa et al. (2021) in the possibility to create a ground breaking tech doctrine based on the African principle. Nevertheless, other participants foregrounded the lack of risk-taking culture, aligning with Isagah & Musabila (2020) on the legacy culture within African organisations as a challenge to AI procurement.

6.4 Related and Supporting Industries

In CT, the presence and collaboration of AI-related and supporting industries was exemplified by themes of *collaboration* and *proximity*. The importance of collaboration and critical mass for AI progress was strengthened by the developing context, in which collaboration is required

to overcome resource constraints and to address the lack of market intermediaries, aligning with Atiase, Kolade & Ledong (2020).

All participants saw stakeholder collaboration as essential to the success and competitive advantage of an AI hub, aligning with the citing the need for citizens, other African countries, and the global North as stakeholders. The centrality of collaboration was similarly highlighted by Dada & Van Belle (2023) in their review of innovation hub literature, ranking fourth from twenty-three identified factors. In line with Cluster Theory, effective collaboration was predicted by participants to increase productivity and networking. Balancing stakeholder types and needs within the hub emerged as key to collaboration, with recommendations outlined to attract each stakeholder type. Significantly, the need to address citizens fears over AI-induced job-loss was foregrounded, to ensure AI demand is not hindered. Through addressing the relationship between job security and AI pertinent in the SA landscape, but relevant around the world, the AI hub could pioneer considerations of how AI will change work, answering questions posed by Verganti et al. (2020).

The influence of international collaboration was demonstrated across themes, particularly from the global North. This collaboration was seen as essential to keeping up with change, and to providing funding. International, global North influence was felt in the AI products used by local entrepreneurs, and the stronghold over data infrastructure in SA. Considering competitive advantages, international partners were key to providing the (albeit costly) products and inspirations for ‘artiSAnal’ AI, providing the technological leadership for SA to build competitive advantage from (Porter, 1985). On the other hand, they motivate local solutions and data through ill-suited foreign models, inadvertently encouraging differentiation of AI products and services in SA. International collaboration has motivated the suggestion to create ethical guidelines emergent from African principles. This aligns with assertions by Mapuranga (1990) to consider the moderating effect of powerful international collaborators in developing contexts when utilising Porter’s Diamond Framework (1990).

Further, proximity as a key enabler of hubs was mentioned by the majority of participants, confirming the centrality of this construct to Cluster Theory. While most participants subscribed to the hybrid view of proximity based on the emerging status of the hub and the need to foster lasting collaborations, others preferred an online model in the technologically advanced age of AI. Efforts to include stakeholders from emerging contexts requires a physical

context, to ensure equal opportunity for access to resources. Nevertheless, proximity was cited as essential for knowledge spillovers and a concentration of skilled labour, as well as collaboration and innovation, aligning with de Falco (2022). While participants confirmed Porter's (1998) view on the need for physically proximate related and supporting industries, especially to cater to the developing context, they also highlighted that in the digital age, an online presence is essential to widen access and maintain connections.

6.5 Government

Porter (1990) posits that while government does play a role in complementing systems of national competitiveness, they do not contribute to lasting competitive advantages. This was evidenced by fourteen participants that mentioned *government involvement*, and the applicability of government when discussing regulation, location, collaboration, and funding. While government emerged as a theme, it was most relevant when discussed in relation to other themes as a challenging factor. Echoing Isagah & Musabila (2020), the poor collaboration between government and the private sector was foregrounded, alongside lack of government support and funds. The difficulty of accessing participants currently working for government, despite multiple attempts, may further indicate a lack of government support for AI-related research. The PGWC and CoCT was cited as being more progressive than local government in most other parts of SA, but they are still guided by a presidency and national government that has not taken public action on the 4IR in relation to AI implementation. While government was cited as essential to regulatory support (Mazumder & Hossain, 2024) and to realising the benefits of AI in the local context (Isagah & Musabila, 2020) by participants, Porter's (1990) assertions regarding the minimal role of government in national competitiveness was confirmed by the study. Moreover, especially in developing contexts, there is an argument to be made that government is often hindering the progress and advancement of AI through prioritisation of more pressing local issues or failure to promulgate supportive regulation.

6.6 Chance

Similarly to government, Porter (1990) views the chance factor as complementing systems of national competitiveness. The theme of chance is represented in this study by *rapid AI change***,** with participants commenting on the exponential growth of AI and its role in shaping competitive environments. The findings revealed that participants foregrounded change as essential to preventing further AI-related harm in CT. However, participants also saw the exploitation of change as key to AI and hub success, highlighting the importance of resilient

leadership and vision. This change is also essential to entrepreneurship, and capitalising on the AI market at the right moment to maximise impact. Strusani & Houngbonon (2019) stress that emerging AI continually disrupts traditional pathways, drastically changing economies. Adapting to and capitalising on change will allow competitors to set themselves apart. In the age of exponential intelligence capabilities, the findings of the study confirm Porter's (1990) Diamond Framework with chance as a moderating factor on national competitive advantage.

Chapter 7: Proposed Framework

Incorporating the findings and discussion emergent from participant responses, the proposed framework is visualised in Figure 14. Using deductively derived themes, the study *qualitatively confirmed the relevance and interdependence of the four major factors in Porter's (1990) Diamond Framework.* Additionally, government and chance were confirmed by the study as a moderating factor on all other factors. This demonstrates that Porter's framework is suitable for analysing the national competitiveness of developing countries, while providing sub-themes which enrich the applicability of the framework in this context. However, based on the need to define individual concepts and the deductive mapping of themes, this study suggests that the terminology used by Porter to represent concepts in the Diamond Framework may not suit the diverse disciplines in which the framework is being utilised. Although the Diamond Framework is designed within the economic school, it has been criticised for being too general and broad in its attempt to explain *all* aspects of trade and competition, limiting its usefulness in determining economic causalities (Smit, 2010). However, it is "precisely because it is so general that it is so well accepted" by management and information systems disciplines (Smit, 2010, p. 120). To reflect the interdisciplinary contexts in which the framework is used, this study proposes an adjustment to Porter's terminology to enhance accessibility to researchers outside of the field of economics (Table 9). Based on the deductive themes, and the need to foster interdisciplinary research into AI, the proposed framework is presented below with adjusted terminology to enhance understanding. The solid arrows indicate the interdependence of the major factors and their constituent sub-factors in fostering national competitive advantage, while the dotted arrows demonstrate an influencing relationship, but not an interdependence, between the moderating factors and major factors.

Table 9 - Proposed adjustments to Porter's terminology

Porter's Terminology	Proposed Terminology
Firm Strategy, Rivalry and Structure	Competitive Conditions
Related and Supporting Industries	Collaborative Conditions
Factor Conditions	Driving Factors
Demand Conditions	Demand Factors
Government	Government
Chance	Chance

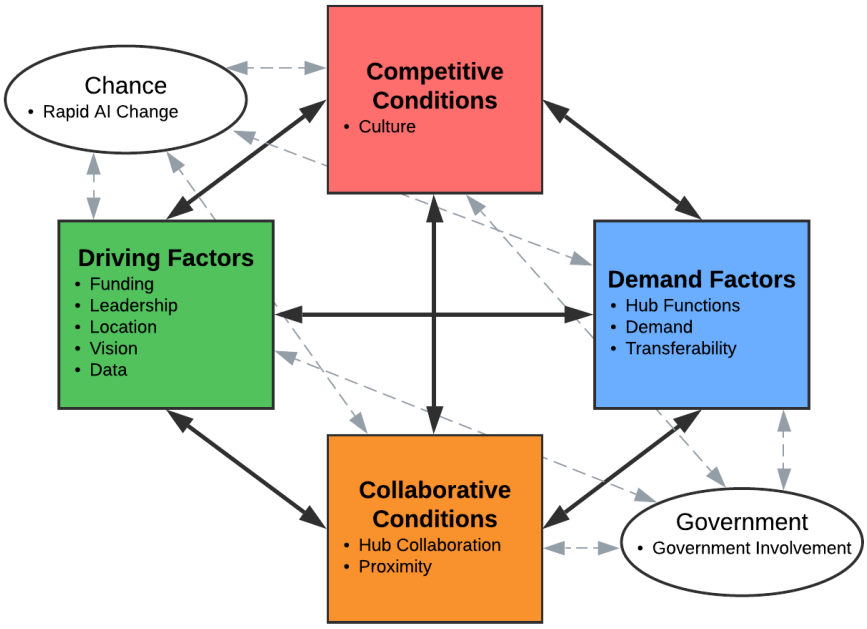

Figure 14 - Proposed Diamond of National Advantage (based on Porter, 1990)

The notion of physical proximity in Porter's (1998) Cluster Theory was confirmed by participants responses. The emphasis on critical mass and collaborations by participants demonstrates the need for companies, organisations, and institutions with common or complementary functions to stimulate innovation. However, many preferred a hybrid format for an AI hub, noting that productivity and stimulating competitiveness had to extend to the online sphere to maintain collaboration momentum and to provide a platform for knowledge sharing. Based on the findings of the study, the authors redefine Cluster Theory (Porter, 1998) as *related organisations clustered together physically* ***and digitally*** *to benefit from enhanced competitiveness as a result of increased productivity and innovation, alongside stimulating new business ventures*.

Chapter 8: Recommendations

To maximise the impact of research, it should be practically useful to academics, industry, entrepreneurs, and government. With a view to collating participant inputs, this section provides recommendations to specific stakeholders on their role in advancing the establishment of an AI hub in CT, and the competitive advantage of AI in SA. Stakeholders have an overarching responsibility to collaborate with each other in overcoming resource and talent constraints in SA, and advancing the productivity of AI adoption, development, and deployment.

Industry

The private sector in CT has been cited as mature and innovative in addressing emerging technologies, and largely involved in providing funding and resources to advance their corporate social responsibility. Arguably, industry stakeholders have the largest influence in stimulating the AI ecosystem in CT. The following recommendations are provided to industry stakeholders:

- Collectively provide the funding for an AI hub, recognising that this investment has the potential to grow AI adoption customer bases, facilitate access to unique datasets, create forums on best practices in resource-constrained landscapes, provide responsible and grounded solutions to industry problems, and enhance AI productivity across companies.
- Continue to invest in and upskill young SAs, hosting hackathons and workshops to demonstrate the need for shared space and fostering of AI talent.
- Pre-emptively address concerns regarding talent poaching in AI collaboration through investing in the views and needs of employees.
    - Consider strategies for sharing proprietary information without idea appropriation or risking IP.
    - Consider implementing ‘employee sharing’ practices to encourage a culture of co-opetition while maintaining competition in respective markets.
- Aid in developing a SA knowledge base for shared AI resources or infrastructure for mutual benefit, that could eventually be taken over by the AI hub.
- Collaborate to provide recommendations to government on AI legislation, highlighting which regulations could stifle innovation.

- Consider the balance between 'technological leadership' and 'technological followership' within AI products to foster strategic competitive advantage.
    - Explore resources and capabilities that are unique to the SA landscape to build more sustainable competitive advantage that caters to the local landscape, and differentiates AI from the global North.

Government

Both national and local governments have a distinct responsibility to deliver on the promises of the PC4IR, balancing innovation, regulation and public benefit in the AI landscape. Although funding may not be available for an AI hub in light of more pressing priorities, government can still demonstrate their support through regulation and incentivisation. The following recommendations are provided to government stakeholders:

- Urgently address regulation for AI adoption, development and deployment in SA to ensure that imported and local products do not infringe on the rights of citizens and risk neo-colonialist underpinnings.
    - Draw inspiration from regulation in developing countries as well as developed countries, considering the unique socio-economic context and needs within SA.
    - Implement regulation gradually, giving industry and entrepreneurs a chance to adapt and remain competitive.
- Consider offering tax incentives for companies investing in or actively contributing to the AI hub in dimensions of entrepreneur support, sharing pivotal AI resources, or advising government on regulation and departmental AI adoption.
- Provide AI educational resources for public sector employees, bridging the knowledge gap which may be preventing decision-makers from incorporating AI in their projects.

Considering the CoCT specifically, the following recommendations are made:

- Enhance the existing Open Data Initiative through encouraging cross-departmental cooperation, providing multi-dimensional, non-sensitive government data for public benefit.
- Promote success stories and showcase the value of local solutions, to bolster the position of CT as the 'Silicon Cape' of Africa, encourage international investment, and address citizen fears over AI by demonstrating public benefit.

Entrepreneurs

Entrepreneurs are pivotal to the success of an AI hub, and to the innovation and growth of the economy. The following recommendations are provided to entrepreneurial stakeholders:

- Critically consider strategies for competitive advantage in the national and global AI landscape, foregrounding differentiation and cost factors, as well as scalability and sustainability.
    - Foster technological followership through catering to local needs and leveraging existing technology to increase time to market and ROI, promoting 'artiSAnal' solutions to complex SA problems.
    - Foster technological leadership through critically considering the value proposition of the AI solution and the costs involved in bottom-up innovation.
- Consider unique national opportunities as well as problems, drawing from the success of industries such as FinTech.
- Collaborate with other local entities to create synergies and share resources, attracting broader support and building networks to overcome barriers.
- Locate businesses in CT to take advantage of and contribute to the enabling and collaborative ecosystem.
- Build and market solutions to demonstrate the unique SA angle, attracting international investment and enhancing perceptions of SA as an AI power.

Academia

Academic collaboration within the AI hub is crucial to the balance between research and innovation, and to provide proximity to highly educated graduates. The following recommendations are provided to academic stakeholders:

- Remain abreast of critical development and research into AI, updating curricula to ensure that graduates are equipped with the necessary skills to foster competitiveness in the 4IR landscape.
- Continue to address the unique context of SA in research, centring national progress and development.
- Assess the risks of AI in the national context, ensuring that AI developments do not cause harm to citizens.
- Advocate for the competitive advantage of CT in the AI landscape when attending international conferences, building the global status of SA as not only a technological

follower, but as a country with the potential to lead 4IR competition through differentiation and cost advantage.

- Collaborate with industry to provide practical and current suggestions for advancing the competitiveness of AI in SA, grounding research in the lived realities of citizens.
- Continue to develop innovative ideas and research, sharing data responsibly and publicly to further the productivity of an AI hub in CT.

Chapter 9: Conclusion

South Africa presents an exacting context to navigate in the 4IR. Although the challenges of developing AI "in Africa, by Africans, for Africans" (Kiemde & Kora, 2020, p.4) are considerable, the opportunities presented by this disruptive technology to 'leapfrog' national progress cannot be ignored. Using Porter's Diamond of National Advantage (1990) and Cluster Theory (1998) as guiding frameworks, this deductive study has qualitatively analysed the potential success factors of an AI hub in CT from the perspective of diverse stakeholders, demonstrating how SA could use the hub to harness national competitive advantage. Beyond engaging technological followership to tailor AI technologies to the local landscape, there are distinct gaps, particularly in developing markets, where SA could pioneer and foster technological leadership.

9.1 Theoretical Contributions

The findings provide a theoretical contribution through demonstrating the suitability of Porter's frameworks to developing economies similar to SA, and enriching the constructs with context- and AI-specific sub-themes. Moreover, the physical proximity of clusters was extended to include digital proximities, redefining Porter's (1998) Cluster Theory in the 4IR. Further, this study provided theoretical contributions through a comprehensive literature review on the relationship between SA, AI and hubs, mapping the SA AI landscape, demonstrating the significance of contextual relevance and competitive advantage to AI in Africa, and relating the knowledge on hub organisations to the insufficiently researched national context. Major gaps in the literature motivated the focus of the study: there is a lack of research on the capacity and capability of SA to take a global position in the 4IR, and limited knowledge on the competitiveness of SA's ICT sector. Research on hubs remains concentrated in developed countries, and there is a distinct need to analyse the proposal of the PC4IR to create an African AI Institute. Foregrounding CT as a location for the AI hub adds to the limited literature on CT and the 4IR.

9.2 Practical Contributions

This study provided holistic practical contributions through interviewing diverse SA stakeholders and demonstrating their contrasting and comparable viewpoints in relation to the research questions and existing literature. These AI-knowledgeable participants foregrounded critical success factors of clear vision, bottom-up hub functions, national and international

collaboration, physical and digital proximity, adequate funding, resilient leadership and a conducive location. Government involvement and rapid AI change were shown to moderate critical success factors, with the former holding more influence in developing countries. These critical success factors provide a starting point for the conceptualisation and development of an AI hub in CT, addressing the promises of the PC4IR. Further, the opportunities for an AI hub to foster competitive advantage in the 4IR through 'artisanal' AI demand, creating and safeguarding unique SA data, and harnessing SA culture and diversity demonstrate how SA could become a noteworthy national and global AI player. These competitive advantages foreground that while techniques of technological followership are essential to overcoming resource constraints and fast-tracking development, the opportunities of technological leadership are evident in differentiation and cost advantage of potential SA AI solutions. Moreover, the study provides actionable recommendations to specific stakeholder groups on their role in fostering SA AI, catalysing the advancement of African AI.

9.3 Limitations and Future Research

This study is constrained by the specificity to the SA context, limiting the applicability of results to non-SA contexts. There is a distinct need for further study into other developing contexts in relation to AI and hubs. Moreover, due to the exploratory nature, the study embraced a wide definition of AI and hubs. Future research could consider different hub forms, demonstrating success factors and competitive advantages which cater to distinct industries, geographies, and technological affordances. Similarly, future research could explore more specific applications of AI in the context of hub success factors and national competitive advantage, to determine which applications would cater most successfully to SAs unique opportunities and challenges.

Additionally, the study is limited by the lacking government viewpoint and the limited stakeholder sample. Given the moderating effect of government on hub success and competitive advantage, and the vital role of this stakeholder in creating and enforcing national AI legislation, future studies could attempt to centre this stakeholder type, employing strategies to engage government participants which exceeded the ability of the researcher. This would reflect the cruciality of government participation in catering to national contexts, as these stakeholders represent the needs of citizens and the public sector, and have a holistic understanding of regional challenges and opportunities. Future studies could also employ a larger stakeholder sample, to further the validity and diversity of findings.

The findings revealed contradicting views that highlight important directions for future research. While all participants saw funding as key to success, their views diverged on the ease of accessing this investment. Future work could explore the investment culture in SA and CT, mapping the difference in perceptions across sectors and examining strategies for bridging global capital and local investment practices. Participants views were also split on the availability of infrastructure to support the hub, arguing that smartphone penetration and on-demand cloud services could lower access barriers. Further work is needed to understand the evolving digital infrastructure landscape in SA and CT, identifying where gaps still undermine hub potential and national development, as well as how emerging technologies or partnerships could address these deficits. Participants recognised the cruciality of AI-specific regulation for safe and ethical development, yet several cautioned stifling innovation with regulatory frameworks. Future research could identify models of adaptive regulation that foster trust without creating prohibitive barriers, drawing on international and continental best practices, as well as local stakeholder needs. The study is also limited by the cross-sectional timeframe which surfaces tensions in perceptions that cannot be fully addressed and explored. AI is advancing rapidly, alongside risks and affordances. Moreover, the SA context is volatile, shifting in availability of energy and political priorities. Future studies should prioritise interdisciplinary, longitudinal inquiry that address tensions directly, especially in the rapidly developing AI landscape. Collaborative research involving diverse stakeholders will be essential for developing nuanced, context-sensitive strategies that support a sustainable and competitive AI ecosystem in SA.

This research is a rallying call to SA AI stakeholders, not only to participate in the advancement of AI in providing more value to fellow citizens, but to celebrate and harness the unique national affordances of a landscape which demands innovation. It is hoped that this research will contribute to the articulation and wider discussion around the desirability, feasibility and competitive potential of establishing an AI hub in Cape Town, taking a step towards AI developed in Africa, by Africans, for Africans.

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Appendices

Appendix A – Other Potentially Applicable Theoretical Frameworks

The table below lists and briefly discusses other theoretical frameworks that were considered as potentially useful in guiding the analysis. In the end, the two frameworks that were finally selected for this study seemed to have relatively more strengths and fewer weaknesses in addition to showing a better applicability and leading to a more insightful analysis.

Table 10 - Research on potentially applicable theoretical frameworks

Theoretical / Conceptual Framework	Key Concepts	Application Domains	Strengths	Weaknesses
Situated Learning Theory (Lave & Wenger, 1991; Orgill, 2007)	Situatedness; peripheral participation; social interaction/community; meaning making; reification; reflection	Learning (workplace, education); technology-mediated learning; community and professional development	Contextual emphasis; developing expertise; active learning; genuine and constant assessments	Doesn't address individual learning; not transferable; relies on communities; heightened focus on context and social interactions
Knowledge Production Model (Gibbons, 1998)	Traditional learning; collaborative learning; contextualised knowledge; social accountability; quality and relevance	Higher education; research; healthcare	Accountability of knowledge; contextualization; acknowledges institutional change; transdisciplinary approach	Limited application to different contexts; need for availability of resources; lack of clear guidelines; complex network relationships
Technological Innovation Systems (TIS) Theory (Hekkert et al., 2007; Aldersey-Williams, Strachan, & Broadbent, 2020)	Innovation networks; dominant technologies; knowledge development & diffusion; entrepreneurship; legitimation	Renewable energy; information and communication technology; biotechnology	Broader social and institutional context; stakeholder interaction; policy dimensions; cross-discipline & co-evolution	Limited view of structural weaknesses; indefinite scope of innovation networks
Resource-Based View Theory (Wernerfelt, 1984; Collis & Montgomery, 2008; Barney, 1991)	Resources & capabilities; heterogeneity; value; rarity; inimitability; non-substitutable; competitive advantage	Manufacturing; product development; human capital; innovation; entrepreneurship	Sustained competitive advantage; focus on internal resources and microeconomic factors; adaptable	Limited focus on external factors & competitive environments; difficulty of measuring resources; measures resources as immobile
Business Model Canvas (Simuka & Chinakidzwa, 2022)	Value creation; partners; resources; activities; relationships; revenue; collaboration	Start-ups; business innovation; public sector; SMEs; innovation hubs	Universal application; well-regarded; strong starting point; connects key concepts; simple; customer-centric; visual representation	Limited view of financing, social and environmental dimensions; abstract; does not consider volatility of business landscape; subjective; lack of focus on external factors; does not address NGOs

Triple Layered Business Model Canvas (Kolade et al., 2021)	Economic, environmental and social benefits and impacts; value creation; partners; resources; activities; relationships; revenue; sustainability; governance; culture	Tech hubs	Includes social and environmental dimensions to highlight responsibility; African approach; detailed; future-oriented; addresses external factors;	Not well-known; subjective; abstract; does not consider volatility of business landscape
Sustainable DIHs Conceptual Framework (Zamiri, et al., 2021)	Environmental; social; economic; governance; technical; sustainability; competition; co-operation; services	Digital innovation hubs	Focus on research area of innovation hubs; detailed considerations; holistic; provides recommendations	Not well-known; abstract; unclear relationships

Appendix B – Interview Guide

Introduction	
Thank you	"Thank you for giving your time to participate in this research study. My name is Savannah Althoff-Thomson, and I am the researcher for my study which aims to explore the success factors and competitive advantage of an AI hub in South Africa.
Interview Duration	"The interview will take between 30 and 60 minutes, but there is no limitation on the length of answers."
Informed Consent	"This research has been approved by the University of Cape Town's Commerce Faculty Ethics in Research Committee. Please note that you will be kept anonymous and the data collected from this interview will only be used for this UCT research project and stored securely. You have the right to withdraw at any point during the study, for any reason, and without prejudice, and to refrain from answering any questions. If you have any questions, you are welcome to ask them at any point during the interview. Please confirm whether you understand what is meant by consent, give your informed consent, and agree to be recorded?"
Questions	"Do you have any questions regarding what I have just explained?" / "Is there anything you would like to add?"

Demographic information	**Questions**
	- What is your current job title? - Can you tell me about your educational background? - How many years of experience do you have in your field?
Research Focus	**Questions**
Identify understanding of AI	- What is your experience / familiarity with AI? - How has the South African context shaped that experience?
Contextual considerations of AI	- From your perspective, what are the most impactful AI applications for South Africa? - How could AI technologies be better adapted to the South African landscape? - What unique resources or capabilities do you think South Africa has in the AI landscape? - In your view, what are the motivations for global companies to invest in a presence in South Africa (Amazon, Deloitte etc.)?

Exploring hubs, success factors, and competitive advantage	- What is your definition of a successful AI hub? (Provide definition)
	- In your view, what are the success factors for the establishment of hubs?
	  o Could you elaborate on whether you consider physical proximity to be a critical success factor for AI hubs?
	- Which AI applications or AI technologies should a South African-based AI hub focus on? Why?
	- Could you provide specific examples of the types of resources or support an AI specialized hub could provide to serve the needs of the South African AI ecosystem?
	  o Or to tailor foreign AI products to the South African market?
	- What would be the unique competitive advantage or value propositions for an AI hub located in South Africa (as opposed to AI hubs in other countries)?
	- What do you think would be the biggest obstacle(s) that stand in the way of the success of an SA AI hub?

Government stakeholders	- What policies / regulations are in place to support the development of AI and AI hubs in South Africa? - How could an AI hub aid South African government?

- *Western Cape Government, Department of Science and Innovation* - *PC4IR*	
Academic stakeholders - *CAIR* - *Intelligent Systems Group* - *IS/CS Department at UCT*	- Which considerations of South African context shape academic research? - How can hubs encourage the collaboration of academic stakeholders?
Industry stakeholders - *Praekelt* - *BlueMachine* - *Ashanti AI* - *DataProphet* - *Xineoh* - *CapeAI* - *AWS*	- Why has your company invested in AI development in South Africa? - Is there a demand for AI products in South Africa? - What differentiates the South African business landscape? - How can hubs encourage the collaboration of industry stakeholders?
Entrepreneurial stakeholders	- What barriers have you experienced in pursuing AI ventures? - How can hubs encourage the collaboration of entrepreneurs?
Final Comments	- Do you have any suggestions of other possible research participants? - Is there anything you would like to add to or remove from this interview? - Are there any questions which you think I should've asked, but didn't?

Conclusions	
Questions	"Do you have any questions related to the study or the interview conducted?"
Thank you	"Thank you again for participating in this interview. Your insights and experiences are invaluable to my research, and I appreciate the time."

Appendix C – Pilot Study of Interview Instrument

The interview instrument underwent a pilot test to determine whether the questions were neutral, clear, and relevant to the underlying theories. The research instrument was tested by a Professor in Information Systems, a Masters student in Information Systems. Additionally, the first participant served as a pilot interviewee. The suggested changes are outlined in the table below, alongside justification for including or excluding these suggestions form the interview guide.

During data collection, participants were explicitly encouraged to request clarification on questions, and were asked whether they identified any gaps in the line of questioning after each interview. Most participants expressed their satisfaction, noting that no additional questions were required: "*No, I think it was all interesting and relevant*" (P7) and "*No nothing. This was good, you did a great job.*" (P9). This demonstrates the appropriateness of the research instrument. P4 suggested adding a question on the potential specialisation of an AI hub in SA, which was added to subsequent interviews: *Which AI applications or technologies should a CT-based AI hub focus on? Why?*.

Table 11 - Pilot review corrections to interview guide

	Original	**Suggestion/Correction**	**Result**	**Explanation**
Research Participant 1	No definition of AI hub included	Include a definition of an AI hub at the onset of the interview.	Definition for an AI hub included: *In this study, an AI hub can be defined as a critical mass of AI or AI-related companies concentrated in a particular location, with examples of the Silicon Savanna or Silicon Valley.*	A definition was required for participants to understand the context of the study, given that hubs have diverse definitions in the literature.
Master's Student in Information Systems	*What is your experience / familiarity with AI?*	Split into two questions: *How familiar are you with AI?* *Can you describe your experiences with AI?*	*What is your experience / familiarity with AI?*	This question was not altered as the suggestion was a leading question, assuming AI knowledge of the research participant. To ensure adherence to the sampling frame, this open-ended question was necessary. Personal experiences with AI, not relevant to the SA

				context of the study, were not relevant and therefore not included.
	What are the development of these policies / regulations influenced by?	Reword: *What influences the development of these policies / regulations?*	*What influences the development of these policies / regulations?*	The question was reworded for clarity.
Professor in Information Systems	*Could you elaborate on whether you consider collaboration to be a critical success factor for an AI hub?*	Remove question, "Not sure what the aim of this one is."	-	The question removed from interview guide due to lack of relevance. Collaboration is essential to the definition of an AI hub and underscores Cluster Theory as a foundation of the study.
	What is the competitive advantage for an AI hub in CT (as oppose to other places)?	Reword: *What would be the unique competitive advantages or value propositions for an AI hub located in CT (as opposed to AI hubs in other regions)?*	*What would be the unique competitive advantages or value propositions for an AI hub located in CT (as opposed to AI hubs in other regions)?*	The question was reworded as suggested for clarity and specificity.

Appendix D – Research Ethics Committee Project Approval Letter

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA · UNIVERSITEIT VAN KAAPSTAD

2023/08/21

COM/00380/2023

RE: Research Ethics Committee Project Approval Letter

Dear Savannah Althoff-Thomson,

Your application for ethics review of your project titled

The Critical Success Factors and Competitive Advantage of a South African AI Hub

has been reviewed and evaluated by the

Commerce Research Ethics Committee.

You may proceed with your research project titled:

The Critical Success Factors and Competitive Advantage of a South African AI Hub

Please note that should:

(i) any serious or adverse effects to participants occur and/or,

(ii) aspect(s) of your current project change and/or

(iii) any unforeseen events that might affect continued ethical acceptability of the project occur then you should immediately report this to the approving REC. You may be required to submit an amendment to this application, in order to determine whether the changed aspects increase the ethical risks of your project.

Based on the information supplied your application has been successful and is approved.

Please note the following additional conditions associated with this approval:

(i)

Regards,

Commerce Research Ethics Committee.

Appendix E – Informed Consent Document

Department of Information Systems

Leslie Commerce Building
Engineering Mall, Upper Campus
OR
Private Bag X3 - Rondebosch - 7701
Tel: +27 (0) 21 650 2261 Fax: +27 (0) 21650 2280
Internet: http://www.commerce.uct.ac.za/informationsystems/

September 2024

Dear Sir/Madam,

In terms of the requirements for completing a Master's Degree in Information Systems at the University of Cape Town, a research study is required. The researcher, in this case Savannah Althoff-Thomson, has chosen to conduct a study entitled **The Critical Success Factors and Competitive Advantage of an AI Hub in Cape Town.** The objective of this research is to understand the success factors of establishing an AI hub in South Africa which nurtures contextually responsive AI solutions for competitive advantage from the perspective of multiple stakeholders, to create AI "developed in Africa by Africans for Africans" (Kiemde & Kora, 2020, p.4). Your responses are important to enable a rich and informed understanding of how South Africa can harness transformative AI to engage with the Fourth Industrial Revolution in a way which truly addresses context.

Your participation in this research is entirely voluntary. The semi-structured interview should take between 30 and 45 minutes to complete. You have the right to withdraw at any point during the study, for any reason, and without prejudice. You will not be required to provide any identifiable information, aside from academic qualifications, (AI) experience, and general job position, ensuring anonymity of your responses. All information will be treated in a confidential manner and used exclusively for the purpose of this study. The research has been approved by the UCT Commerce Faculty Ethics in Research Committee.

Should you have any questions regarding the research please feel free to contact me via email, altsav001@myuct.ac.za. Your participation would be greatly appreciated, but is entirely voluntary.

Sincerely,

Savannah Althoff-Thomson
Researcher - B. Com Masters
Department of Information Systems
University of Cape Town

Research Participant Consent

I, _____, consent to participate in the research entitled "**The Critical Success Factors and Competitive Advantage of an AI Hub in Cape Town"** and give my consent to be recorded and transcribed.

I am aware my participation is voluntary and that I may choose to withdraw from this study at any time, should I wish to.

Signature:_____ Date:_____