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Value co-creation in regional innovation ecosystems in South Africa

Tshegohatso Chifokoyo

A research paper submitted to the University of the Witwatersrand's Wits Business School in partial fulfilment of the criteria for the degree of Master of Management in the field of Innovation Studies

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ABSTRACT

Technological innovation has been a factor in encouraging inclusive economic growth and enabling developing countries to address pressing development issues. Small, Medium, and Micro-Enterprises (SMMEs) account for around 30% of South Africa's GDP and employ more than 45% of the labour force (OECD Library, 2021). However, these technology SMMEs have faced challenges in South Africa, and their regional innovation ecosystems have needed the innovation support provided through the Department of Science and Innovation's Regional Innovation Support Programme (RISP). The regional innovation support programme aims to use innovation as a catalyst to foster development. However, the actual contribution of regional innovation network platforms (RINPs) to value co-creation is not adequately evidenced and understood.

The literature suggests that value co-creation can be realized through the innovation process's four highly collaborative phases: co-experience, co-definition, co-evolution, and co-development. To explore the question of how RINP ecosystems contribute to value co-creation, this research employed a qualitative approach. The research design methods involved content analysis and semi-structured interviews with key informants.

The study found that there are nuances found in the detail of each RINP's innovation-enabling activities, the structure of their governing bodies, and the various methods of joining the platforms. The study also found that there is limited knowledge among key actors about the national system of innovation and its role at regional level. The findings identify the necessary innovation practices and innovation capabilities to enable more effective RINPs. The study findings also suggest that the definition of "value" in RINP research differs from region to region based on assessing their innovation outputs. Ultimately, the study found that – notwithstanding the fact that South Africa has made major advancements in establishing RINPs across the country – some RINPs struggle to fully function owing to challenges such as a lack of human, financial and physical resources. The study provides practitioners and scholars with insight into how the regional innovation ecosystems can better contribute to value co-creation in South Africa.

KEY WORDS

Regional innovation system. Value co-creation. Regional innovation ecosystems. Regional innovation network platforms. Socio-economic development. Regional innovation support programme.

DECLARATION

I, **Tshegohatso Chifokoyo** certify that this research report is all my own work, except as noted in the acknowledgements and references. It is submitted in partial fulfilment of the criteria for the Master of Management degree in the discipline of Innovation Studies at the University of the Witwatersrand, Johannesburg's Wits Business School. It has never been presented for an exam or a degree at this or any other university.



Signature: ……

On the 20th of November 2023

TSHEGOHATSO CHIFOKOYO

DEDICATION

This study is devoted to God Yahweh for giving me the passion for socio-economic development and love for humanity. It is equally devoted to my wonderful husband for his unending patience and my parents for their unreserved expectation of me and their dedication to equip me with knowledge to pursue a better life and fulfil my role in society.

The research is also dedicated to all the contributors actively seeking to improve the lives of others through innovative contributions to the health of the ecosystem. May your love for humanity propel you to explore knowledge.

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LIST OF ABBREVIATIONS & ACRONYMS

FBDM	- Frances Baard District Municipality
COFISA	- Cooperation Framework on Innovation Systems (Finland and South Africa)
CSIR	- Council for Scientific and Industrial Research
DEDAT	- Department of Economic Development and Tourism
DSI	- Department of Science and Innovation
MOU	- Memorandum of Understanding
NCIF	- Northern Cape Innovation Forum
NW RISP	- North West Regional Innovation Support Platform
NCPG	- Northern Cape Provincial Government
NSI	- National System of Innovation
OECD	- Organisation for Economic Cooperation and Development
PGDP	- Provincial Growth Development Plan
PSC	- Project Steering Committee
PMU	- Project Management Unit
PPP	- Public-Private Partnerships
RP	- Respondent
RIS	- Regional Innovation Systems
RISP	- Regional Innovation Support Programme
RINP	- Regional Innovation Network Platform
RIE	- Regional Innovation Ecosystem
STI	- Science, Technology, and Innovation
TLIU	- Technology Localisation Implementation Unit

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CHAPTER 1: INTRODUCTION

The introduction chapter is a research summary that outlines the study's purpose, context, problem statement and significance. The chapter considers the limitations, research problems, and provides a list of main terms used and formatting of the research report.

1.1 PURPOSE OF THE STUDY

"Teamwork without coordination leads to confusion" - African Proverb

The goal of the research is to do an exploratory analysis for further comprehension of the structure of the regional innovation ecosystem (RIE) and how these actors interact to create value in regional innovation network platforms (RINP) in South Africa.

The study will explore value co-creation in regional innovation ecosystems through content analysis and one-on-one interviews with strategic regional innovation ecosystem actors and national experts in regional innovation network platforms in South Africa. RINP is a project of the Department of Science and Innovation (DSI), aimed at strengthening regional innovation systems (rural) through establishment of collaboration and networking platforms. The RINP initiative and others are approached with full recognition that strong regional innovation systems supported by government can boost the national innovation system (NSI) significantly (Rong et al., 2021). The RINPs have multi-sectoral actors comprising research and development institutions (RDIs), government, society, technology SMMEs and industry. The purpose of the RINP is to bring together multi-sectoral actors in creating a catalytic environment for innovation at regional level.

The study will be focused on regional innovation network platforms in the following provinces: Northern Cape, Limpopo and North-West, including national experts working in the regional innovation ecosystems. The context of the study is provided in the next section.

1.2 CONTEXT OF THE STUDY

Innovation systems represent a complex phenomenon that has been widely used. Katz (2016) states that such a complex system dynamically evolves in non-linear ways giving it unique properties that differentiate it from other systems and exhibiting activities that are indicative of self-organizing processes. Rigorous frameworks have been established in the last 30 years to improve the understanding and management of innovation systems (Lundvall, 1992; Freeman, 1985; Lundvall et al, 2009; Granstrand & Holgersson, 2020). The concept was refined by Lundvall and Freeman (1992, 1985) through economic and technological change evolutionary hypotheses. As recently as the early 1990s, regional innovation systems as a concept was diffused and adopted by policymakers and innovation scholars (Cooke, 1992; Lundvall, 2004). A regional innovation system is characterized as a collection of networking civic or commercial organisations or governmental players, which may include formal and informal institutions, that work according to their respective arrangements and connections that promote knowledge production, use, and dissemination. (Lundvall et al., 2009; Rong et al., 2021; Ritala & Almpanopoulou, 2017). A region is a categorization of space such that entities within one region are in some way distinguished from other entities that lie outside the region (or in a different region) (Montello, 2003). Regions can vary widely in size and scope, ranging from small local areas to vast territories (Vukovic & Kochetkov, 2017). The study identifies with a region in the context of the administrative regions defined by governmental boundaries for purposes of governance and administration, examples include provinces, municipalities, etc.

The study focuses on recently established regional innovation networking platforms (RINPs) which are funded by the Department of Science and Innovation. The RINPs are implemented through Regional (sub-national) Innovation Support Programme (RISP) at the Council for Scientific and Industrial Research's (CSIR). The RINPs mandate is to harness a knowledge driven economy through the facilitation of the regional innovation ecosystem by enabling and supporting technology innovation activities. This is achieved by bringing together technology SMMEs, industry, research development, innovation communities and government within a spatially bound

context. Regional innovation ecosystems are a key dimension that brings in a meso level that can connect the macro and micro dynamics of the innovation system dimensions. Thus, the study will employ a two-part value co-creation model approach that includes distinct but two overlying concepts: platforms and ecosystems. (Galbrun & Kijima, 2009; Kijima & Arai, 2016; Ketonen-Oksi & Valkokari, 2019).

Regional innovation systems contribute significantly to the national system of innovation (NSI) (Pogue et al., 2010; Raphasha, 2015). Similarly, the innovation ecosystem is a strategic driver of regional innovation (Thomas 2016; Rong et al., 2021). It is one of the recently emerging concepts and has become increasingly popular; attracting researchers, innovation scholars and practitioners to repeatedly adopt, modify and develop further (Ritala & Almpanopoulou, 2017; Granstrand & Holgersson, 2020).

The innovation ecosystem, as a theoretical framework, has evolved and especially increased in popularity over the last decade amongst scholars, practitioners, and policymakers, emerging from Schumpeter's view on innovation as a collaborative process (Schumpeter,1934; Rong et al., 2018). Based on ecology, Moore (1993) popularized the concept of business ecosystems, which was catalytic to a totally new perception of a business environment as a system that is mutually interdependent (Moore, 1993; Klimas & Czakon, 2022). There have since been literature reviews that have identified a variety of ecosystems such as business, knowledge, innovation, entrepreneurial start-up, platform, and service ecosystems (Valkokari, 2015; Ritala, 2017). A regional innovation ecosystem is a group of multi-sectoral stakeholders who collectively collaborate and evolve in uncertain conditions to attain continual technological innovation and development in the region. (Rong et al., 2021). The emphasis of this research will be on innovation ecosystems in the context of the provincial RINPs, focusing on practices in their respective regional innovation ecosystems which provide insight to the ecosystem's dynamic character. More so, it is found to be the most strategically orientated of ecosystems in comparison to the variety of ecosystems defined in prior literature (Granstrand & Holgersson, 2020).

The RIS has emerged as a novel concept within South Africa, thus remained an abstract approach to the role of regional innovation systems as a critical component to drive innovation for economic growth. It was not until a pilot collaboration in 2006 between governments of South Africa and Finland, designed to strengthen the effectiveness of the NSI, that the Cooperation Framework on Innovation Systems between Finland and South Africa (COFISA) established regional innovation systems as one of the prioritised policy objectives of South Africa (Pogue et al., 2010). Regional innovation systems were piloted in Gauteng, the Western Cape, and the Eastern Cape through the formation of innovation forums. The objective was to improve collaboration among important stakeholders and to pilot a functional and long-term support framework to enable and foster innovation for higher socioeconomic growth and development in the three targeted regions (Pague, 2010). COFISA ended successfully in 2010 adding significant value to the NSI (Pague, 2010), propelling South Africa towards the development of a multi-level innovation system.

However, this study focuses on the Northern Cape, North-West and Limpopo provinces, that are currently supported and facilitated by the Council for Scientific and Industrial Research (CSIR) in backing DSI's Technology Localisation Plan (TLP) which is implemented by Technology Localisation Implementation Unit (TLIU). TLIU supports the implementation of the regional innovation network platforms (RINP) through the Regional Innovation Support Programme (RISP). The Regional Innovation Support Platform's core mandate is to build and support technology innovation ecosystem within a specified boundary or region, through the promotion and support of technology entrepreneurship and innovation. The DSI is the direct line of management responsible for science, technology, and innovation, thus an increase of various initiatives to improve and grow the national system of innovation (DST, 2019).

The Northern Cape, North-West and Limpopo provinces to some extent share multiple characteristics such as high levels of unemployment, climate change and service delivery challenges. A brief analysis of each province and its respective innovation landscape is provided. In addition to promoting an entrepreneurial and innovation driven society, the study aims to encourage provinces to adopt a culture of co-creation and provide a guide for best practices or common characteristics of regional innovation

ecosystems in South Africa. This may ultimately boost socio-economic growth that is anchored on the sustainability pillars of economy, society, and ecology.

Table 1.1: Socio-economic profiles of the three focus provinces (Source: Stats SA, 2016, 2022)

	Northern Cape	**North-West**	**Limpopo**
Population	1.3million	4.1million	5.9million
Unemployment Rate	26.4%	39%	31%
Households in Poverty	8.8%	6.6%	11.5%
Main Economic Sector	Mining (19%)	Mining (30%)	Mining (25%)

The Northern Cape is the largest province by land size and most sparsely populated. North-West recorded the lowest increase in the number of employed persons at 8 000 and has an unemployment rate above national unemployment rate (Statistics SA, 2016; 2022). Northern Cape had the biggest year-on-year change in employment with an increase of 17,6%, followed by Limpopo with increases of 16,7% (Statistics SA, 2022).

Out of the nine provinces, the DSI is supporting seven regional innovation network platforms across seven provinces: Northern Cape, Eastern Cape, Limpopo, Gauteng, Western Cape, North-West, and Free State. In addition, in all three provinces the study focused on, both agriculture and mining are the main economic drivers. Thus, leveraging technology innovation for priority socio-economic growth and development has the potential to enable 'catch-up' with the other provinces, especially those with functional innovation systems. The RISP supports and enables technology SMME development, particularly youth, women, and persons with disabilities in the ecosystem.

'

The study to be undertaken aims to explore the regional innovation network platforms and aims to gain more insight into the dynamic interactions within the innovation ecosystem, and the hoped-for outcome that value co-creation will occur.

All the reports and content on regional innovation ecosystems is based on the 2021/2 year, thus, contextual application might vary owing to the dynamic nature of innovation ecosystems.

1.3 RESEARCH PROBLEM STATEMENT

South Africa has made strides with the NSI; it is however fragmented and divorced from the regional systems of innovation (UNDP, 2020). The White Paper on Science, Technology, and Innovation (2019) provides minimal detail in the significant role that regional innovation systems can play within the NSI, nor has it provided a strategic framework for the provinces to take guidance from establishing their regional innovation systems to address development challenges. Various reviews have pointed out that the South African innovation effort is fragmented, government departments do not work together and there are insufficient linkages between government and business to optimally drive innovation (DST, 2022). The current policy environment is typified by misalignment between government policies and the use and adoption of STI. This manifests in the lack of infusion and expression of innovation in sectoral policies (DST, 2019). Thus, the Department of Science and Innovation in partnership with provincial and local stakeholders has over the past 10 years been involved in the implementation of innovation activities and systems at sub-national level. This is primarily through strengthening collaboration between Research and Development institutions, industry, government, and society, to catalyse Public-Private Partnerships (PPPs) at regional level to create (or support) technology-intensive companies; and to foster networking between innovation stakeholders within specific regions (TLIU CFP, 2021). Regional innovation systems play a critical role in coordinating economic activities at the meso level, an institutional infrastructure that supports and produces innovation within a regional production structure (Borras & Lundvall,1999; Pino & Ortega, 2018).

Technological innovation has become a key feature in emerging markets, encouraging inclusive economic growth, and allowing developing countries to address pressing development issues. Small, Medium and Micro-Enterprises (SMMEs) in South Africa

contribute approximately 30% of the GDP and employ over 45% of the country's labour force (OECD Library, 2021). The sector pays 6% in corporate taxes (OECD Library, 2021) and contributes a little under a third of total turnover in the formal business sector (Stats SA, 2020). Technology SMMEs in the regional ecosystems do need the innovation support provided through the RISP given challenges faced by SMMEs in South Africa; the sector is faced by complex regulatory frameworks, lack of access to finance, weak policy, inadequate infrastructure, lack of skills and knowledge shortage (OECD Library, 2021). According to the South African Business Innovation Survey 2019-2021, less than two-thirds of businesses were innovation-active during 2019-2021 and a significant proportion had innovation activities that did not result in product or process innovations (Centre for Science, Technology and Innovation Indicators, 2024). The impact of the Covid-19 pandemic on SMMEs should be considered as the difficult business environment required them to adjust their innovation strategies to cope.

A functional support ecosystem is required to foster development; the role of multiple actors and practices for value co-creation within a regional innovation ecosystem is recognised with minimal details on the specific role or activities required to create the output that is innovation. There is variability in understanding and implementation across different regions, sectors, and levels of governance of innovation as a process that is made up of diverse multiple actors, particularly in the context of regional innovation ecosystems in South Africa (Ketonen-Oksi and Valkokari, 2019; Rong et al., 2021). The 2019 STI White Paper states, over the past 25+ years, considerable effort has been made to support innovation. However, the support has been biased towards research and development organisations, higher education and training institutions, and public research institutions. This bias came at the expense of the rest of post-school education institutions (such as CET colleges), community-based and non-profit innovation support organisations, SMMEs, civil society (DST, 2019). South Africa is certainly following the lead of countries regarded as competitive in innovation such as Finland, which is evident in the COFISA collaboration. Finland has been receptive to regional and innovation theories from the 1960s growth pole and regional welfare policies to the more recent regional innovation systems. The country followed these policy trends until the 1980s, but many claim that Finland is a trend-setter in

current regional innovation policy practice (Jauhiainen, 2009). In the United States, there are two successful innovation driven regions, Silicon Valley and Route 128 in Boston although they possess quite different patterns and characteristics (Őnday, 2016).

Efforts to strengthen understanding and implementation of RIS should focus on addressing these variabilities through targeted policy interventions, capacity-building initiatives, and fostering collaboration between different stakeholders.

1.4 SIGNIFICANCE OF THE STUDY

The study aims to contribute to further understanding of value co-creation in regional innovation ecosystems in South Africa. The study will also build on the empirical work theory of regional innovation ecosystems and will seek to contribute to the National Development Plan and the United Nations Sustainable Development Goals.

There is intent to create functional regional innovation systems across provinces, to support the coordination and effectiveness of the NSI. In addition, innovation policy is geared towards transformational innovation policy (TIP), which is a decentralised, region-driven strategy that encourages knowledge co-creation (Daniels, 2020). Thus, it is timely and relevant to embark on an exploratory study on the recent emergence of technology-driven regional innovation network platforms (RINPs) across South Africa.

Innovation is a collaborative process, with some scholars stating, ‘without innovation, a society cannot evolve and develop’. Surugia and Surugia, (2018); Schumpeter, (1934); and OECD, (2017), similarly introduce collaborative co-creative ways of working together Co-creation is a form of social innovation; a process or method of active participation of various key stakeholders working towards new or improved ideas (Eckhardt et al., 2021). Thus, the study will provide regional innovation network platforms with further understanding of practices that shape the regional innovation ecosystems through value co-creation; in addition, providing an alternative approach to resolving relevant and pressing socio-economic issues together with society,

allowing for a bottom-up approach to creating value collectively for development and economic growth.

The research seeks to assist and inform actors in the knowledge driven economy, namely, the DSI and related innovation agencies, RINPs and policymakers in profiling the regional innovation ecosystems by providing understanding on how value is co-created among ecosystem actors in a RINP.

1.5 DELIMITATIONS OF THE STUDY

The research is focused on innovation activities for value co-creation in regional innovation ecosystems of regional innovation network platforms in the Northern Cape, North-West and Limpopo province. The study is also focused on three of the nine provinces, which do not have any metropolitan cities. The study focuses on the narrow view of regional innovation ecosystem which is at a meso level on the innovation system. The Northern Cape, North-West and Limpopo province were selected owing to demographic and socio-economic similarities, and because of their common absence of the regional innovation strategy or policy at the time when the study was conducted. Therefore, the research outcomes may not be applicable to another region or province within or outside the borders of South Africa.

1.6 ASSUMPTIONS

According to Creswell (2007), one captures a good qualitative study through the interconnectedness and interplay among the approach to inquiry, research design, worldviews, theories, and assumptions. Assumptions of the study verify the validity of the study, ensuring comprehension of the research problem and research findings.

To further understand value co-creation in regional innovation ecosystems, the researcher makes the following assumptions:

- Regional innovation ecosystems comprise of finance institutions, industry, academia, government, technology SMMEs and civil society.
- The lead facilitating actor is responsible for driving the platform and coordinating the ecosystem; cooperative or noncooperative behaviour between the lead facilitator and actors is real time. At any stage this responsibility can shift when the ecosystem requires the formation of a new cooperative relationship (Chen et al., 2021).

1.7 DEFINITION OF KEY TERMS

- **Value Co-creation:** Value co-creation is the joint, collaborative, concurrent, peer-like process of producing new value, both materially and symbolically (Galvagno and Dalli, 2014).

- **Regional Innovation Network Platforms:** Refers to Technology Localisation Implementation Unit (TLIU) supported innovation platforms at the sub-national level with the objective of strengthening regional innovation systems through establishing cross sectoral networking platforms to bring together multi-sectoral stakeholders such as research, development and innovation communities, technology SMMEs, industry and government (TLIU, RISP CFP, 2021).

  National System of Innovation (NSI): "... that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies" (Metcalfe, 1995).

- **Regional Innovation System (RIS):** A set of interacting private or public actors, including formal institutions and other organisations that operate

according to their respective arrangements and relationships conducive to the production, use and dissemination of knowledge (Doloreux, 2003).

- **Regional Innovation Ecosystem:** A sub-national level system of innovation actors encompassing institutions, private organisations, society, government, and other socio-economic structures that dynamically interact and co-evolve with each other, and the uncertain environment, to achieve ongoing technological innovation and development (Rong et al., 2021).

- **Region:** The concept of a region is not constrained by a specific size but rather defined by homogeneous characteristics and a degree of internal cohesion. Generally, a region is considered a spatial entity at a subnational level that meets specific criteria and operates within a governance framework. Regions can be categorized as homogeneous, functional, or administrative entities.

1.8 RESEARCH QUESTIONS

The overarching research question is: How do regional innovation network platform ecosystems contribute to value co-creation?

The main question is refined through the following sub-questions, addressed in the research study:

- What are the innovation practices that enhance value co-creation in the respective regional innovation ecosystems?
- What are the required innovation capabilities for an effective regional innovation ecosystem?
- How is value defined and how are the innovation outcomes measured in regional innovation ecosystems?

1.9 OUTLINE AND STRUCTURE OF THE REPORT

Chapter 1: Introduction

The first chapter provides the reader with background and context of the research study.

Chapter 2: Literature Review

This section highlights the theoretical and conceptual frameworks that the study is seeking to investigate. The theoretical and conceptual framework of regional innovation ecosystems is reviewed in the context of regional innovation network platforms (RINP) in regional innovation systems.

Chapter 3: Research Methodology

The third chapter consists of the methodology followed in collecting data for the research, providing the reader with the processes involved, details of participants and the type of data collected. A qualitative research approach with semi-structured interviews and document analysis will be used.

Chapter 4: Research Findings and Data

This chapter represents the findings from the study.

Chapter 5: Analysis of the Research Findings

Chapter five discusses the study findings; the analysis will be a comparison of the literature review and the research findings.

Chapter 6: Conclusions and Recommendations

This section focuses on concluding the study and is followed by recommendations for the regional innovation ecosystem actors.

1.10 CONCLUSION

The first chapter highlighted the research focus area and provided a background with the problem statement and purpose of the research study. Key terms used in the context are defined and delimitations of the study were detailed. The significance and

assumptions of the study were highlighted. In addition, the chapter presents the outline structure of the remainder of the research report.

The second chapter involves regional innovation systems, their sub-systems, and presents a literature review providing a foundation for the study.

Chapter 2: LITERATURE REVIEW

2.1 INTRODUCTION

The aim of this chapter is to provide a critical review of the underpinning theoretical frameworks used for the study, namely, regional innovation systems and regional innovation ecosystems. Value co-creation is the conceptual framework used. A literature review on the theoretical and conceptual frameworks is outlined below.

2.2 VALUE CO-CREATION

One of the ways multiple stakeholders can collaborate is through value co-creation, it is defined as a collaborative and peer-like process, method or service by diverse ecosystem actors producing new value (Brandsen & Honingh, 2018; Ketoketn-Oksi and Valkokari, 2019). Value co-creation comes from a service dominant logic (Vargo et al., 2008), a systemic view of value co-creation has emerged in recent years, replacing supplier driven value chains with value networks that consist of all stakeholders (Ketoketn-Oksi & Valkokari, 2019).

Value co-creation is a participative innovation activity that changes the way things are done irrespective of context; driven from a bottom-up approach (Kumari et al., 2019). It involves the collaboration and experimentation of multi-disciplinary actors. Value co-creation is not rigid, making it applicable to multiple contexts and dynamics (Eckhardt

et al., 2021). Co-creation as a concept was initially proposed in academic literature more than ten years ago (Prahalad & Ramaswamy, 2000). Shortly thereafter (2004) the same authors used the term value co-creation, describing the process of value co-creation initiated by a dissatisfied customer determined to act against available choices.

Value co-creation in the context of regional innovation ecosystems involves independent and interdependent actors (civil organisations, universities, private firms, venture capital and government), represented by multi-sectoral firms or organisations that have different educational and cultural backgrounds. Actors participate in value co-creation for various reasons (Siaw & Okorie, 2022), such as reputation enhancement, stakeholder management and innovation. Purpose and goals are key attributes of networking, which also characterise innovation in the RINPs (Jacobs et al., 2022).

2.2.1 Defining Value

Ecosystem actors could individually have different goals although mutually shared interests to their diverse peers and contribute varying degrees of resources to the innovation process. Thus, value will at times be misaligned, differing from actor to actor (Pera et al., 2016). What is value co-creation for either of the RINPs, is it translation of jobs, community development, intrinsic, economic, or financial growth? An understanding of the expected outputs is necessary for the innovation ecosystem to evolve over time, which provides a benefit of facilitating shared resources (Ketonen-Oksi & Valkokari, 2019).

2.2.2 Importance of Regional Innovation Ecosystems

South Africa and the world at large have embarked on a journey to address sustainable development issues driven by each individual country's strategic imperatives. The 2030 Agenda for Sustainable Development (United Nations, 2015), adopted by UN members in September 2015 is grounded on the three pillars of sustainable development, namely, the social, environmental, and economic. The 17 transformational and ambitious SDGs are a collective plan of action to eradicate

poverty and reduce the effects of climate change, including the goal to achieve global peace. Goal 9 is about building resilient infrastructure, promoting inclusive and sustainable industrialisation, and fostering innovation (United Nations, 2015). Inclusion of goal number 9 is indicative of the common understanding that sustainable development is unattainable without technological innovation, and the mass dispersion of innovation across the world. Innovative development is the most important condition for overcoming the gap between the developed versus the developing countries, which significantly enhances the socio-economic profile of the country (Pidorycheva et al, 2020).

2.2.3 Significance of the South African Context

The NDP outlines a long-term development path towards a prosperous and successful economy characterized by high levels of economic growth, employment generation and an equitable society. Both the New Growth Path and the Industrial Policy Action Plan outline the government's industrial development agenda and the critical jobs drivers, prioritised industrial sectors and a range of interventions required to accelerate economic growth, create jobs, and fight poverty and under-development (NDP, 2012). One of the seven South African government's priorities is to transform the economy into a globally competitive industrialised economy, in line with the 2030 Agenda for Sustainable Development Goals (SDGs). Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987).

"I am not self-sufficient alone. We are self-sufficient in community" (NDP, 2012, P.43).

South Africa as a developing country adopted the NSI to improve socio-economic conditions; thus, it is more fitting to use a holistic definition of innovation ecosystem in the context of regional innovation systems. The COVID–19 pandemic not only upended the individual lives of South Africans, but also hindered economic growth and increased the pressure on the South African dual economy, in addition to the country's three socio-economic challenges, namely, poverty, unemployment and inequality. By

the third quarter of 2022, the size of the economy exceeded pre-pandemic levels. Real gross domestic product (GDP), measured by production, was R1 161 billion, which is above the previous peak of R1 152 billion recorded in the fourth quarter of 2018 (STATSSA, 2022). The World Bank (2018, 2022) identified South Africa as one of the most unequal countries in the world, a complexity that was perpetuated by a legacy of apartheid, high income inequality and unequal opportunities for children and youth. Despite its natural wealth, South Africa with a population of more than 60.6 million has a 34.5% unemployment rate, 10% of the population owns more than 80% of the wealth and the poor and vulnerable continue to have limited access to basic public services (General Household Survey, 2021; STATSSA, 2022). Although South Africa has made progress since independence, poverty is at levels not seen for more than a decade, inflation has increased to a 13-year high and unemployment amongst youth aged between 15 and 24 years is at 66.5% (World Bank, 2022).

Russell et al., (2011) broadens the definition of innovation ecosystems as a network of multi-sectoral actors through which resources flow to create sustainable value co-creation. Resources include knowledge, information, skills, and funding; whilst the network encompasses the political, economic, environmental and technological systems of innovation where business growth is supported. The Schumpeterian view is one that innovation is a collective effort, one requiring collaboration and 'co-creation' of actors (Schumpeter, 1934). Thus, innovation is a fitting tool for growth by collectively addressing national and global development challenges.

2.3 REGIONAL INNOVATION SYSTEMS

Niosi previously suggested that defining RIS should be preceded by the definition of region (Niosi, 2000). This section starts by defining region in the context of RIS and innovation systems.

2.3.1 Region: The locus of innovation

Regions are a fundamental geographic concept (Folch, 2014). A region is defined as a "territory in which the interaction between the market actors and flows of goods and services create a regional economic system whose borders are determined by the

point at which the magnitude of these interactions and flows change from one direction to another" (Andersson & Karlsson, 2004). It is the networks of actors within the ecosystem located in proximity within clusters or specified region that drives innovation. According to Pino and Ortega (2018), a region is beyond a geographical space, as it is recognized as a vital jurisdiction for innovation. Some scholars highlight the instances where the unique social and, in some instances, unspoken type of innovation produced accumulatively from the localised knowledge, skills, and learning is inherent to the region owing to geographical proximity (Asheim & Gertler, 2005; Acs, 2000; De la Mothe & Paquet, 1998).

In consideration of the newness of the concept of region, it is important to note that regions are also affected by their socio-economic and political composition such as budgetary responsibilities, capacity, and political orientation (Christopherson & Clark, 2007). The study focuses on the provincial dimension of region according to its administrative, spatial closeness and geographic boundaries, as well as a sense of place, social and linguistic community.

2.3.2 Defining RIS

There is no one definition of regional innovation systems. However, for the purpose of this study it is defined as a set of interacting private or public actors, including formal institutions and other organisations that operate according to their respective arrangements and relationships conducive to the production, use and dissemination of knowledge (Doloreux, 2003; Lundvall et al., 2009; Rong et al., 2021; Ritala et al., 2013). The territorial concept was inspired by Freeman (1987), Lundvall (1992) and Nelson's (1993) initial work on the national level of innovation systems. The national innovation systems approach reflects the economic role of knowledge and the increased attention it has received (OECD, 1997). Regional innovation system is based on the systematic approach to innovation and is the meso level of the complex and multi-dimensional innovation systems. Regional innovation systems are based on the similar rationale as national innovation systems, which focuses on territorial based innovation systems (Asheim & Gertler, 2009; Pino & Ortega, 2018).

There are two different perspectives of innovation system research, the narrow view, equating innovation to science and technology, and a broader view encircling learning,

innovation, and competence building (Lundvall 1992; Lundvall, 2007; Asheim & Gertler, 2009). The narrow view of innovation systems is aligned to the science, technology, and innovation mode of innovation which is based on research and development (R & D) outputs.

Regional innovation systems were first published by Cooke (1992), the initial concept development focused on regional science and economic geography (Asheim & Coenen, 2005; Cooke, 2001; Cooke et al., 1997). Literature on RIS has been of great interest, where four distinct elements have been identified (Kiryushin et al., 2013). The elements are knowledge generation and diffusion subsystem, knowledge application and exploitation subsystem, regional policy, and socio-cultural factors. Figure 2.1 shows the four components of RIS:

1). *knowledge generation and diffusion subsystem*, which includes research institutions, such as universities, colleges, and science & technology parks;

2). *knowledge application and exploitation subsystem*, which includes firms located within the region including other regional actors; and

3). *regional policy subsystem*, includes structural elements such as economic factors (sector and firm size), local public authorities such as local or regional municipalities, government department and other institutions (Fröhlich, 2010).

4). *socio-cultural factors*, which include laws, regulations, behaviour, and habits (formal & informal) of institutions.

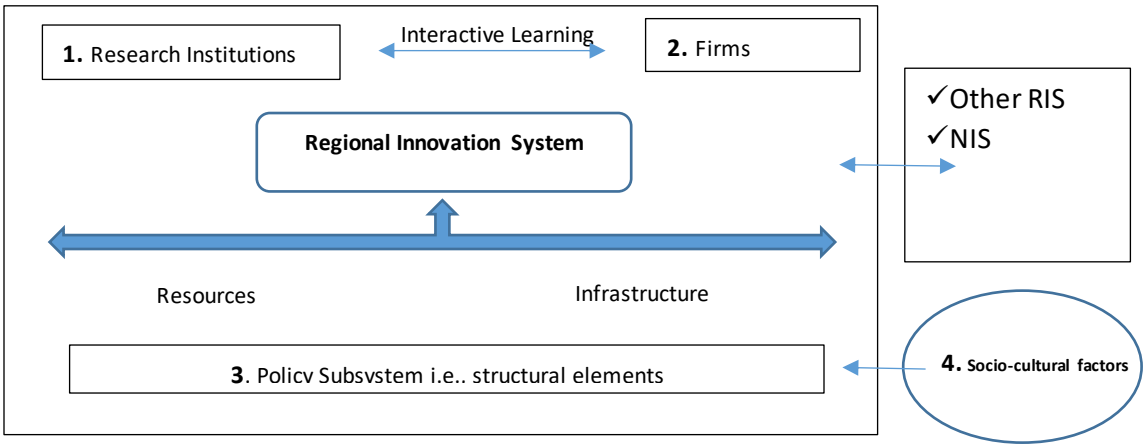


Figure 2.1: Components of RIS (Source: Author)

The innovation resources and infrastructure (banking, health, network, etc.) are positioned to support innovation enablement within the regional context. Regional innovation systems where firms and other organisations are systematically engaged in interactive learning through an institutional context increase the chances for regions to innovate (Cooke, 1997). According to the innovation system approach, analysis should be focused on the creation, diffusion, and use of knowledge as information and competence. This implies focusing on interactions between socio-economic structures and institutions that support competence and capacity building for innovation (Kuhlmann & Arnold, 2001; Lundvall et al., 2009).

An innovation system is more than multiple relationships among actors involved in innovation (Lundvall, 1992). The team-like nature associated with innovation contains some degree of interdependent relations among actors, which is reflective of the systemic dimension of regional innovation systems, aiming for continuous learning capacity in the region. Institutions and organisations are critical components of the RIS, with the varying regions characterised by the role played by institutions in assisting with the creation of networks and linking organisations within the system (Whittington, Owen-Smith & Powell, 2009; Pino & Ortega, 2018). Universities and research institutes are identified by various researchers as important for the learning process and knowledge based RISs (Jiao et al., 2016; Benneworth et al., 2017; Pino & Ortega, 2018), addressing regional needs through research, academic personnel and creating a culture of innovation in societies. Institutionally thin RIS are usually located in less urbanised regions and are characterized by SMEs with minimal innovative capacity and lack of support organisations as compared to urbanised regions. Institutionally thick regions, by comparison, are often located in metropolitan areas. SMEs in these regions benefit from a stronger network of support institutions, interactions are frequent and results in high levels of innovation (Chimanade, 2011). All three RINPS under focus in the study are in less urbanised RIS.

It is the nature of interactions and communication between the actors that will help enable improved innovation performance. The interactions between actors in such a system requires a process of feedback and reciprocity (Chaminade & Edquist, 2010). The role of government is to create an enabling environment, in terms of encouraging collaboration and technological development through the appropriate regulatory and

political frameworks; universities and research institutes create and supply technical capacity and knowledge for firms to innovate (Benneworth, Pinheiro & James, 2017); while private firms contribute to the RIS via capital investments for innovation, generate demand and manage supply to customers (Zhao et al., 2015).

"If you want to go fast, go alone, if you want to go far, go together."

– African Proverb

The regional innovation system is a new concept in South Africa, so the approach to the role of regional innovation systems as a critical component to drive innovation for economic growth has remained an abstract one.

Acknowledging the multi-dimensional characteristic and two perspectives of the innovation system concept, this study focuses on the regional level and the narrow view of innovation systems. Although national level is the one that provides explicit differences between the narrow and broad view of innovation systems (Lundvall et al., 2009). The Regional Innovation System offers the framework to identify the type of elements (actors, social capital, resources, institutions, structures, and organisations) involved in the diffusion of new technologies and infrastructures to support innovation and regional development at an institutional level (Andersson, 2013). There has been more focus on the systematic and static view of RIS. Thus, the study seeks to explore the dynamism of innovation ecosystems, particularly the crucial linkages and collaborations created among actors that accelerate technological change and innovation processes (Rong, 2021).

2.4 REGIONAL INNOVATION ECOSYSTEMS: CONCEPTS AND COMPONENTS

The RIE is defined as a sub-national level system of innovation actors encompassing entrepreneurs, academia, public sector, private sector, financiers, entrepreneurial support organisations, and civil society who dynamically interact and co-evolve with each other, and the uncertain environment, to achieve ongoing technological innovation and development (Rong et al., 2021).

2.4.1 Metaphor in Innovation Ecosystems

For improved understanding of business' collaborative and competitive levels, the ecosystem concept is an ecological metaphor in management literature introduced by Moore (1993; 2009). Moore's concept inspired the innovation ecosystems concept, followed by various other types of ecosystems, for instance, the service ecosystem, entrepreneurial ecosystem, and the platform ecosystem (Adner, 2017; Rong et al., 2020). Platform ecosystem is a recent concept; thus, the study will not focus on it but on innovation ecosystems.

In recent years, some scholars argued that the ecological metaphor used contains inconsistencies and confusion with the term 'innovation ecosystems' (Oh et al., 2016; Ritala & Almpanopoulou, 2017). Simultaneously, for the purposes of theory development, the concept attracted researchers to seek improved understanding of the prefix 'eco' in ecosystems (Oh et al., 2016; Autio & Thomas, 2019). The ecological comparison is thought to have been utilized in the context of innovation owing to its nature of flexibility, ecosystem level output, heterogeneity, interdependence, and co-evolution of actors, except for distinctive governance.

The innovation ecosystem is a controversial concept. For instance, the utilization of the concept of innovation is a prominent feature of literature. There is no defined or consistent definition of ecosystems study (Granstrand & Holgersson, 2020; Ritala & Almpanopoulou, 2017; Oh et al., 2016). Simultaneously, some researchers maintained the relevance of the innovation ecosystem concept, especially if it is well defined and went as far as extending the definition of innovation ecosystems (Granstrand & Holgersson, 2020). For further theoretical contribution, the study will focus specifically on the exploration of the theoretical framework of regional innovation ecosystems and its dynamism (Rong et al., 2018). Thus, for coherency, researchers proposed that usage of the term innovation ecosystems ought to be limited within the boundaries of innovation activities or processes (Autio & Thomas, 2019; Ritala & Almpanopoulou, 2017).

One of the inconsistencies highlighted in the use of the ecology approach is that governance is a characteristic that is lacking in natural ecosystems as there is an absence of regulatory framework or policies for their activities. Innovation ecosystem is a term loosely used; at times it is not within context and thus loses its true meaning

and intent. Governance is key to coordination of an effective innovation ecosystem (Rong et al., 2020) and it is one of the weaknesses found in developing countries (Adams et al., 2019). Researchers have also highlighted some of the challenges present in the development, and co-evolution of regional innovation ecosystem actors (Rong et al., 2021).

2.4.2 Components of RIE

Capital, skill, and technology are critical components of an innovation ecosystem (Hunter et al., 2020). A flourishing ecosystem requires actors with access to technology, actors with the correct mix of technical and soft entrepreneurship abilities, and actors with the right motivation. The innovators and SMMEs will require access to capital to develop and commercialise their ideas.

2.4.3 Linking Value Co-Creation and Regional Innovation Ecosystems

Additionally, to the basic elements of a successful innovation ecosystem stated earlier in the business ecosystem concept literature, a regional innovation ecosystem necessitates collaboration (Moore, 1993; Radziwon & Bogers, 2019). The innovation ecosystem framework provides an understanding of the underlying dynamic and holistic phenomena of the functioning of relations among actors within an innovation system Thus, it is of great importance and relevance to gain improved understanding of the dynamism of ecosystem development (Rong et al., 2021), which will stipulate empirical evidence on the interactions of actors in the regional innovation ecosystems.

The concept of value co-creation emphasises the importance of effective collaboration among the ecosystem actors (Bal, 2019). With this approach, various actors are afforded the chance to participate in the idea-generation process. Thus, value co-creation is suitable in the RIE in the setting of RINPs, considering that innovation is a collaborative process requiring active participation among diverse actors to create value. The regional innovation ecosystem's collaboration is organised through the multi-sectoral actors, which encompasses academia, administration, civil organisations, private and public actors working together to improve quality of life for all citizens.

2.5 REGIONAL INNOVATION ECOSYSTEMS IN SOUTH AFRICA

2.5.1 Overview of South Africa's Innovation Landscape

In accordance with the UN Development Programme (2020), South Africa possesses the required mechanisms and systems, including a creative commercial sector and outstanding research institutes. Collaboration, coordination, and interaction among ecosystem actors are essential areas for improvement in the national innovation system (UNDP, 2020). In South Africa, there is a misunderstanding of the concept of innovation (Kahn, 2013), and there is a perception about innovation being related to ICT (Hart et al., 2015).

There is an absence of current and feasible ecosystem maps to conduct sound analysis of the innovation environment at the regional and local government levels. However, progress toward mapping provincial ecosystems is seen through the efforts of the Human Science Research Council, for example, the (HSRC) is actively charting rural innovation systems utilizing their Local Innovation Advancement Tools (LIAT).

South Africa has long played a pivotal part of the international innovation ecosystem, resultant in the development of numerous products that have influenced the world of innovation. The first heart transplant in history, as well as the discovery of the Computed Axial Tomography (CAT) scan are two of South Africa's groundbreaking innovations.

2.5.2 Overview of Regional Innovation Ecosystems in South Africa

This paper concludes a review of the theoretical and conceptual foundations of regional innovation ecosystems in the context of regional innovation network platforms in South African regional innovation systems. As a result, RINP and RIE are terminologies that are used interchangeably. In 2021, South Africa has 9 RINPs backed by the Technology Localisation Implementation Unit spread throughout 8 provinces. Through several projects, the DSI intends to build the NSI. As a result, another of the DSI's strategic goals is to support and expand regional and local (rural) innovation systems through catalytic mediations (DST, 2020). This is founded

on the premise that great NSIs are built on the foundation of effective regional innovation systems.

The Council for Scientific and Industrial Research hosts the TLIU, which is a DSI program. TLIU oversees carrying out the DSI's Technology Localisation Plan deliverables. Furthermore, through the RISP Project Management Unit (RISP PMU), TLIU implements the Regional Innovation Support Programme on behalf of the DSI and implements innovation support interventions (see figure 2.4 below) such as feasibility study/business plan support, innovation baseline studies, and regional innovation network platforms. Feasibility studies are carried out to evaluate the viability of mechanisms that enable innovation for example Innovation Hubs, Science and Technology Parks, and so on. The intention of the innovation baseline studies is to evaluate and probe the state of readiness and effectiveness of regional (provincial and local) innovation systems.



Figure 2.2. RISP elements of Support (Source: TLIU CFP, 2021)

Regional Innovation Networking Platforms strive to boost location-bound innovation systems by developing networking platforms that bring multi-sectoral actors together to collectively harness technological innovation. These regional innovation network platforms should leverage the spatial closeness of multiple innovation stakeholders (with matching resources and expertise) to foster a conducive setting for growing science, technology, and innovation (STI) for socioeconomic development; support

technology-based SMMEs through bottom-up innovation enabling activities; and build innovation capabilities in stakeholders while promoting inclusive economic growth.

The primary goal of the RINP should be to initiate and implement projected innovation-driven programs aimed at stimulating the respective regional economies through job creation, industrialization, and regional capacity development. The RINPS will offer structured and relevant innovation capacity-building programs such as innovation-related interventions, mentorship programs, technical training, networking, and seminars among other things. The interventions are intended to improve innovative capacity. The initiative, however, does not fund business incubation or SMME development services.

The role of the RINP is to clearly outline the steering committee stakeholders, including the lead institution and platform facilitator. The RISP project steering committee (PSC) (Figure 2.3) governs the RISP. The DSI and RISP PMU office is to be represented in the project steering committee. A governing structure should be in place as early as possible as it establishes a set of rules and regulations to ensure that everyone involved follows the same procedures and guidelines (Pogue et al., 2010).

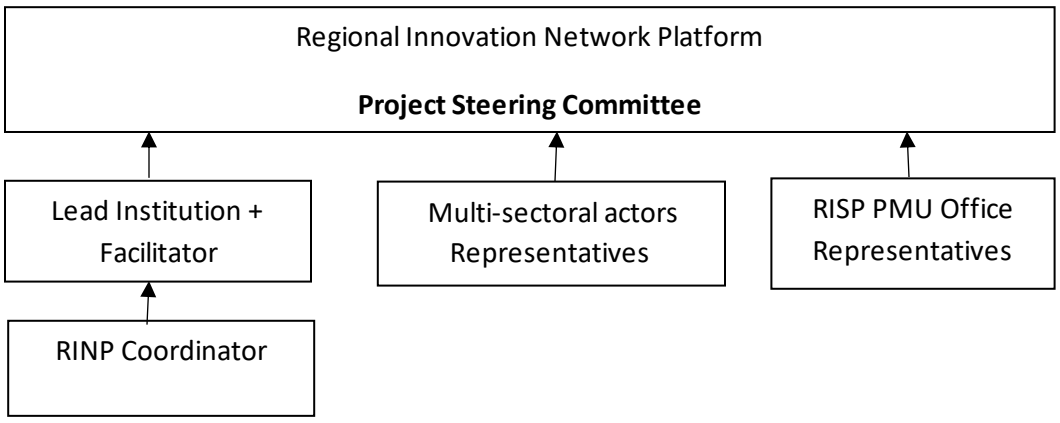


Figure 2.3: Typical RINP governance structure (Source: Author)

To meet the RIS program application criteria, RINPs must map prospective actors, and key local and global partners. The number of connections, partnerships, and

collaborations among institutions of Science, Technology, and Innovation (including institutions beyond the region), all levels of government, civic organizations, and industries (including SMMEs, innovators, and inventors) are all necessary. Each of the participants is critical to the ecosystem's success, notably the connection between innovation and socioeconomic progress.

The TLIU requires that the funded RINPs use the quadruple-helix model of innovation to accomplish the mutual goal of socioeconomic progress (CFP RISP, 2021). Academia, the commercial sector, civil society, and government are all involved in the quadruple-helix model. This is in line with the White Paper on Science, Technology and Innovation's objective of increased NSI partnering between business, academia, government and civil society (DST, 2019).

2.5.3 Key Actors and Stakeholders in South African Ecosystems

The triple helix model of innovation concept initially was developed as an intellectual response to the emerging knowledge-based economy in the early 1990s, by scholars, Etzkowitz (1993, 1994) and Leydesdorff (1994). The scholars simultaneously explored new ways of looking at the dynamics in regional innovation, highlighting the role of academia and organised knowledge production, until they jointly developed the concept of the triple helix model of academia, industry and government interactions.

The transition from the triple helix to the quadruple helix model in 2006 was an evolutionary process to reconceptualise society in the twenty-first century and to allow better interpretation of the ecosystems of innovation (Carayannis et al. 2018, Cai and Lattu, 2022). Carayannis and Campbell (2010, 2020), who are considered the founders of the model developed it as a response to the transformation towards Society 5.0, which 'aims to put human beings at the centre of innovation, taking advantage of the impact of technology and the results of industry 4.0 with the deepening of technological integration in improving quality of life, social responsibility and sustainability. Thus, the Quadruple Helix model was developed by adding a fourth helix, defined as 'the media-based and culture-based public and civil society' (Carayannis & Campbell, 2012, p.13). The fourth helix illustrates that in a modern

knowledge society and economy, aside from academia, industry and government, knowledge flows into all spheres of the society and the innovation ecosystem.

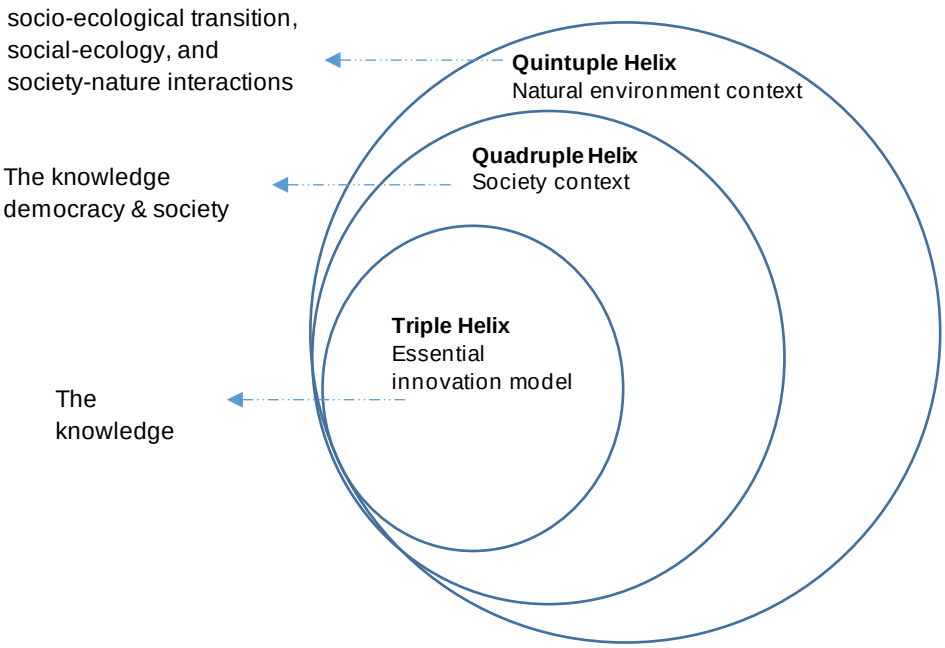


Figure 2.4: Innovation Helices Socio-Ecological Transition (Similar to Carayannis et al., 2022)

One of the misunderstandings is equating the triple helix model to an innovation system, this is commonly seen in innovation studies (Arranz et al. 2020; Porto-Gomez et al. 2019). In addition, in South African policy discourse the 'triple helix' concept is often used interchangeably with the NSI. However, Etzkowitz and Zhou (2017) emphasised that the triple helix goes beyond innovation systems theory in that the innovation system has its theoretical root in general systems theory, whereas the triple helix model is grounded on Simmel's triadic interactions as an Occam's razor principle. As Leydesdorff (2012: 25) asserted, 'Using the Triple Helix model of university, industry and government relations, one can measure the extent to which innovation has become systemic instead of assuming the existence of national (or regional) systems of innovations on a prior grounds'. Although the founders of the triple helix model try to avoid mixing the model with the concept of the innovation system, their

elaboration on the differences between the triple helix model and the innovation system occurs on an abstract level (Cai & Lattu, 2022). This may explain why many scholars and practitioners of innovation studies treat the triple helix model and innovation systems as exchangeable.

However, Zheng (2010) argued, in comparison to other approaches to innovation studies, including the quadruple helix, 'the triple helix model reduces the complexity of the dynamics at play in the innovation systems of the knowledge economy'. Greater societal involvement in research and innovation can serve to legitimize research trajectories and produce context relevant sustainable innovations by re-orienting research and development toward public preferences in new and emerging fields of technology. Including society, may provide access to more diverse and directly applicable knowledge (Edler & Georghiou, 2007).

In the context of South Africa, key actors in a regional innovation ecosystem are identified as government, civil society, private sector (including financial institutions such as venture capital firms), research institutions (universities). Collaborating with societal actors not only meets an established standard as cooperation and collaboration is the duty of every actor in an innovation system. With growing public awareness of socially responsible innovation, as well as the role of civil society in science and technology development in governmental policies, people tend to find the quadruple helix model more suitable for addressing new features of society (Miller et al., 2018 and Monteiro & Carayannis, 2017). It is imperative that the RIS not choose to rely on a narrow conception of an innovation system, such as the triple helix, but rather embrace the inclusion of society. STI has a fu It is worth noting that the White Paper on Science, Technology and Innovation identified insufficient involvement of business and civil society as one of the main factors constraining South Africa's STI performance (DST, 2019). Figure 2.3 below depicts the typical ecosystem actors in Regional Innovation Network Platforms.

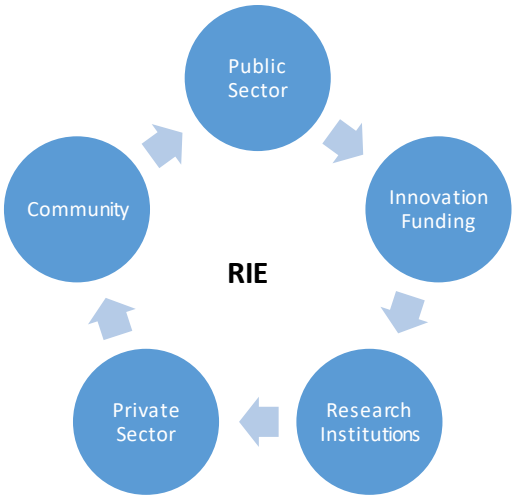


Figure 2.5.: A typical RIE (Source: Author, adapted from Napier and Kethelz, 2014)

'People should not be left behind as society and the economy become more technologically driven.' - (DST, 2019, p.25).

2.5.4 Case Study - The COFISA Experience

There is a scarcity of RIE research in relation to RINPS in South Africa, since COFISA, the collaboration between South Africa and Finland. COFISA started in 2004 with Finnish and South African experts conducting research on the most appropriate intervention to leverage Finland's know-how to strengthen the innovation capabilities of South Africa. COFISA focused on building regional innovation systems across three provinces.

2.5.4.1 The Cooperation Framework on Innovation Systems between Finland and South Africa (COFISA)

The South African government's commitment to the development of the national and regional innovation systems is reflected in the global partnership with Finland which was founded on South Africa's policy and strategy documents, such as the then National Research and Development Strategy (2002) and National Innovation Plan (2008-2018). Thus, the country was already set on a path to a knowledge-based economy and had identified the critical need to build up human capacity in selected

science parts, to direct resources to STEM education, and to invest in research and development and improve collaboration among innovation ecosystem actors.

In recognition of what needs to happen to position South Africa in the global economy, COFISA was conceptualised to anchor the NSI as an important development framework, particularly in driving the plan of South Africa's economic development (Pague et al., 2010). The collaboration between South Africa and Finland started in 2004 with Finnish and South African experts conducting research on the most appropriate intervention to access Finland's know-how to strengthen the innovation capabilities of South Africa. COFISA concentrated on creating innovation systems; Western Cape, Gauteng, and Eastern Cape are the three metropolitan provinces. However, the collaboration allowed for the other provinces' ecosystem actors to participate in some of the COFISA instruments including the seed fund. The seed fund supported the creation of networks, and long-lasting relationships amongst stakeholders for the development of the NSI. The COFISA pilot also reported stakeholder activities cutting across various capacity building interventions such as incubation services, ICT, and life skills training. These activities were facilitated by a community champion. These three pilot provinces, including to some extent Kwazulu Natal and Free State have fully functional regional innovation systems, determined by their respective provincial innovation policy (Rhaphasha, 2015), leaving four out of nine provinces without fully functional regional innovation systems.

> *"My department is pleased that this Finland and South Africa collaboration has led to success in creating effective innovation systems. COFISA was designed to be a pilot programme − a catalyst that would challenge our thinking and approaches to innovation systems development."*
>
> – Naledi Pandor, Minister of Department of Science and Technology,
>
> South Africa (2009 – 2012)

The NSI still faces some of the challenges identified during the formation of COFISA which directly affect development regional innovation systems, such as (Pague et al., 2010):

- lack of consistent understanding of the NSI by stakeholders as to the roles and responsibilities, operation, and interaction components of the NSI;

- lack of integration of the insufficiently developed regional/provincial system of innovation and the NSI;

- lack of innovation-enabling mechanisms such as innovation hubs, science actors cross the country; poor communication between the innovation actors; and

- the absence of a link between the first and second economies.

COFISA as a learning experiment played a critical role in laying the foundation for regional innovation support in the country. COFISA efforts and outcomes include planning foresight, the construction of scientific parks, rural innovation, and innovation forums which brings together multi-sectoral stakeholders.

2.6 VALUE CO-CREATION IN SOUTH AFRICAN REGIONAL INNOVATION ECOSYSTEMS (VALUE CO-CREATION PROCESS)

The value co-creation concept remains very theoretical and lacks empirical operationalisation (Melis et al., 2023), particularly regarding the establishment of South Africa's RINPs. The absence of value as an output in the establishment of the RINPs could hinder the creation of an innovation enabling environment and culture (DST,2019).

2.6.1 Role of Collaboration & Cooperation in Value Co-Creation

Value co-creation comes from a service dominant logic and is a view that has lately acquired acceptance in the business world (Fan & Luo, 2020). It is the idea that customers and organisations can collaborate to create mutual value by exchanging resources, ideas, insights, and experiences. The method of generating mutual value by producing subjects by trading services and integrating resources is termed as value co-creation (Zhong et al., 2020).

Collaboration is defined as a form of teamwork which consists of detailed parts (Arina & Rustiadi, 2018). The purpose of the collaboration is to achieve shared goals, which requires trust amongst ecosystem actors. The interaction among ecosystem actors promotes skills development and knowledge exchange (Eckhardt et al., 2021) owing to actors leveraging off each other's capabilities. Thus, actor interaction is crucial to the value co-creation process; defined as a collective and noble process, method or service by diverse ecosystem actors producing new value (Brandsen & Honingh, 2018; Ketoketn-Oksi & Valkokari, 2019). It is on this basis that it is imperative that actors clearly outline the mutually shared objectives towards the identified issue to resolve. It is not a solo act to maintain and develop these systemic dynamics. That is why multi-sectoral ecosystems of actors ranging in composition and size are formed. Collaboration enables ecosystem actors to access a broader pool of resources and knowledge while sharing risks with others (OECD, 2017). However, collaboration (horizontal and vertical) is a persistent challenge in the innovation ecosystems in South Africa. Collaboration also ensures synergy and better impact (UNDP, 2020).

This form of collaboration can result in various outcomes, consisting of new products and services, higher consumer happiness, and increased revenues. From the standpoint of innovation, value co-creation focuses on the technique of interaction and cooperation among players (Fan & Luo, 2020).

2.7 CHALLENGES TO VALUE CO-CREATION IN SOUTH AFRICAN INNOVATION ECOSYSTEMS

Despite attempts to establish and continuously improve the national innovation ecosystem, numerous problems exist that may impede the acceleration of solving South Africa's development needs. South Africa has dropped five places since 2018, placing 63rd in the world in the Global Innovation Index (GII) in 2019 (UNDP, 2020).

Below are the key challenges to co-creating value in regional innovation ecosystems:

- **Institutional and Policy Challenges**

  South African science, technology, and innovation (STI) policy has been insufficiently accessible, favoring "big science." The UNDP's Ten-Year Innovation Plan reflects this, prioritizing mission-oriented programs including biotechnology,

nanotechnology, and hydrogen economy (UNDP, 2020). The absence of horizontal as well as vertical policy integration and coordination is being identified as the ongoing challenge in South Africa's national innovation system (UNDP, 2020).

The public sector has strong policies in place to promote enterprise development, support SMMEs, and fund basic research. However, these policies' execution needs to be improved (Hunter et al., 2020). The public sector has been quite supportive of SMMEs; however, start-ups are regarded to be less supportive. Hindrance of growth for SMMEs is due to procurement systems, public finance management, internal systems, and regulatory obstacles.

- **Socio-economic and Cultural Factors**

Affordable new solutions must be developed and implemented to alleviate poverty, reduce unemployment, address inequality, and achieve sustainable development goals. However, due to South Africa's unequal socioeconomic background, SMMEs and innovators have limited access to start-up financing. Private-sector financing for research and development is declining, and there are no early-stage venture capitalists (UNDP, 2020).

Every region creates distinctive circumstances for the creation of innovations based on its level of social and economic development, economic structure, institutional effectiveness, acquired expertise and abilities, and population cultural views. Three intangible, cultural elements can influence the chance of innovation (Hunter et al., 2020). First and foremost, to increase the opportunity of innovation, there is a need to address critical societal demands. Second, an entrepreneurial attitude is required, which includes the capacity to perceive opportunities and take the necessary risks to capitalize on these opportunities (Farley, 2013). Third, the presence of interaction and the interchange of ideas among diverse ecosystem actors with diverse life experiences and knowledge is critical to successful collaboration. Collaboration can generate fresh ideas and views, which can lead to opportunities for innovation (Kaplan, 2012).

Conflict among ecosystem actors does occur depending on the personal networks and context (Akaka et al., 2013).

- **Technological and Infrastructural Constraints**

Infrastructure refers to the physical resources used by an ecosystem (Rabelo & Bernus, 2015). Essential infrastructure, for example, transport, energy, and ICT are deficient, restricting the country's ability to innovate. South Africa is currently suffering extended periods of loadshedding, which has an impact on network access, particularly in rural areas. High-speed broadband that is affordable and easily accessible is a critical enabler of competitiveness in many domains. While the government has made significant efforts to encourage nationwide internet connectivity expansion under the National Broadband Plan, more infrastructure investment and development is required to meet market demand.

The unequal geographic distribution, as well as the fact that many communities are uninformed of the presence of support organizations, impedes national development (UNDP, 2020). There are just a few regions with suitable start-up infrastructure and support systems.

2.8 ENABLERS AND SUCCESS FACTORS FOR VALUE CO-CREATION IN SOUTH AFRICAN ECOSYSTEMS

Open innovation activities such as hackathons and inter-firm collaboration are important to enable advancements in technology within interconnected business ecosystems; whereas an ecosystem's evolutionary nature is reflected in the ecosystem actors' ability to adapt to changes caused by external constraints from the ecosystems business environment (Masucci, Brusoni & Cennamo, 2020; Rong et al., 2021). One of the critical roles is that of the ecosystem facilitator, it is important in enhancing co-creation and the evolution of the ecosystem (Ketonen-Oksi & Valkokari, 2019). Interactions among ecosystem actors strengthen the development of collaborative activities and encourage monetary as well as non-monetary transactions. Firms participating in complex innovation ecosystems need to adapt their business models to be appropriate for risk mitigation.

Knowledge producing institutions, such as universities, are critical to growth since knowledge is an intangible asset with no diminishing returns (Habiyaremye et al., 2022). Universities benefit because their influence can be felt across the entire innovation process (Zmiyak et al., 2020), connecting entrepreneurs with the information generated for competitive advantage and profitability. Universities are increasingly focusing their efforts on commercialization research rather than only teaching and research.

2.8.1 Role of Government and Policy Interventions

According to this article, research on innovation policy and NSI in underdeveloped nations is still in its early stages. According to Edquist (1997), innovation policy objectives are developed through a political process. Thus, it is important that the government work hand in hand with ecosystem actors to demolish regulatory blockages and co-create policies that uphold an ecosystem conducive to innovation. Government's principal role is to initiate and implement policies (Ehrenhard et al., 2014).

One of the key aspects in the evolution of the innovation process is the increasing importance of regional characteristics. The regional innovation system level plays a critical part in the stimulation of the development of national economies, the development of regulations to promote technology transfer among universities and to boost collaboration among ecosystem actors (Raphasha, 2015). The region offers instructive insights into the design and implementation of future innovation research.

Strategic alignment of regional platforms with provincial/regional priorities allows the platform to tap into the resources and expertise of the government, which can help to accelerate the growth of innovations and technologies. Additionally, it ensures that the platform can positively impact the regional economy and support regional businesses and entrepreneurs. Strong alignment between the government and the platform can help to foster collaboration, trust, and a common vision for regional development. The lack of alignment might be due to the absence of governance structures in some regions (Pogue et al., 2010). A position on alignment should be agreed upon with the participation of the governance structure.

Other challenges faced by the NSI according to the White Paper on Science Technology and Innovation (2019), is a lack of policy coherence and coordination, as well as insufficient paths for policy learning (DST, 2019). Without policy coherence and coordination, it is difficult to ensure that provincial/regional government priorities are aligned with the RINPs.

2.8.2 Importance of Education and Skills Development

There's a direct relationship between learning, knowledge, and innovation and what is termed a 'learning economy' (Lundvall, 1996; Lundvall & Johnson, 1994). It is in the regions where the creation of new knowledge process is focused, where there is a suitable infrastructure for further knowledge distribution and usage. The transfer of knowledge is more effective at regional level, this is because it is advantageous to communicate directly versus other long channels of communication. According to OECD experts, the strongest contact in invention occurs in close vicinity, within a radius of almost 200 kilometres (OECD, 2013).

Higher Education Institutions (HEIs) play a vital role in addressing the various difficulties that the African region faces. Given their educational function in society, policymakers rely on universities to play a vital part in the harmonisation of collective programmes and collaboration capacities among numerous players, as well as their influence of the advancement of an ecosystem's database of knowledge (Rosli & Cacciolatti, 2022). Regional competencies and skills are essential and should be developed, incorporated, and supported through continuous training (Herselman & Botha, 2017). Certain innovation capabilities are critical for regional innovation ecosystems because they provide the necessary resources, support, and infrastructure to allow for the creation of new ideas and technologies. These capabilities include having a well-defined strategy, access to research and development (Carayannis & Campbell, 2010), funding, mentorship, collaboration opportunities and effective networks (Viitanen, 2016), talent and skills development (Mulas et al., 2015), as well as supportive government policies, and appropriate infrastructure.

2.8.3 Leveraging Digital Technologies for Value Co-Creation

By leveraging digital technologies, African nations and economies will be transformed in order to advance African unity, generate equitable prosperity, promote employment, bridge the digital gap, and eradicate impoverished conditions for the Africa's socioeconomic development, all while ensuring Africa's control of cutting-edge digital management tools (African Union, 2020). Digital technologies are the primary accelerators of value co-creation and innovation, some scholars regard technology as a crucial tool for the facilitation of co-creation and innovation (Breidbach & Brodie, 2017). Digital technologies change the way organisations do business. Value co-creation is an appropriate strategy for creating and applying digital technologies and change (Dugstad et al., 2019). A technology-driven approach understands usage of emerging digital technologies as drivers of value co-creation that offers outcomes that could not otherwise have been obtained without the adoption of technology.

Furthermore, the innovation advancement is dependent on the technical competence of technology (Jiménez-Barreto & Campo-Martínez, 2018). Africa's Digital Transformation Strategy, developed by the African Union (2020-2030) acknowledges the leadership of the continent's efforts to prioritize and drive digital transformation to connect digital technologies and innovation (African Union, 2020).

2.9. MEASURING VALUE CO-CREATION IN REGIONAL INNOVATION ECOSYSTEMS

Like innovation, Value co-creation encourages multi-agent participation, which is critical for actors to attain long-term competitive advantage. Working together in this respect is the impetus necessary to create a coordinated and favourable environment in order to achieve genuine effect that is measurable both in terms of funding and helpfulness perspective (UNDP, 2020).

Evaluating the outputs of value co-creation is a vital step in ensuring that the value created is of high quality and meets the goals of all the parties involved. In the existing studies, there is still a lack of uniform cognition about the composition of regional innovation ecosystem’s co-creation value. Consequently, ecosystem actors do gain

value directly from using the product rather than from the product itself and by interacting with other entities participating in the process (Katzan, 2008).

2.9.1 Economic and Social Impacts of Value Co-Creation (including Success Stories and Lessons Learnt from South African Context)

In 2022, Sakala investigated the interactions of multiple actors in value co-creation to address water supply issues in rural areas (Sakala, 2022). The study identified that value co-created resulted in community empowerment, which was highlighted by the coordinated approach of all stakeholders involved. The research also emphasized the value of including the participation of rural community actors to enhance technology and knowledge transfer (Sakala, 2022).

Nonetheless, the research was used in the health sector; Herselman and Botha (2017) studied what value was co-created with multiple stakeholders to construct a South African Digital Health Innovation Ecosystem (DHIE). The research led in the creation of South Africa's Digital Health Innovation Ecosystem by co-creation with various ecosystem actors. It was the first time this sort of ecosystem had been created with the interaction of the different stakeholders in South Africa. The National System of Innovation was powered by this ecosystem development through collaboration, as the insights learnt influenced organizations, the health industry, and the South African government (Herselman & Botha, 2017).

2.10 CONCEPTUAL FRAMEWORK

The two-part value co-creation model below (see figure 2.6) is the framework that Ketonen-Oksi & Valkokari (2019) came up with to explore how RIE are structures of value co-creation. Autio and Thomas (2019) described the structural and governance processes across three types of ecosystems in the value co-creation process of platforms and ecosystems. They establish that there is a major facilitator whose capacity to arrange the offerings from the ecosystem actors in their various capacities determines the key ecosystem value offering. However, for value to be co-created,

ecosystem participants do not have to engage directly and concurrently (Autio et al., 2016).

The framework has partly over-lapping but separate concepts, platforms, and ecosystems; and was first introduced by Galbrun & Kijima in 2009. Ketonen-Oksi and Valkokari (2019) previously applied the two-part value co-creation model to multi-sectoral ecosystems in the early development phase with complementary and comparable characteristics. The two-part model is made up of a **platform**, which is where the ecosystem actors initially meet and engage on ideas for possible collaboration. Platforms are structures or venues where value is created by coordinating transactions between networks or groups of actors who would usually not be connecting if it was not for the platform (Ketonen-Oksi & Valkokarii, 2019). Platforms may form or encourage the emergence of ecosystems, enabling the co-creation of innovations (Herselman & Botha, 2017). This study will not be focusing on the newly emerging concept of platforms because it is presumed that ecosystem actors have already had initial interaction and have determined a shared interest in technology innovation.

The second part is the **ecosystem** concept that describes how true value co-creation occurs in four critical stages of collaboration (Kijima & Arai, 2016). As a result, the model stresses innovation ecosystems as value co-creation structures akin to RINPs.

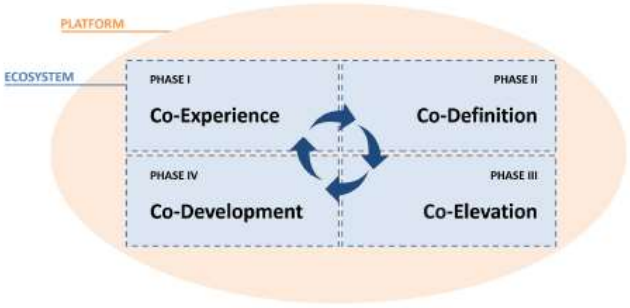


Figure 2.6: The value co-creation two-part model (Source: Galbrun & Kijima, 2009)

The innovation process allows for the actualisation of the value co-creation process through its highly collaborative driven four stages: “co-experience, co-definition, co-evolution, and co-development”. These four phases promote continuous interaction

among ecosystem actors, which encourages clearly defined mission for quality knowledge creation and exchange. Below is an outline of the four phases of interaction (see Figure 2.6 above) in the innovation process (Ketonen-Oksi & Valkokari, 2019):

- Phase 1: Co-experience

  This initial phase involves ecosystem actors recognising their individual and mutual needs and expectations, which gradually leads to awareness of each other's needs and expectations.

- Phase 2: Co-definition

  The second phase is when the actors become acquainted with one another's talents, perspectives, and understanding of value co-creation.

- Phase 3: Co-evolution

  This third phase focuses on collaborative value propositions and is reliant on strong communication among the ecosystem actors.

- Phase 4: Co-development

  The fourth phase represents where actual value co-creation is realised and there is output that can be evaluated. In some instances, co-destruction is what is actualised instead of value co-creation.

The overall goal of these four stages is to highlight the characteristics of the value co-creation process. In practice, all stages are repetitive and interconnected, and simultaneously, creative, and socially active. Value co-creation requires effort and dedication from all ecosystem actors, individuals, and organisations. It is from these continuous engagements and awareness of expectations that the ecosystem actors will develop shared principles and integration of resources exchanged (Vargo & Lusch, 2016) that will drive the innovation process.

On the ground, the approach of value co-creation is initiated once two or more ecosystem actors collaborate and work towards mutually shared interests. Figure 2.6 is aligned to the notion of ecosystems, which provides a framework for analyzing and studying the interplay of many multi-sectoral players, including societal situations (Kumari et al., 2019).

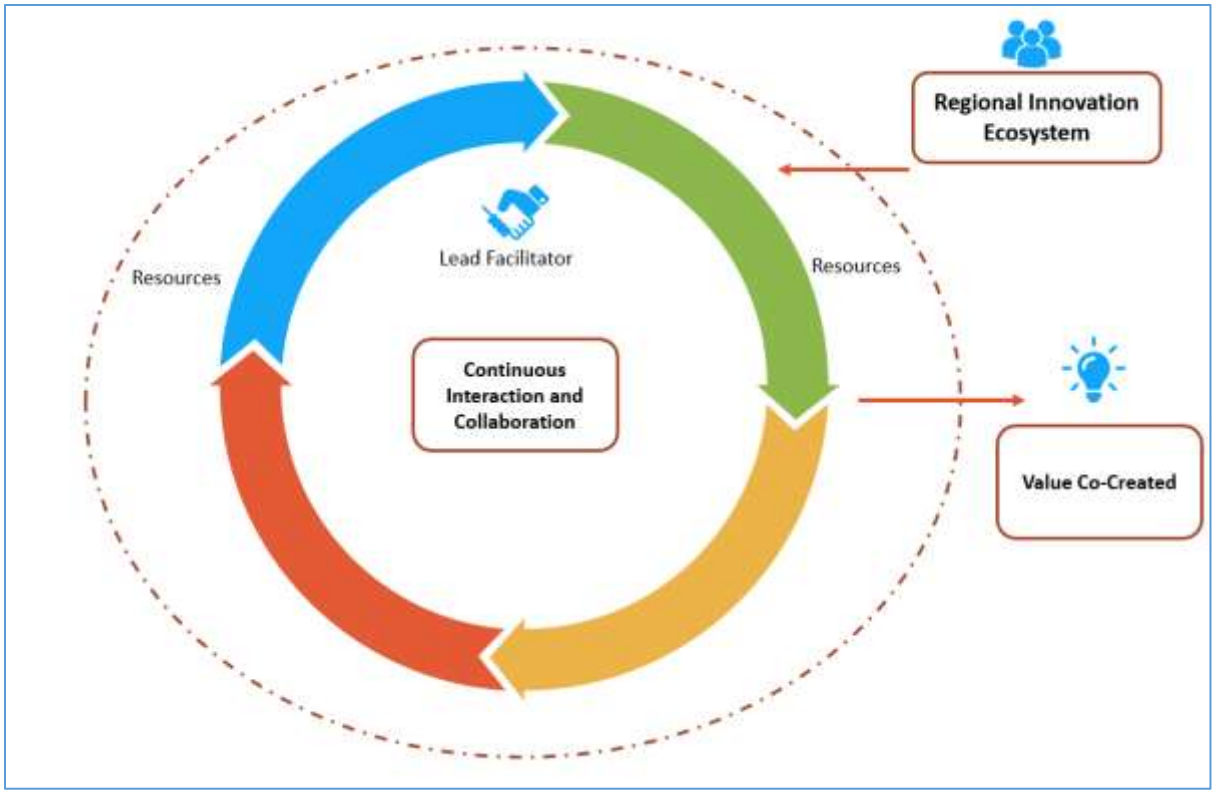


Figure 2.7: Conceptual framework of RIE value co-creation (Source: Author)

Value co-creation requires a multi-stakeholder approach, particularly to harness and leverage off each other's capabilities during the innovation process. Key stakeholders in the regional innovation ecosystem are usually a collective of actors committed to the development of the region (Ricardo & Ortega, 2018). As intended with the quintuple helix model, all actors play a critical and unique role in value co-creation; however, it is crucial that all ecosystem members understand their role in achieving the ecosystem's purpose (Matt et al., 2021; Carayannis et al., 2022). In the figure above (Figure 2.7) there is continuous interaction among ecosystem actors to exchange resources for capturing collaborative value. The process starts after identifying the resources, The facilitating institution coordinates the interaction among ecosystem actors. Collaboration is then established by ongoing interaction between the participating actors. The more contact there is between the RINP and its numerous stakeholders, the more value can be generated through the formation of synergies (Desai, 2010). Similarly, if there exist no firsthand interactions, value co-creation is impossible (Grönroos, 2011).

2.11 CONCLUSION

The chapter has reviewed regional innovation ecosystems in South Africa; their significance in driving regional innovation systems and ultimately the National System of Innovation (NSI) for socio-economic growth and development (Pague, 2010; Thomas, 2016; Rong et al., 2021). The theoretical and conceptual framework of regional innovation ecosystems and value co-creation were reviewed in the setting of regional innovation network platforms.

The chapter also reviewed efforts of the Cooperation Framework on Innovation Systems between Finland and South Africa (COFISA) for development of multi-level innovation systems across three provinces in South Africa, a process that ended in 2010.

CHAPTER 3: RESEARCH STRATEGY AND METHODOLOGY

3.1 INTRODUCTION

Chapter 2 gave a literature review on regional innovation ecosystems and value co-creation within the context of regional systems of innovation. This chapter focuses on the study's research strategy and methods, providing research techniques and design to be implemented for the study. This section will be addressed in the following order:

- Research Strategy and Design
- Research Methodology
- Study Limitations
- Ethical Considerations
- Validity and Reliability

The intention of the study is to investigate how RIE actors contribute to value co-creation in regional innovation network platforms in South Africa.

3.2 RESEARCH STRATEGY AND DESIGN

Research is the pursuit of knowledge through an objective and systematic approach to problem solving (Kothari, 2004). Saunders et al (2019) introduced the theory of research onion as a way of depicting the issues underlying the choice of data collection, and peeling away the outer two layers, namely, research philosophy and the approach to theory development. Kothari (2004) also mentions that the research process should follow a systematic method that clearly articulates the problem, hypothesis formulation, processing data and generating findings in the form of solutions to the research challenge. The general strategy for the research was qualitative, which required the interviewer to be alert and active (Rallis & Rossman, 2017).

The research paradigm of the researcher is an interpretivist one. A paradigm is a fundamental collection of beliefs or worldviews that research directs inquiry, or action (Lincoln & Guba 1985). The paradigm defines the researchers philosophical

positioning and philosophy informs methodology. The interpretivist approach is entrenched in the fact that approaches utilized to comprehend knowledge in the human and social sciences are different from its application in physical sciences because human beings read their environment and re-act on that understanding, whereas the environment does not (Hammersley, 2013, p. 26). Hammersley (2013) emphasizes the interpretivist researcher's responsibility to comprehend "the diverse ways of seeing and experiencing the world through different contexts and cultures" as well as to prevent bias when researching procedures and individuals based on their personal interpretations.

The trade-off with statistical approaches associated with interpretivist paradigm relates to the subjective nature of this approach, which poses as an opportunity for bias on behalf of the scholar. The researcher's positionality relative to the subject matter is coming from co-ordinating one of the regional innovation ecosystems under study, and it is during her time building and supporting the innovation ecosystem that the study became ideal.

The study is grounded on primary research data from participative semi-structured one on one interviews. Thus, the interpretivist paradigm is the selected approach.

Research design is required prior to data collection or analysis. Research design is a blueprint of specified activities or procedures and strategies to follow to obtain the most valuable answers to research questions (Hassan, 1995). The research approach will be exploratory and will be based on a comparative case study analysis of three regional innovation ecosystems. An exploratory design is used to study a research problem when there are not many or no prior research studies to refer to. The main objective is to gain insights for later investigation or is implemented when issues are in the early stage of investigation. Thus, explorative design is appropriate in terms of the interpretivist paradigm selected, as the technique of questioning "allows researcher to investigate and prompt things that we cannot observe, researchers can probe an interviewee's thoughts, values, prejudices, perceptions, views, feelings and perspectives" (Wellington & Szczerbinski, 2007). This will provide insight for further action later, such as informing the effectiveness of the regional innovation ecosystem and developing regional innovation policy.

3.3 RESEARCH METHODOLOGY

The section covers the development of the research methodology which involves participant selection, collection of data and data analysis approaches. A research technique is a way for solving a research problem in a methodical manner (Kothari, 2004).

3.3.1 SELECTION OF PARTICIPANTS

Participants were selected via stratified purposeful sampling method which allowed for the facilitation of comparisons and illustration of subgroups (Miles & Huberman, 1994). The population is all the key actors in the respective provinces of focus, and the sample was purposeful, consisting of people working in the regional innovation network platforms, ecosystem actors, experts, such as retired officials and managers, who can comment independently on the regional innovation ecosystems in the three provinces; these experts may be from the national level of the NIS and have a good sense of innovation systems.

3.3.2 Data Collection and instrument

To address the research objectives, primary data collection was conducted using content analysis and open ended, in-depth semi-structured interviews of existing key public documents such as, strategy documents and respective provincial growth and development plans. Semi-structured interviews allow for an open-ended set of questions which allow for flexibility for the interviewer to have leading questions preceded by follow-up questions. Semi-structured interviews are another trustworthy and comparable qualitative mode of inquiry that allows an interviewer to delve further into themes or responses (Cohen et al., 2007).

Access to the regional innovation network platforms was obtained through permission requests, providing background to the study and any other ethical issues for consideration. Selected participants were provided with a consent form, issues of anonymity and confidentiality were clarified to obtain permission to participate in the

research. The interview process assisted the scholar to establish a respectable connection with the interview informants (Creswell, 2007), which increased the chances of participants being open and honest during the interview.

In the qualitative study, the researcher was the primary data collector (Walters, 2001). However, the researcher used protocol, such as self-developed interview questionnaires to collect the data. The researcher had prepared questions up-front, which indicates that the researcher was well prepared and set out what to ask (Ruslin et al, 2022).

3.3.3 Data Analysis

The objective of qualitative analysis of data is to identify recurring theme or patterns in the data. Data analysis is challenging (Creswell, 2007), it involves the management and analysis of data collected. The five common steps of qualitative data analysis (Busetto et al., 2020) were followed within the specific context of data collection methodology used, the five steps include preparation and organization of data; data review and exploration; development of a data coding system; assigning codes; and identification of recurring themes.

The qualitative data analysis was structured according to three categories for the assessment of value co-creation in the regional innovation ecosystems. The analytic strategy involved displaying the data into a table or graph for comparison.

The qualitative data was videotaped and verbatim transcribed to allow the researcher to revisit the obtained data.

3.3.3.1 Content Analysis

Margrit Schreier (2012) defines qualitative content analysis as a technique for determining the relevance of qualitative material. The study achieved the method by classifying successive sections of content assigned to the categories of a coding frame.

3.3.3.2 Research Population

Population / sample 1:

Population: Actors in Regional Innovation Network Platforms

Sample: A sample size of 15 key actors within the regional innovation ecosystem, such as platform management and administration staff, multisectoral ecosystem actors, including entrepreneurs, practitioners, researchers, and steering committee members. The regional innovation ecosystem actors were unevenly distributed across the three provinces because certain identified actors were not available during the data collection period.

Population / sample 2:

Population: Actors in the National System of Innovation.

Sample: 5 key cross sectoral actors such as innovation experts (practitioners, researchers, and government administrators) at national level in management or administration.

3.4 LIMITATIONS OF THE STUDY

In terms of content analysis, the methodology is limited; and the main one is the subjectivity of coding (Creswell, 2007). The study is limited to several documents for content analysis, such as the respective regional innovation ecosystem strategic documents, the TLIUs RISP 2021 annual report and White Paper on Science, Technology, and Innovation.

Innovation is context specific, and thus poses a geographical limitation to the study. The study findings may not be applicable to other regions.

3.5 ETHICAL CONSIDERATIONS

Ethics are behaviours or standards that guide humanity on how to interact with one another (Cooper & Schindler, 2014). The research was conducted according to the set ethical codes and regulations of the University of Witwatersrand (WITS); this involved seeking ethical clearance from the WITS ethical committee. The researcher ensured all participants grant permission for all semi structured interviews analysed

through email or verbally. Research should be conducted in a way that no one participating is negatively impacted, experiences discomfort or feels embarrassed (Cooper & Schindler, 2014).

The researcher conducted the research with diligence and consideration of ethical issues throughout the research process, which have been documented. Participants were sent communication highlighting the background and purpose of the study.

3.6 RELIABILITY AND VALIDITY

The collected data's reliability and validity are verified using mixed methods key actor interviews and content analysis. Strategies to ensure rigour will be built in the design of the research process to attain validity and reliability (Cypress, 2017). The researcher aims to be consistent and accurate in the data collection to guarantee reliability and validity. Reliability refers to the methods applied in data collection and commitment to producing the collected data under the same conditions (Walters, 2001 & Cypress, 2017). Improved performance in human instrumental performance is achieved through a guided learning process in mentorship (Lincoln & Guba, 1991). Thus, this study will prove to be reliable in that the researcher has acquired knowledge during the research methodology class, and continued guidance of an expert and professional mentor during the research process.

Validity questions integrity rather than indifference (Cypress, 2017). To control validity, the researcher will reduce researcher bias by being proactive, inductive, and intentional; by allowing the participants to speak freely, based on their own perspectives, experience, and knowledge and finally, by requesting assistance from two to three peers to check if the information collected was used in the intended way. In addition to the stipulated strategies, validity will also be achieved through the open ended and semi-structured interview method with strategically selected participants (Cypress, 2017).

3.7 SUMMARY

Chapter 3 presented the research design and methodology adopted for the study, detailing the ethical consideration, validity, and reliability, as well as data analysis. The research findings of the study will be presented in the following chapter.

CHAPTER 4 : RESEARCH FINDINGS

4.1 OVERVIEW

The previous chapter discussed the study plan and approach. The conclusions of the investigation are described in Chapter 4. The study focuses on value co-creation activities in South African regional innovation ecosystems.

The research purpose is to give responses to research questions below:

- What are the innovation practices that enhance value co-creation in the respective regional innovation ecosystems?
- What are the required innovation capabilities for an effective regional innovation ecosystem?
- How is value defined and how are the innovation outcomes measured in regional innovation ecosystems?

Semi-structured interviews were employed to address study questions and outcomes, they are reported in two parts below. The regional innovation ecosystem strategic documents, TLIUs RISP 2021 annual report and White Paper on STI will be evaluated and discussed in the next chapter to substantiate the results.

4.2 FINDINGS FROM THE SEMI-STRUCTURED INTERVIEWS

4.2.1 Section 1: Background information

This section offers respondents' background information. The introductory information is crucial because it reveals whether relevant and knowledgeable individuals participated in the study. The study focused on regional innovation network platforms in the following provinces: Northern Cape, Limpopo, and North-West, and the national experts working in the regional innovation ecosystems. All twenty individuals initially targeted participated in the interviews, which correlates with a total response rate of

100%. Figure 4.1 results below indicate that of the 20 individuals who participated in the study, twelve (60%) respondents were male, and only eight (40%) were female.

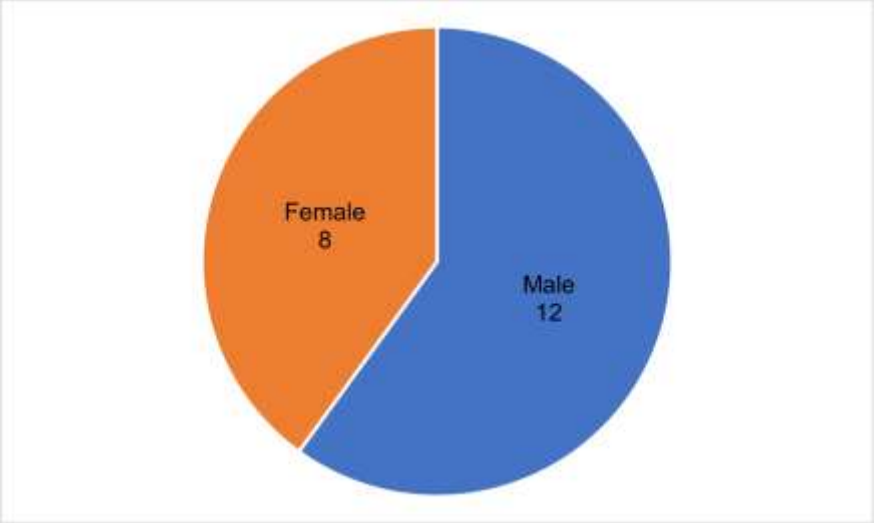


Figure 4.1: Distribution of participants by Gender (n = 20)

The results in Figure 4.2 below represent the number of participants per region. Two participants were from the North-West Province, four were from the Limpopo Province, nine were from the Northern Cape and five were from National.

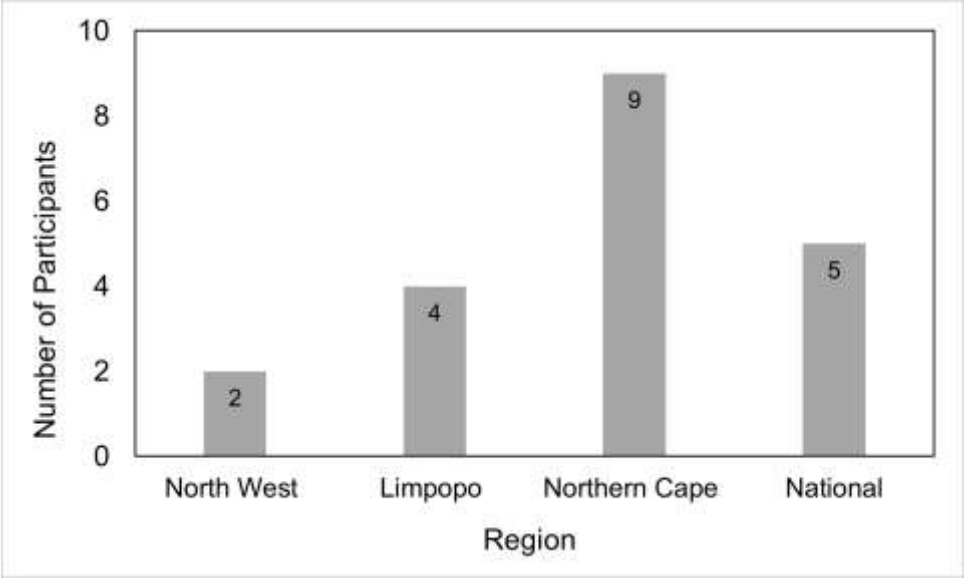


Figure 4.2: Distribution of participants by region

Table 4.1 below provides additional background information of the various respondents for this research. The respondents included employees, innovation program practitioners/participants/entrepreneurs, collaborators, and committee members. Moreover, the respondents knew of or had worked with various platforms through invitation, funding, memorandum of understanding (MOU), referrals, through search engines, other hubs, the CSIR and through collaborations with other government entities and universities. Although the respondents for the study had various backgrounds, they were all part of regional innovation ecosystem see Table 4.1 below:

Table 1.2: Respondents' introductory information

Respondent (RP)	Relationship with the case company	Province/Region
RP1	Employee	North-West
RP2	Participated in innovation-enabling interventions	North-West
RP3	Participant	Limpopo
RP4	Coordinate programs, awareness campaigns and communities' capacity-building programs, training for the district municipality	Limpopo
RP5	Employee	National
RP6	Participant in a funding programme for start-ups	Limpopo
RP7	Member of project steering committee (PSC)	Northern Cape
RP8	Ecosystem partner (Collaboration)	Northern Cape
RP9	Member of the PSC	Northern Cape

RP10	Member of the PSC	Northern Cape
RP11	Facilitator: coding and robotics	Northern Cape
RP12	Former member of the PSC	Northern Cape
RP13	Participated in the TLIU RFP	Northern Cape
RP14	Employee	Northern Cape
RP15	Stakeholder	Northern Cape
RP16	N/A	National
RP17	A director of special projects at the university	National
RP18	Started as an intern - DSI agency	National
RP19	Managing of RISP, oversight to PMU and participate in governance structures of some of the platforms	National
RP20	Project steering committee member	National

**N/A means the question was not relevant to the respondent/was not responded to by the respondent.*

**RP stands for "respondent".*

PRESENTATION OF FINDINGS AND DATA RESULTS

Themes generated from the findings

Based on the study questions stated, data analysis for the study yielded three themes. The themes generated were:

- Strategic goals
- Key actors and structure of the ecosystem
- Outputs of value co-creation

4.3.1 Theme 1: Strategic goals

Table 1.3: Summary of results for theme 1

Sub-indicator	North-West		Limpopo		Northern Cape		National	
	Yes	No	Yes	No	Yes	No	Yes	No
Strategic alignment between the provincial government priorities and the RINP	1	1	1	0	8	1	3	2
Understanding by the ecosystem actors of the set priorities and intended outcomes.	2	0	4	0	1	8	0	5
Understanding of innovation among ecosystem actors	1	1	3	1	7	2	0	5
Knowledge about the national systems of innovation and their role at a regional level	0	2	2	2	0	9	2	3

Strategic alignment between the provincial government priorities and the Regional Innovation Networking Platform

Strategic alignment between the provincial/regional government priorities and the Regional Innovation Networking Platform goals/objectives is essential to ensuring the successful implementation of regional initiatives. In the North-West province, the focus was on the North-West Regional Innovation Support platform. Mixed responses were received from respondents. One of the respondents believed that there was strategic alignment between the provincial/regional government priorities and the Regional Innovation Networking Platform in North-West province, while another respondent believed the opposite. RP1 responded as follows to the question whether there was strategic alignment:

> *"Honestly, I think not necessarily …* in terms of other governmental departments, I think they are only discovering our existence now … so in

terms of their priorities being aligned with the RISP, I don't think I would say yes*". (RP1)*

In Limpopo province, all but one respondent were entrepreneurs and were either participants or had previously participated in programmes offered at the RISP. One respondent believed that there was strategic alignment with the provincial/regional government priorities. RP5 responded as follows:

"Yes, there is alignment, especially in the tourism and agri-sector as they are amongst the biggest sectors contributing to the province's economic growth. Agriculture and Agri processing are strategically important sectors for Limpopo". (RP5).

The other three respondents in Limpopo did not give an indication as to whether they believed that there was an alignment or not.

The analysis discovered strategic convergence between provincial government priorities and the RISP in the Northern Cape province. Only one respondent believed that there was no alignment because the platform was still at the inception stage, and Northern Cape also had a newly developed strategy with new leadership. This respondent responded as follows:

"I don't necessarily think we are at that stage yet. NCIF is still a newborn baby. And the problem with the new direction is also a vision of the premier. So, the nice thing is, in all these things there will be synergy later. You understand? I think we should not necessarily rush to force this synergy or to build the structure of the NCIF to like, be heavily married to the current whatever, because at one stage or so, I think the NCIF will go into state of the province address, it will be some of the key role players in shaping where the trajectory of some of the innovation, landscape and other economic activities would need to happen as an important stakeholder rather than just taking mandate and implementing, but to be able, it needs to be a visionary vehicle that would be used. And one of those platforms that would have to be

used is there to make sure that we have frequent meetings with NCEDA and economic development as a whole because they are driving the economic development agenda of the province. So, I would not want it to be seen to be implementing government mandate but playing a role as a major stakeholder in making sure that it influences the direction of what needs to happen". (RP9).

From the national perspective, the respondents had different views regarding the strategic alignment between provincial/regional government priorities and the RINP. Some respondents believed there was no strategic alignment whereas some believed there was alignment in certain areas or regions. Below are some responses from these respondents:

"…. there are certain locations and regions where I think there's strong alignment". (RP19)

"The provincial government documents…almost all of them are very silent on innovation or even technology development. They largely talk about economic development … And an explicit focus on leveraging innovation for social and economic development … I would say that there is no alignment of provincial priorities ... Just to put it simply, there's no alignment between provincial and regional government priorities with the science policy, let me put it like that; because that White Paper is a science policy and will emanate into an array of policies that would be implemented by the DSI". (RP18)

In summary, there is strategic alignment between the provincial government priorities and the RINP, with a total of 13 participants responding "yes" to the question. Although this is not in all provinces, the overall finding demonstrates that the vast majority of respondents believe that alignment exists.

Understanding by the ecosystem actors of the set priorities and intended outcomes.

A clear understanding of the set priorities and intended outcome by the ecosystem actors is essential for the successful implementation of any project. Proper communication and collaboration among the ecosystem actors are important factors for ensuring understanding and synergy between all actors. Consequently, these two factors are crucial to helping ecosystem actors effectively utilise resources and facilitate prompt project completion with desired outcomes.

From the interviews, it was found that there is an understanding by the ecosystem actors on the set priorities and intended outcome in the North-West Province. This is achieved by holding group sessions to emphasise the objectives of the innovation support programme. Some responses from the respondents are as follows:

> *"…...so, in terms of understanding the set priorities regarding the intended outcome, I think the ecosystem actors actually do understand it". (RP1)*

> *"Yes, they do, because we do have a group session as part of the boot camp, so that's where they emphasized the need for us to work together."(RP2)*

In Limpopo province, all respondents agreed that there is an understanding to a greater extent. The following responses were noted:

> *"So, I think they understand what MLab is doing and what MLab is trying to achieve. And I think they applied because they could see that they could become better partners with MLab than any other company. (RP3)*

> *"I think they do understand. We've seen activities/partners coming on board wanting to collaborate with us, such as universities, private sectors, and industry leaders coming on board to support the whole programme." (RP5)*

For the Northern Cape province, eight respondents believed that there is a lack of understanding or a shallow understanding only. Some of the responses were as follows:

> *"To be quite honest, I do not think most of the other stakeholders have allowed themselves time to understand the bigger picture and so on. So, there's a whole lot of work that needs to happen in that respect because you cannot move forward if there's no total buy-in. And total buy-in is difficult sometimes if people do not have an understanding of what their role is and what needs to happen when they are committed and active ... so that space, we are still navigating through it to make sure that we get them on board and have their buy in". RP9*

One respondent suggested that the ecosystem actors need to be brought together to share their experiences and knowledge, as this is currently not done sufficiently. Currently, there is a lot of misunderstanding between the RISP and other ecosystem actors. The RISP does not understand the needs for the province and the people also do not understand the role of the RISP in assisting them. One of the noted responses was:

> *"…. The NCIF doesn't understand the needs of the Northern Cape and as a result, it makes it difficult for the local guys to understand what the role of NCIF is … the NCIF must go down to the people to implement, to assist them in strengthening their ecosystem, but they don't understand that. People don't understand what the role of NCIF is ... It's only the committee that might understand, but we are not there for the committee. That committee is there to serve. The committee is there to help with the leadership within different government departments to help them to strengthen the ecosystem, but I don't think that is done. They haven't done that". (RP11)*

Regarding the national experts, respondents believed that there is limited understanding on the side of the DSI and that the regional innovation ecosystems are fragile. Moreover, the DSI manages without knowledge of a particular region/province. The DSI has a national view but has no specific familiarity with regional dynamics. One response was noted as follows:

“[it is a mixed bag and difficult for the DSI … [the DSI] has a national view, thus no specific familiarity of regional dynamics. National [is] trying to show regions the gap”.

The overall finding is that there is no understanding by the ecosystem actors of the set priorities and intended outcomes. Only seven out of 20 respondents believed that there was an understanding. The findings further indicate that there is an understanding by the ecosystem actors in the North-West and Limpopo province. However, in the Northern Cape and nationally, there is a shallow or limited understanding of the set priorities and intended outcomes.

4.2.1.1. Understanding of innovation among ecosystem actors

Innovation is an essential tool for global economic growth and competitiveness. Understanding of innovation should be shared not just among businesses but across various stakeholders such as government, universities, civil society, and researchers. It is essential to recognize the different roles these stakeholders have in the innovation process and how they can work together to create an environment conducive to innovation.

In terms of the understanding of innovation among ecosystem actors, one respondent in the North-West province indicated that there is a broader understanding of innovation among ecosystem actors. The respondent commented as follows:

> *"Yes, they understand what innovation is at a broader scale because most of them bring ideas which are more innovative. So, they will be the ones as well helping us too". (RP2)*

The other respondent, however, believed that there is not much understanding of what innovation is, but there is a willingness to learn. The following response was recorded from RP1:

> *"… I don't think that there is much of an understanding in terms of innovation, especially when it comes to the regional innovation support platform. I mean in terms of understanding, perhaps they don't have much of an understanding, but they are willing to come to the party and they are willing to kind of learn what different types of innovation would be for, you know, for the hub as well".*

In Limpopo province, one respondent felt that there was no understanding of innovation. In fact, one response insinuated that there was confusion between innovation and invention. RP3 gave the following response:

> *"No, I don't think they do…… we discussed it a lot. I don't think they do. Not to say we were officially discussing it. It was just off the record to see what their understanding of innovation is, how innovation should be and so forth. So, it's not understood … people confuse the word with invention."(RP3)*

However, RP4 believed that in their sector, there is an understanding of what innovation is. The respondent commented as follows:

> *"I think for now, yes. Young people are conscious that the issue of innovation is very important … Some of them have the innovative mindset of how they can market their products and so forth … but they know there's a need to be innovative". (RP4)*

In the Northern Cape, although different respondents had different perspectives, the overall findings were that there is a good understanding of what innovation is. However, the implementation remains a major hurdle. Previously, there was no understanding of innovation until the RISP introduced the masterclasses on

innovation. However, only a handful of people have access to online classes, and therefore, there is a need to take the masterclass to the people.

From the national experts' perspective, the study found that the understanding of innovation is narrow, as it tends to think mostly about innovation in economic sectors where the private sector is dominant. One respondent noted that private sector actors possess a strong understanding of frugal innovation but show less interest in social innovation. Conversely, public sector actors are perceived to have a limited grasp of both economic and social innovation concepts. RP18 indicated that:

> *"Generally, the concept of innovation is not well understood in provincial and local government, but academia and private business mainly understand it". (RP18)*

RP19 also indicated that:

> *"Innovation is usually equated with ICT. This shows that people indeed have limited understanding of this concept". (RP19)*

In terms of the understanding of innovation among ecosystem actors, the overall finding is that there is an understanding of what innovation is. About 11 respondents agree that the understanding exists, and it is clear to all the ecosystem actors. The study found that there is an understanding of innovation in North-West and Northern Cape. Nevertheless, in Limpopo province, there is still some confusion between the term invention and innovation. Nationally, the findings reveals that there is a narrow or limited understanding of innovation among the ecosystem actors.

4.2.1.2. Knowledge about the national systems of innovation and their role at a regional level

Knowledge about the NSI and its role at the regional level is essential for the success of regional development. These systems are responsible for coordinating regional and national policies, research, funding, and investments in innovation-enabling activities.

Regarding the knowledge about the national systems of innovation and their role at the regional level, the respondents from North West province believed that the ecosystem actors are not knowledgeable or have limited knowledge about the national system of innovation and the role that the regional level plays in it. The respondents indicated that the key drivers of innovation should be the top management of government institutions. These individuals can bring the required knowledge to the other ecosystem actors to ensure that the goals of regional development are achieved. One respondent commented as follows:

> *"….. There isn't kind of a lot of knowledge into, you know, the national system of innovation, which is why there are programs like a digital transformation program that has been developed … that is aimed at key drivers like top management of government institutions like senior management to kind of give them an idea of what the national system of innovation would entail. It's obviously tailored according to the type of management as well as, you know, the type of people that attend". (RP1)*

From the Limpopo province, two respondents indicated that the ecosystem actors are not knowledgeable about the national system of innovation, whereas the other two respondents believed that the ecosystem actors are knowledgeable. Some of the responses were as follows:

> *"I think the province should be the voice of communities, for them to identify their challenges and try to come up with technology solutions within the region by stimulating and coming up with such programmes. Very critical to include community, most of the time we don't include community engagement; we are on the ground and know what the people need. It's very critical, innovation requires inclusion. Sometimes policies are not working for the people, practical example, fine you're giving me funding but limiting me on how to use this funding, but my people don't necessarily need the funding you're approving. For instance, if funding is only to stimulate innovation and the community*

needs equipment so they can kickstart their innovation facility. Funding use vs what community needs". (RP5)

"Yes, there is … MLab are the ones who intervened in the start-up funding programme and made me realise that there is such a thing as 'innovation". (RP6)

In the Northern Cape province, the study found that respondents believed there is limited or lack of knowledge on the side of the ecosystem actors. Similar findings were recorded for the national experts. The respondents indicated that the ecosystem actors are not knowledgeable about the national innovation system and their role at regional level. This is because the RIS is not well-equipped or strengthened to provide information and clarity on the national innovation systems. Strengthening of the RIS requires systemic support, ensuring training, STI institutions/infrastructure, and developing policies that support economic sectors. Sector-driven innovation is what is prevalent, without including other parts or aspects requiring development. In addition, the DSI mandate was misunderstood by ecosystem actors, making it difficult for them to know about the roles of regional levels.

The overall finding regarding the knowledge about the national systems of innovation and their role at a regional level is that the respondents believe that there is no such knowledge. A total of 13 participants responded "no", indicating that the lack of knowledge regarding the national systems of innovation is dominant. In the Northern Cape province, North West province and nationally, the study found that there is limited or lack of knowledge on the side of the ecosystem actors. On the other hand, some respondents in Limpopo believed that the ecosystem actors are knowledgeable. This shows that different individuals have different experiences when they are working within their regions.

4.2.2. Theme 2: Key actors and structure of the ecosystem

The innovation ecosystem comprises a complex network of key actors working together to create, develop, and implement new ideas and technologies. Each of these

actors plays an important role in the innovation ecosystem and contribute to the success of new or improved innovations. The structure of the innovation ecosystem is highly dynamic and constantly evolving. Different actors interact with each other in different ways, and the overall structure of the ecosystem is constantly changing as new ideas and technologies emerge. Understanding the key actors and structure of the innovation ecosystem is essential for successful innovation and development.

Regarding the key actors and structure of the ecosystem, the study found that the key actors in an innovation ecosystem included entrepreneurs, investors, corporations, research institutions including universities, government agencies, non-governmental organizations, and many other stakeholders. In North West province, the roles and responsibilities of the governing body, including the facilitator/coordinator, are well outlined. In the Northern Cape and nationally, the roles are blurred and sometimes clash or are not adequately defined. The governing body structures are in place, although sometimes there is minimal participation in the activities. Meetings by the governing body also differ from region to region. The meetings range from weekly, bi-weekly, monthly, every two months, or even quarterly, depending on the needs of each platform.

The methods used to join an innovation ecosystem vary, depending on the ecosystem's nature and the available resources. Methods identified in this study include walk-ins and pitching ideas, referrals, applying, joining through the website, and directly contacting the coordinator or other stakeholders.

Innovation-enabling activities implemented in the regional innovation networking platform were identified as bootcamps, teambuilding, hackathons, digital literacy training, networking, accelerator programme, student incubation programmes, strategic plan, masterclasses on coding and robotics, innovation & design thinking, and workshops. Each activity's frequency is not standard; and therefore, each RINP decides on the frequency.

In terms of the level of capacity to achieve the set objectives, the study revealed that there are no adequate financial, physical, and human resources to achieve the set

objectives. The study also found that the key competencies required in an effective innovation ecosystem include: strong project management capabilities, understanding of innovation enablement context, stakeholder management, understanding of technology and innovation management, relevant training and experience, better knowledge and understanding of the theory and practice of innovation, management and leadership skill, efficient equipment, research and collaboration, more team members with diverse expertise and sectoral specific skills.

4.2.3. Theme 3: Outputs of value co-creation

On the members' expectations and expected outputs of the RINP and their evaluation, the study found that different platforms had different expected outputs. Some of the respondents indicated that when they work with the RINP, they expect to acquire funding, skills (transfer and acquire) and mentorship. The expected outputs of the RINP include the following: raising funds, combining all innovative apps into one obtaining tangible results for the submitted creative ideas, improving products, ensuring SMME progress/improvement, establishing new businesses across different sectors, self-sufficiency, having a working system, stimulating a culture of innovation, improving efficiency and service delivery, facilitating activities for innovation output, and bringing stakeholders together.

The evaluation of outputs for RINPs is a critical part of understanding the success of the platform. Each output must be evaluated to determine the effectiveness of the platform. For this study, the respondents indicated that in their platforms, evaluation is done by measuring the outcomes against the initial project objectives; having products evaluated against the current markets; maintaining the relationship with innovators to continue monitoring progress; conducting impact assessment to provide strategic re-direction if necessary; through monitoring and evaluation; through improved productivity; and by conducting an impact assessment of activities.

Questions 8-13 of the interviews focused on the key actors of the selected and structure of the ecosystem. The table below presents the summary of the findings.

Questions	Findings			
	North West	Limpopo	Northern Cape	National experts
Have the roles and responsibilities of the governing body, including the facilitator/ coordinator, been outlined	Well-aligned	Not Applicable (N/A)	✓ Lines of responsibility still blur. ✓ Clashing roles ✓ Some clearly defined	✓ Not adequately articulated or defined
Governing body structure	✓ Structure in place	N/A	✓ Structure in place ✓ Minimal participation	N/A
Profile of the ecosystem (sectors, size of organisations, Institutions)	✓ DSI - TLIU ✓ North West University ✓ Ikageng School of Governance ✓ Local Communities ✓ TIA ✓ CISCO ✓ SMME's	✓ Academia ✓ Private sector ✓ NPO ✓ SMMEs ✓ Learners	✓ DSI – TLIU ✓ DEDAT ✓ ESKOM ✓ SPU ✓ SPM LED ✓ DEDaT ✓ NCPG ✓ UNISA enterprise ✓ BMF ✓ REEF-SA ✓ MLab ✓ SMME's	N/A
How often does the governing body meet and engage with the administrative office?	✓ Twice a year ✓ Monthly	N/A	✓ Seldom ✓ Quarterly ✓ Scheduled every 2 months ✓ core team meets every fortnight ✓ Office of premier and coordinator (meet once every 2 weeks) ✓ PSC meets once quarterly.	N/A
How do interested actors participate or join the innovation ecosystem?	✓ Through idea presentation ✓ Open door policy - walk in and pitch ideas	Word of mouth – apply and present ideas	✓ NCIF needs to implement KPI to raise awareness of activities ✓ Using the website ✓ Face2face/virtual platforms to invite actors ✓ Contact the coordinator directly ✓ Invitation and made to sign a commitment letter	N/A
Innovation enabling activities	✓ Bootcamp annually ✓ Teambuilding	✓ Networking ✓ Accelerator programme	✓ NCIF has strategic plan ✓ Hackathons	N/A

implemented in the regional innovation networking platform, and how frequent	✓ Hackathons twice a year ✓ Digital literacy training weekly	✓ Student incubation programmes	✓ Masterclasses - coding and robotics ✓ Innovation & design thinking ✓ Network Corner and workshops	
Level of capacity sufficient to achieve the set objectives	✓ Sufficient equipment ✓ Lack of funds	✓ Insufficient human resource ✓ Great mentors	✓ No support for the coordinator ✓ Not sufficient human resource ✓ Insufficient funds to build capacity	✓ No adequate capacity ✓ Limitation of financial resources
Key competencies required in an effective innovation ecosystem	✓ Efficient equipment ✓ Research and Collaboration	✓ More team members ✓ Visibility and accessibility	✓ Individuals with understanding and teams with requisite skills and experience ✓ Collaboration (including cross-provincial) ✓ Need to have teams with various expertise ✓ Good management skills, project coordination skills, ICT skills ✓ Sectoral specific skills	✓ Strong PM capabilities ✓ Understanding of innovation enablement context ✓ Stakeholder management ✓ Understanding tech and innovation management ✓ Relevant training and experience ✓ Better knowledge and understanding of the theory and practise of innovation ✓ Management and leadership skills

Table 1.4: Summary of findings on key actors and structure of the ecosystem in various provinces

Summary of overall findings

Section 4.2 of the chapter focused on identifying the members' expectations from the regional innovation network platform, exploring the various outputs of value co-creation and their evaluation. The findings are summarised in the table below:

Table 1.5: Summary of findings on outputs of value co-creation

Outputs of value co-creation	Findings			
	North West	Limpopo	Northern Cape	National experts
Member's expectations from RINP	• Funding • Skills (transfer and acquire) • Mentorship	• Funding • Skills (transfer and acquire) • Mentorship	• Funding • Skills (transfer and acquire) • Mentorship	• Funding • Skills (transfer and acquire)
Expected outputs of the RINP	• Raise funds • Improve products • Positive outcomes for all projects • Self sufficiency • Facilitate activities for innovation output • Bring and connect stakeholders together	• Combine all innovative apps into one functional app • Tangible results for the innovative ideas submitted	• SMME progress/improvement • Establishment of new business across different sectors	• Have a working system • Stimulate a culture of innovation • Improved efficiency • Improved service delivery
How outputs are evaluated	• Evaluation is done by measuring the outcomes against the initial project objectives • By users and through Improved productivity	• Maintaining the relationship with innovators to continue monitoring progress • Monitoring and evaluation committee investigate/determine if activities are impactful	• HSRC report output • Products are evaluated against the current market • Based on strategic document • Conducting impact assessment to provide strategic re-direction if necessary	• Commercialisation • Impact assessment of activities • HSRC report output • Based on strategic document

4.3 RESULTS FROM CONTENT ANALYSIS

4.3.1 Overview of collected documents

A summary of various documents used in the content analysis is presented in this section. The documents include the RISP Annual Review Document (2020/2021); The NCIF Revised Strategy for 2020/2021 – 2022/2023 (NCIF, 2020); Northern Cape Provincial Growth and Development Plan (NCPG, 2019); MLab outcome assessment report (TWB, 2014); North West Province Regional Innovation Support Platform (NWPISP); policy manual (NWRISP, 2021); Limpopo Strategic Plan 2020-2025 (LPG, 2020); The White Paper on Science, Technology, and Innovation (DST, 2019); and The Ten Year Innovation Plan (TYIP) (2008). These documents were analysed (in no specific order) according to the themes formulated for this study, i.e., Strategic goals, key actors and structure of the ecosystem and the outputs of value co-creation.

4.3.2 Theme 1: Strategic goals

Strategic alignment between the provincial government priorities and the Regional Innovation Networking Platform

North West province

To determine the strategic alignment between the provincial government and RINP, it is necessary to evaluate the extent to which the provincial strategic plans and RINP documents share common mandates, scopes, goals, or priorities.

The RINP policy document from the North West province distinctly outlines its mandate regarding innovation as follows:

- "*To enhance and promote innovation and technology transfer through structured support while creating jobs".*
- *"To improve the quality of education, skills development and innovation".*

The North West Province's 2020-2025 strategic plan does not address innovation activities and does not mention any collaborative efforts between RISP and the province.

Limpopo Province

In Limpopo Province, MLab was the RINP which the research focused on. The MLab (which is the RINP in this context), outlines its innovation initiatives which include the following (The World Bank, 2014):

- Providing one-on-one mentorship through an entrepreneur in residence.
- Developing a vertical model that allows the MLab to integrate with existing incubators and innovation spaces by providing specialised mobile tech incubation services.

The MLab's objective is to create an infrastructure that fosters innovation among young entrepreneurs, offering devices such as application testing tools and connecting them with existing industries. As a crucial link between provincial and national government agencies and grassroots entrepreneurs and ICT developers, it facilitates engagement and coordination among stakeholders. Through pilot experiences, all three analysed MLab's in this report have demonstrated the high potential of regional and cross-national connectivity, which enables the MLab to connect local, regional, and international ecosystems.

The Limpopo Province strategic plan for 2020-2025 outlines a goal of transforming the economy to serve all people, which will involve various processes such as driving innovation and digital revolution, increasing levels of investment, accelerating the provision of infrastructure, consolidating support for small businesses and cooperatives, as well as promoting the growth of the village and rural economy. However, the document also highlights that the Limpopo Integrated Innovation Strategy has yet to be developed.

Northern Cape province

In the Northern Cape, the NCIF's strategic approach will involve establishing partnerships and collaborations, leveraging resources, and implementing pioneering development projects. The strategic goals outlined for the NCIF are as follows:

- *"To develop innovation capabilities in the Northern Cape Province".*
- *"To mobilise resources for innovation-oriented activities".*

- *“To inspire a culture of innovation in the province”.*

The Northern Cape Provincial Government Development Plan (PGDP) will act as a crucial reference point for the direction and intervention of the NCIF, while also promoting coordination among government departments. To ensure that a wide range of policies impacting innovation are well-aligned, it is crucial that there is coherence not only at the central government level but also between the central government, regional and local authorities, which are often actively engaged in innovation activities.

National

The White Paper on Science, Technology, and Innovation (2019) at the national level states that local and provincial growth and development strategies will integrate innovation plans. The document further highlights the expansion of "innovation hubs" to improve provincial growth and development strategies and enhance technology competencies at the provincial level.

The Ten-Year Innovation Plan (TYIP) states that “*to encourage innovation, the DST will partner with provincial governments and facilitate the development of regional innovation systems plans”*. In addition, the plan outlines the DST's goal to enhance innovation in strategic areas through a range of targeted interventions in collaboration with other government departments.

4.3.3 Theme 2: Key actors and structure of the ecosystem

The RISP annual review report for 2020/2021 mentions key actors of the ecosystems such as universities, businesses, government departments, government agencies, municipalities, and innovation hubs among others. The report also makes mention of the platforms that collaborated with RISP to support innovation. These new stakeholders included the Monti Feeds, National Electronic Media Institute of South Africa, BioCODE technologies, Centre for Public Service Innovation, Rail Manufacturing Centre for Entrepreneurship Rapid Incubator, Tshaya Mashabela Attorneys, National Youth Development Agency, Google South Africa, Digify Africa and Facebook Partner.

According to the MLab 2014 research report, the entrepreneurial ecosystem is made up of several key actors, including universities, mobile operators, original mobile equipment manufacturers (OEMs), investors, training companies, government agencies, and various other entities (TWB, 2014).

Regarding the structure of the ecosystem, the NWRISP policy document (2021) clearly outlines all structures in this platform and provides information on the roles and responsibilities of all people involved. The documents specifically explain the governance, financial management, human resources, disciplinary code, and procedure, as well as the grievance procedure. With regards to meetings, the document states that there shall be four formal board meetings per annum, or as many as necessary provided there are urgent matters to address.

The Limpopo 2020-2025 strategic plan document does not provide any information or details about the structure of the ecosystem in Limpopo Province, as well as any relevant key actors who play a vital role in its functioning. Additionally, the strategic document did not acknowledge the various stakeholders who play a critical role in the ecosystem, such as government agencies, environmental organisations, and community groups.

The NCIF strategic plan 2020/21 – 2022/23 mentions the roles to be carried out by the NCIF. The document explains in detail the governance and management of the platform, the roles, and responsibilities as well as the mode of the organisations. Furthermore, there are clear timelines for discussion of progress and review of set priorities through meetings and forums.

4.3.4 Innovation activities

The MLab 2014 report has outlined activities that promote innovation and strengthen the human resource base of entrepreneurial ecosystems. These activities include training, workshops, and event-based skill building. The RISP 2020/2021 annual

review document also lists various networking events, training events and mentorship programmes as some of the innovation-enabling activities that were implemented in various regional innovation network platforms.

4.3.5 Theme 3: Outputs of value co-creation

Only the revised NCIF Strategic Plan 2020/21 – 2022/23 clearly outlines their objectives and expected outputs. The outputs are in line with the objectives of the NCIF and have key performance indicators. Specific focus is on information services outputs, research services outputs, learning and knowledge-sharing services outputs, network facilitation and brokerage services outputs, capacity building services outputs, technology transfer services outputs, and resource mobilisation services outputs. The NCIF also conducts performance monitoring and evaluation. A quarterly monitoring report is supposed to be issued and used as a monitoring tool. As an additional step, it is recommended that a thorough evaluation be conducted at the end of the three-year planning cycle to assess the NCIF's relevance, effectiveness, efficiency, and impact.

4.4 CONCLUSION

The two main empirical aspects entail content analysis which involved systematically analyzing documented sources and one on one interview responses from the participants involved in the study. The study examined the strategic alignment between provincial government priorities and the Regional Innovation Networking Platforms (RINPs) alongside the understanding of the RINP structure and intended outcomes among ecosystem actors across different provinces such as North West, Limpopo, and Northern Cape.

The content analysis reveals that strategic objectives are clearly outlined in the various RINPs strategic documents, but not all represent strategic alignment with their respective government priorities. For instance, the RINP policy document from the North West province distinctly outlines its mandate regarding innovation in their strategic plan. However, the North West Province's 2020-2025 strategic plan does not address innovation activities and does not mention any collaborative efforts between

RISP and the province. Whilst the Northen Cape and Limpopo strategic plans mention innovation as a key driver of innovation and economic development.

Similarly, the participant responses revealed varying perspectives across different provinces and nationally regarding strategic alignment between RINPs and provincial government priorities. For instance, in the North-West province, there was mixed feedback. While one respondent acknowledged alignment, another highlighted that other governmental departments were only beginning to recognize the platform's existence, suggesting less alignment with broader government priorities (RP1). Conversely, in Limpopo province, most respondents, primarily entrepreneurs involved with the RINP, perceived alignment, particularly in sectors like tourism and agriculture, which are pivotal for the province's economic growth (RP5). However, not all respondents in Limpopo explicitly indicated alignment, underscoring some divergence in perceptions.

In the Northern Cape, one respondent expressed skepticism due to the platform's early stage and the region's new development strategy under new leadership, suggesting potential future alignment as strategies mature (RP9). Nationally, views were also diverse, with some acknowledging alignment in specific regions while others noted discrepancies, particularly in integrating innovation into broader provincial economic priorities (RP18, RP19).

Regarding understanding of priorities and intended outcomes among ecosystem actors, the North-West province showed positive responses. Participants highlighted group sessions within the RINP that clarified objectives, fostering better understanding among actors (RP1, RP2). Similarly, in Limpopo, respondents generally felt there was a good grasp of priorities, with stakeholders actively engaging and collaborating to support innovation initiatives (RP3, RP5). However, challenges were noted in the Northern Cape, where respondents perceived a lack of understanding among ecosystem actors about the RINP's role and objectives, hindering effective collaboration (RP11). Nationally, the study highlighted limited understanding among ecosystem actors about set priorities and intended outcomes. Only a minority of respondents felt there was clear understanding, indicating broader challenges in

communication and alignment between national policy frameworks and regional innovation goals (RP18, RP19).

Multiple sources like the RISP Annual Review, MLab outcome assessment report, and strategic plans from each province underscore the involvement of diverse stakeholders including universities, government departments, society and private sector entities in fostering innovation. This is in line with the responses received from participants on the evident multi-sectoral stakeholder participation across the RINPs. The study found that the key actors in an innovation ecosystem included entrepreneurs, investors, corporations, research institutions including universities, government agencies, non-governmental organizations, and many other stakeholders.

In terms of outputs of value co-creation from the participant responses and in the strategic documents reviewed. The content analysis identifies outputs expected from RINPs, including raising funds, improving products, and fostering a culture of innovation. For example, the NCIF's strategic plan details specific outputs. Moreover, the content analysis elucidates specific innovation activities facilitated by RINPs, such as training programs, workshops, and networking events, as outlined in reports like the MLab 2014 report and RISP annual reviews. According to participant responses, innovation-enabling activities implemented in the regional innovation networking platform were delivered through workshops, networking events and training programmes. Such as bootcamps, teambuilding, hackathons, digital literacy training, networking, accelerator programme, student incubation programmes, masterclasses on coding and robotics, innovation & design thinking, and workshops. These activities are aimed at enhancing the innovation capabilities within their respective ecosystems.

Aspects that contribute to value co-creation in RINPs were indicated in this chapter. It could be concluded that the aspects that contribute to value co-creation in regional contexts are multifaceted and interconnected. Thus, the importance of analyzing both content and participants' activities to achieve a nuanced understanding of the research topic. This integrated approach enhances the validity and depth of the study's findings. For instance, the content analysis enriches our understanding of how RINPs

operationalize their objectives, whilst the participants responses provide a more practical perspective of the regional innovation ecosystems in South Africa.

The next chapter will focus on the analysis and discussion of the findings.

CHAPTER 5 : ANALYSIS AND DISCUSSION OF THE RESEARCH FINDINGS

5.1 INTRODUCTION

The study explored value co-creation in regional innovation ecosystems in South Africa, specifically focusing on three provinces, i.e., North West, Limpopo, and the Northern Cape. The national experts in innovation were also included to provide their expert opinion and guidance regarding this topic. Three themes were formulated from the findings. This chapter discusses the findings of the study in relation to both practical and theoretical literature to identify areas that need further research.

Overview of research questions

The overarching research question is: How do regional innovation network platform ecosystems contribute to value co-creation?

The main question is refined through the following sub-questions, addressed in the research study:

- What are the innovation practices that enhance value co-creation in the respective regional innovation ecosystems?
- What are the required innovation capabilities for an effective regional innovation ecosystem?
- How is value defined and how are the innovation outcomes measured in regional innovation ecosystems?

Value co-creation in regional innovation network platforms in South Africa is a process that enables stakeholders to come together to develop and share innovative ideas, products, services, and processes. It is an open platform that encourages the exchange of knowledge and ideas, allowing stakeholders to collaborate and find creative solutions to complex challenges. Through value co-creation, stakeholders can leverage the network's collective knowledge, resources, and expertise to generate innovative solutions that can be shared and implemented across South Africa.

5.2 WHAT ARE THE INNOVATION PRACTICES THAT ENHANCE VALUE CO-CREATION IN THE RESPECTIVE REGIONAL INNOVATION ECOSYSTEMS?

Innovation activities and practices are required to ensure effective value co-creation in the respective regional innovation ecosystems. There are various activities and practices involved in value co-creation that can vary across different regions, but the overall goal is to foster collaboration, innovation, and entrepreneurship (Cowan et al., 2009). The identified activities and practices for this study include, creating a collaborative environment, networking, hackathons, bootcamps, digital literacy classes, masterclasses on coding and robotics, innovation and design thinking, workshops, and sharing resources. Similar innovation activities and practices were reported and experienced during COFISA (Pogue et al., 2010).

In addition, a study carried out by the World Bank to determine whether MLab makes a difference has explicitly reported the successes of some of the mentioned activities in value co-creation across the world (TWB, 2014). Such activities or events not only contribute to creation of startups but also to their evolution. These activities and practices can help create a network of stakeholders that work together to create and capture value in the regional innovation ecosystems and requires commitment from all value co-creators (Ketonen-Oksi & Valkokari, 2019). The various actors strive to develop a common internal model through the exchange of information, in which they learn about each other's expectations and requirements; a model fuelled by shared practices and principles.

5.2.1 Strategic alignment between the provincial/regional government priorities and the Regional Innovation Network Platform

Overall, the findings indicate that in some regions, there is strategic alignment and no strategic alignment in others. This agrees with the DSI's (2019) White Paper on Science, Technology and Innovation that lists lack of policy coordination and coherence as some of the challenges in the NSI. The provincial/regional differences might include lack of policy coordination and coherence as challenges since each province has its unique socio-economic and development context. In addition, provincial governments often have their own policy agendas and priorities, which may

not always align perfectly with the objectives of the Regional Innovation Network Platform. Moreover, the allocation of resources, including funding and personnel, can significantly impact the priorities and strategies pursued by provincial governments and the Regional Innovation Network Platform. Limited resources may necessitate different approaches and choices, resulting in differing strategic alignments. A lack of collaboration between the two may lead to a lack of understanding of their potential synergies. Furthermore, the lack of adequate mechanisms for policy learning can also inhibit the alignment of these two entities. This can result in a lack of knowledge-sharing between the two, as well as a lack of understanding of the potential benefits of strategic alignment. As a result, the RINP may not be able to fully capitalise on the resources and capabilities of the provincial/regional government.

For the North West province, the North West Province's 2020-2025 strategic plan does not address innovation activities and does not mention any collaborative efforts between RISP and the province. However, the 2021 NWRISP policy manual is well aligned with the RISP goals and objectives. It could be concluded that there is no strategic alignment between provincial and RINP in the North West Province.

In Limpopo, although the Limpopo Province strategic plan for 2020-2025 outlines a goal of transforming the economy to serve all people, which will involve various processes such as driving innovation and digital revolution, the province's Integrated Innovation Strategy is yet to be developed. The current RINP of focus in this study was MLab. Focusing on the goals for both MLab and the Limpopo strategic plan, it could be concluded that there is an alignment between the two.

Lastly, focusing on the Northern Cape, the NCIF strategic plan 2020/2021 and the Northern Cape Provincial Government Development Plan have aligned strategic goals. In addition, the PGDP will act as a crucial reference point for the direction and intervention of the NCIF.

5.2.2 Understanding by the ecosystem actors of the set priorities and intended outcome

The overall findings indicate that there is an understanding of set priorities and intended outcomes, although such understanding could be shallow or limited in certain regions. The NCIF strategic plan for 2020 – 2023 and the 2014 MLab report by the World Bank, make mention of the ecosystem actors, set priorities, and intended outcomes for the platform. Having an understanding by the ecosystem actors of the set priorities and intended outcome is beneficial for many reasons. Firstly, it allows for transparency in the decision-making process, as all stakeholders are aware of what is expected of them and understand the project's goals and objectives. This understanding also allows for more effective communication between the stakeholders, facilitating collaboration among ecosystem actors. Additionally, it allows the stakeholders to evaluate their progress accurately; better assess the success of the project, while making better plans for potential contingencies. It also helps to ensure that the project is in line with the goals of the ecosystem, making sure that the project is beneficial to all stakeholders.

5.2.3 Understanding of innovation among ecosystem actors

Even though there is a growing awareness of the concept of innovation in South Africa, the findings indicate that some actors understand the concept of innovation, whereas other actors do not. Similar findings on the lack of understanding of this concept in South Africa were reported by Kahn, (2013). Other respondents indicated that innovation is still linked to ICT despite the definition provided by the 2019 White Paper on Science, Technology, and Innovation. Similar results about innovation being related to ICT were reported by Hart et al., (2015), indicating that the respondents perceived innovation as something involving technology and revenue gains.

The lack of understanding of the concept of innovation in South Africa might be owing to the country's history of socio-economic inequity. South Africa has not had the same opportunities to foster creativity and innovation as other countries have, leading to a lack of resources and knowledge. Additionally, the country's traditional focus on industrial production and extractive industries has led to a short-term orientation that does not emphasize long-term investments in innovation and research. Furthermore,

the government's limited financial commitment to innovation and the lack of access to venture capital for start-ups make it difficult for people to pursue their innovative ideas. Lastly, many South Africans remain unaware of the numerous opportunities to engage with innovation, leading to a lack of understanding of the concept.

5.2.4 Knowledge about the national systems of innovation and their role at a regional level

The overall findings of the study indicate that there is a limited or lack of knowledge about the national system of innovation and its role at the regional level. The lack of knowledge of the NSI by regional ecosystem actors in South Africa is a serious issue that was highlighted by Pogue et al., (2010) and DSI (2019). This is because these ecosystems are essential for driving innovation, economic growth, and development in the country. The lack of knowledge can therefore hamper the ability of regional actors to engage with the NSI in a meaningful way. This will result in a disconnect, and hinder collaboration between the national and regional levels.

The NSI is defined as the set of institutions, organizations, policies, and resources that support and facilitate the innovation process. The NSI provides the necessary environment to foster the development of new products, services, and technologies that can help the economy to grow. In South Africa, the NSI framework is made up of a range of public and private actors, including universities, research institutions, venture capital funds, incubators, SMMEs, government agencies, and other stakeholders. Unfortunately, owing to a lack of understanding about the NSI framework, ecosystem actors in South Africa cannot effectively participate in the innovation process and thus cannot contribute to the country's development. This lack of knowledge about the NSI framework and its role at a regional level is a major obstacle to the development of the economy. To overcome this problem, there needs to be a concerted effort by government, private sector, and other stakeholders to provide better education and awareness about the NSI framework. This can be done through the development of educational materials, workshops, seminars, and other initiatives that will help to raise awareness about the NSI. Additionally, it is important to strengthen the capacity of ecosystem actors through the provision of technical assistance and training. This will help them to better understand the NSI framework

and its role at a regional level. By increasing the knowledge of the NSI framework and its role at a regional level, ecosystem actors in South Africa will be better equipped to participate in the innovation process and contribute to the development of the country. This will ultimately lead to increased economic growth and development for the country.

5.3 WHAT ARE THE REQUIRED INNOVATION CAPABILITIES FOR AN EFFECTIVE REGIONAL INNOVATION ECOSYSTEM?

Certain innovation capabilities are critical for regional innovation ecosystems because they provide the necessary resources, support, and infrastructure to enable the development of new ideas and technologies. The study found that the key competencies required in an innovation ecosystem include: strong project management capabilities, understanding of innovation enablement context, stakeholder management, understanding of technology and innovation management, relevant training and experience, better knowledge and understanding of the theory and practice of innovation, management and leadership skill, efficient equipment, research and collaboration, more team members with diverse expertise and sectoral specific skills. This is in agreement with Carayannis and Campbell, (2010); Viitanen, (2016) and Mulas et al., (2015), who also state that the capabilities are determined by the ecosystem's ability to innovate. These capabilities can help ensure that the region is a competitive and attractive hub for businesses, entrepreneurs, investors, and talent. Furthermore, these capabilities can enable the ecosystem to foster collaboration and creativity, thus creating a platform for long-term economic growth and success.

5.3.1 Key actors and structure of the ecosystem

The 2019 White Paper on Science, Technology and Innovation has placed great emphasis on the development of local and regional ecosystems. It outlines the key players in NSI that can be used as a model for the RINP. The study findings reveal that some participants are aware of the key actors and structure of the ecosystem. The same actors, according to Barth (2011), are aware of the quintuple helix model

mentioned by participants which are also described by the UNDP (2020), RISP (2021) and TWB (2014).

The study found that in certain regions, the participants were not aware of the roles of the facilitator/coordinator because these roles were not clearly outlined, clashed or were not well defined. This is not entirely consistent with Ketonen-Oksi and Valkokari (2019) who state that the role of the facilitator is important "to make people enthusiastic and to innovate". The impact of having unclear roles for facilitators in regional innovation network platforms can be significant. This can confuse the members of the network and the facilitators themselves, resulting in a breakdown in communication and coordination. Without a clear delineation of responsibilities, ecosystem actors may be unsure who to turn to for assistance and advice. This can lead to a decrease in the effectiveness of the RINP, as well as a decrease in the level of innovation and creativity that the ecosystem can produce. In addition, unclear roles can also cause a lack of accountability, leading to a decrease in members' trust in the network, thereby creating a negative atmosphere and decreasing the number of members participating in the ecosystem.

One positive finding, however, was that most participants were aware that there is a governing structure in place and were able to have meetings to discuss issues regarding the projects or the functioning of the regional platforms. Pogue et al., (2010) indicated that governance structures must be in place as early as possible to prevent delays in project implementation. The meeting schedules, however, differ from region to region and sometimes depend solely on the needs of the RINP. The importance of having a governing structure in a regional innovation network platform cannot be overstated. A governing structure helps ensure that the network is operating legally, ethically, and effectively. It also establishes a set of rules and regulations to ensure that everyone involved follows the same procedures and guidelines. The governing structure also provides a framework for decision-making, which helps to ensure that the RINP is making sound decisions that benefit everyone involved. Furthermore, it can help prevent conflicts of interest and provide a platform for addressing disputes.

With regards to joining or becoming part of the innovation ecosystem, the study findings revealed that this could be done in a variety of ways, like simple walk-in and

pitching ideas, referrals, applying, joining through the website, and directly contacting the coordinator or other stakeholders. Walk-ins involve directly visiting the organisation and introducing yourself, providing background information about your experience, and demonstrating enthusiasm for joining the platform. Pitching ideas involves presenting a well-developed plan or idea that could potentially benefit the network and providing evidence to back up the potential of your idea. The different options cater for different types of people with different preferences.

Innovation-enabling activities implemented in the RINPs are designed to cultivate a culture of creativity and collaboration. Bootcamps, teambuilding, hackathons, digital literacy training, networking, accelerator programmes, student incubation programmes, strategic plans, masterclasses on coding and robotics, innovation & design thinking, and workshops are examples of these activities the participants highlighted. These findings are substantiated by the content analysis of the RISP Annual Review Report for 2020/2021 and the 2014 MLab report compiled by the World Bank.

Bootcamps and teambuilding activities allow participants to learn skills and techniques that can be used to solve real-world problems. Hackathons provide a space for collaboration and creativity, while digital literacy training ensures that everyone is equipped with the necessary skills to make the most of technology. Networking events, accelerator programmes, student incubation programmes, and strategic plans provide participants with the necessary tools and resources to develop and grow their ideas. Masterclasses on coding and robotics, innovation & design thinking, and workshops further equip participants with the necessary skills and knowledge to create innovative solutions to various challenges. The participants also indicated the frequency of hosting such activities. The frequency of each activity is determined independently by each RINP.

It should be noted, however, that the activities themselves vary from region to region, depending largely on the specific objective of each RINP. Equally working with the acknowledgement that regional innovation system concept was birthed to promote, cultivate, and produce the region's competitive advantage (Asheim & Gertler, 2005; Katimertzopoulos et al., 2020). The review of the 2021 RISP report supports these

findings. The report indicated that these platforms were able to host several hackathons/innovation challenges and IP awareness training for the financial year 2020/2021 (RISP, 2021). The report further indicated that most IP training and hackathons activities resulted in technology incubation and mentorship programmes. About 1100 black-owned technology-based SMMEs and innovators benefited from the Platform (RISP, 2021). In addition, Limpopo, Northern Cape and the North West province have specifically benefited from these RISP initiatives as they were considered to be previously disadvantaged.

In terms of the capacity to achieve the set objectives, the study revealed a lack of financial, physical, and human resources to meet the objectives. These findings align with the findings of the 2021 RISP review report. The report found that there is a lack of administrative capacity for some of the RINPs and this continues to be a challenge for some of the platforms (RISP, 2021). In terms of funds, although the RISP initiatives have secured a total of about R1.26 million in co-funding contributions for the 2020/2021 financial year (RISP, 2021), not all RINPs benefited from these funds. Instead, only previously disadvantaged communities were allowed to participate in the RISP initiatives (RISP, 2021).

To effectively foster an innovative ecosystem, the study found that key competencies such as: strong project management, knowledge of the context of innovation, stakeholder management, the expertise of technology and innovation management, training and experience, comprehension of the theory and practice of innovation, managerial and leadership skill, utilization of efficient equipment, collaboration, and a diverse team with sector-specific skills are necessary. UNDP (2020) also mentioned the issue of skills shortages as a major structural problem in South African innovation ecosystems. These findings by the UNDP match the current findings of the study because most participants were commenting on what type of skills are currently needed in their respective platforms.

5.4 HOW IS VALUE DEFINED AND HOW ARE THE INNOVATION OUTCOMES MEASURED IN REGIONAL INNOVATION ECOSYSTEMS?

From the findings, the respondents believe that value in innovation is the benefit derived from a product or service. It is measured in terms of the cost-benefit ratio, potential returns on investment, or the customer's overall satisfaction. This supports Pera et al., (2016) that value will be at times misaligned and will differ from actor to actor. Innovation outcomes are measured by looking at the level of impact or the number of new products, services, or processes created because of the innovation process. In their platforms, the respondents measure outcomes against initial project objectives and assess products against current markets. Others maintain relationships with innovators to continue monitoring progress, conducting impact assessments to provide strategic re-direction if necessary, monitoring and evaluating, improving productivity, and conducting activity impact assessments.

5.4.1 Outputs of value co-creation

The RINP should be able to provide members with access to resources, knowledge, and networks; access to education and training opportunities; access to funding and investment opportunities; and mentorship from experienced professionals in the field. In this study, the participants indicate funding, skills and mentorship as their primary expectations when becoming part of a RINP.

Value co-creation in RINPs can have several outputs that help drive innovation and development. These outputs can include tangible benefits such as new products, services, and processes; and intangible benefits such as improved organisational practices and new knowledge. These outputs can be evaluated in terms of their economic, social, and environmental impacts. Economic evaluation looks at the value co-creation process's direct and indirect economic benefits. The social evaluation looks at how value co-creation has strengthened regional relationships and improved stakeholder collaboration. The environmental evaluation looks at how value co-creation has impacted the local environment and the sustainability of the regional ecosystem. Evaluating these outputs can help identify areas needing improvement and can inform future initiatives in regional innovation networks. These findings are

substantiated by the content analysis results of the NCIF Strategic Plan 2020/21 – 2022/23.

The study suggests that the RINP's outputs will include raising funds, consolidating innovative applications into one, obtaining tangible results from creative ideas, improving products, advancing SMMEs, creating new businesses across sectors, fostering self-sufficiency, establishing a working system, encouraging a culture of innovation, increasing efficiency and service delivery, promoting activities for innovation output and uniting stakeholders.

The evaluation of outputs should focus on the contributions made to achieving outcomes and impact, such as changes in the behaviour and activities of the individuals and organizations involved (Pogue et al., 2010). The outputs identified in this study are evaluated by measuring the outcomes against the initial project objectives; having products assessed against the current markets; maintaining the relationship with innovators to continue monitoring progress; conducting impact assessment to provide strategic re-direction if necessary; through monitoring and evaluation; through improved productivity; and by conducting an impact assessment of activities. Monitoring and evaluation allow the assessment of whether a project is being carried out in accordance with its stated objectives and results and its broader impact (Pogue et al., 2010).

5.4.2 The value co-creation process of RISPs

Table 5.1 represents the proposed four phases of value co-creation process of the RISP during the 2020/2021 period. It is worth noting that the four phases of value co-creation are iterative and overlapping in practice (Galbrun & Kijima, 2009). In this instance, the first stage in the value co-creation was the establishment of a Programme Management Unit (PMU) within the CSIR to manage and implement the RISP.

Table 1.6: Summarised practices related to value co-creation process of RISPs in 2020/2021

Phase I: Co-Experience	Phase II: Co-Definition
• DSI established RISP to manage and strengthen provincial and rural innovation systems, namely, RINPs. • The vision of RISP is clearly stipulated to address both national and provincial challenges. • The ecosystem development was increased through facilitation, foundation of RINP, Walk-ins, referrals etc. • General agreement and understanding of participants expectations and set priorities.	• A lot of different meetings, training events, workshops, and implementation of activities. • Collaborations and new partnerships with various stakeholders including Universities, business partners and other government institutions. • Lack of understanding on roles/responsibilities for facilitators and ecosystem actors, communication between different actors could be improved.
Phase IV: Co-Development	**Phase III: Co-Elevation**
• Clearly defined expected outputs and output evaluation/measurement strategies. • Contribution towards inclusivity and transformation with respect to innovation support was emphasised by ensuring participation of previously disadvantaged communities. • Facilitation and online training events increased participation.	• Feasibility studies and business plans for innovation enabling mechanisms (science parks, technology incubators, etc.) and Innovation Baseline studies. • The online/virtual platforms attracted a wider spectrum of stakeholders during the period under review and should be maintained past COVID-19 restrictions. • There is a lack of strategic alignment and knowledge-sharing; more collaborative involvement from national and provincial departments is needed.

The primary purpose of RISP is to manage and strengthen regional and rural innovation systems (RISP, 2021). Within this stage, there is also an introduction to other ecosystem actors to broaden the reach of RISP through the establishment and support of various Regional Innovation Network Platforms (RINPs) and other innovation platforms across all provinces in South Africa. This study will not be focusing on the newly emerging concept of platforms because it is presumed that ecosystem actors have already had initial interaction and have determined a shared interest in technology innovation. The ecosystem is further developed during the first and second stage through collaborations and introduction of new partnerships with universities, business partners and other government institutions (RISP, 2021). It is

worth noting that value co-creation in the context of regional innovation ecosystems involves independent and interdependent actors.

In the third stage, different studies are conducted for the elevation of existing strategies and other limitations and their potential resolutions are also identified. The fourth stages represent co-development where value co-creation is realised and there are outputs that can be evaluated. The third and fourth stage correlate closely with Theme 3 of the study which clearly identified member expectations from the regional innovation network platform, exploring the various outputs of value co-creation and their evaluation. Some of the key expected outputs included raising funds, obtaining tangible results from creative ideas, improving products, advancing SMMEs, promoting participation from previously disadvantaged communities, encouraging a culture of innovation, increasing efficiency and service delivery, promoting activities for innovation output and uniting stakeholders. According to the RISP report, over 15 provincial and local governments participate in the RINPs. The RISP initiatives have secured a total of about R1.26 million in co-funding contributions. Furthermore, contribution towards inclusivity and transformation with respect to innovation support was promoted by ensuring the participation of previously disadvantaged communities such as North West (all four districts) and Limpopo (Polokwane, Venda and Mokopane) in the RISP initiatives (RISP, 2021). As initially mentioned, the phases are iterative and overlapping in practice. Therefore, effective value co-creation will require continuous effort and dedication from all ecosystem actors, individuals, and organisations. It is from these continuous engagements and awareness of expectations that the ecosystem actors will develop shared principles and integration of resources exchanged that will drive the innovation process (Vargo & Lusch, 2016).

5.5 SUMMARY OF DISCUSSION

Findings indicate that the aspect of value co-creation research differs from region to region. This could be owing to the cultural, socio-economic, technological, and regulatory factors that vary across regions, which play a significant role in determining the strategies and approaches to value co-creation. One most important aspect which needs to be addressed is the strategic alignment between the provincial/regional

government priorities and the RINPs. Overall, the findings suggest that there is strategic alignment in certain regions. However, the study also found that there is limited knowledge about the national system of innovation and its role at regional level.

In terms of the key actors of the innovation ecosystem, the findings indicate that there are governing bodies in place, the innovation-enabling activities are known and available on these platforms, and various methods for joining the platforms are also well elaborated. However, the lack of human and financial resources to carry out the mandates for the RINPs was identified as the major issue in all regions. The findings also provide various skills and expertise required for RINPs.

Regarding members' expectations, key outputs and evaluation methods used in the RINPs, the findings reveal that most participants know and understand what is needed and what are the desired outputs in each region. The findings also indicate the suggested and currently used methods for output evaluation.

5.6 CONCLUSION

The analysis of the research findings is presented in this chapter. This study's findings on value co-creation in South Africa's RINPs are consistent with the findings of several related studies on the topic. The subsequent chapter presents the study's conclusions and recommendations.

CHAPTER 6 : CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The White Paper on Science, Technology, and Innovation (2019) has provided only minimal detail in the significant role regional innovation systems can play within the NSI and has not provided a strategic framework for the provinces to take guidance from establishing their regional innovation systems to address development challenges. Ecosystem actors in various provinces are responding to the establishment of regional innovation network platforms, in the quest to support technology innovation. Technological innovation has become a key feature in emerging markets, encouraging inclusive economic growth, and allowing developing countries to address pressing development issues. Technology SMMEs in the regional ecosystems do need the innovation enabling support to create the output that is innovation.

This study has focused on exploring how the RINPs contribute to value co-creation in meeting the mandate of enabling and supporting technology innovation activities. The research offers valuable insight to a RINP in the context of South Africa, providing access to the composition of a typical RINP ecosystem. The study highlights the practices, the required capabilities and value output of RINPs. The findings of this study were described in detail in the previous chapter. This chapter seeks to draw conclusions and provide recommendations for present and future research based on these findings.

6.2 MAJOR FINDINGS

The following major findings on the three research questions are discussed below:

What are the innovation practices that enhance value co-creation in the respective regional innovation ecosystems?

The study findings revealed that certain activities and practices are involved in value co-creation in the regional innovation ecosystem. Among the identified activities and practices are the following: creating an environment that encourages collaboration, networking, hackathons, bootcamps, digital literacy classes, masterclasses on coding

and robotics, innovation and design thinking, workshops, and resource sharing. These activities and practices have the potential to assist in the formation of a network of stakeholders in regional innovation ecosystems who collaborate to produce and harvest value for the ecosystems.

What are the required innovation capabilities for an effective regional innovation ecosystem?

From the study findings, it is established that the respondents are aware of what capabilities are required and why those capabilities are required. The findings show that the ecosystems must have diverse skills and capabilities to be fully functional. These capabilities include having a well-defined strategy, access to research and development funding, mentorship, collaboration opportunities, talent and skills development, supportive government policies, effective networks, and appropriate infrastructure.

Key competencies required for value co-creation in an innovation ecosystem include: strong project management capabilities, understanding of innovation enablement context, stakeholder management, understanding of technology and innovation management, relevant training and experience, better knowledge and understanding of the theory and practice of innovation, management and leadership skill, efficient equipment, research and collaboration, more team members with diverse expertise and sectoral specific skills.

How is value defined and how are the innovation outcomes measured in regional innovation ecosystems?

The findings revealed that there is an understanding of what value is, especially when it comes to products and services in their respective platforms. Regarding measuring innovation outcomes, the respondents mentioned various methods or practices. Some of these methods were currently being used, and some were recommended as they could yield better results. The respondents measure outcomes against initial project objectives and assess products against current markets. Others maintain relationships with innovators to continue monitoring progress, conducting impact assessments to

provide strategic re-direction if necessary, monitoring and evaluating, improving productivity and conducting activity impact assessments.

6.3 KEY CONCLUSIONS OF THE STUDY

This study intended on exploring value co-creation in regional innovation ecosystems in South Africa, with a specific focus on Limpopo province, North West province, and the Northern Cape province. The innovation ecosystem in South Africa is relatively advanced, with key elements and components like an innovative business sector and world-class research organizations (UNDP, 2020). South Africa has made significant progress in establishing RINPs across the country. Notwithstanding this progress, some RINPs struggle to fully function owing to challenges such as a lack of human, financial and physical resources. Thus, the posed research questions the study explored for further understanding of the RINPs.

Strategic alignment between the provincial/regional government priorities and the Regional Innovation Network Platform is reflective in the Northern Cape province's strategic document and their role in the ecosystem although both local and provincial governments are actively engaged and supportive of the RINPs in Limpopo and North West province respectively.

Innovation among ecosystem actors is understood in the Limpopo and Northern Cape province, however, there is only a narrow view of innovation. There is minimal awareness and knowledge of the national system of innovation and its role at regional level. The strategic determination of the RISP and RINPs is reflected in the ecosystem actors' understanding of the set priorities and intended outcomes.

Most of the participants are aware of the RINP governing body, the project steering committee while some participants know only the critical actors and structure of the ecosystem. In addition, participants are aware of what outputs for value co-creation are and how these outputs are or should be evaluated. Despite various structural challenges the RINPS contribute towards value co-creation in technology SMMEs.

6.4 RECOMMENDATIONS FOR ECOSYSTEM ACTORS

The study carried out in this section offers beneficial recommendations for the RINP and other stakeholders. These recommendations have a twofold benefit: they can be applied practically to the RINP and can contribute to existing research in the field. The following recommendations are made:

- **Ensure strategic alignment between the provincial/regional government priorities and the Regional Innovation Network Platform:** Establish a clear value governance structure to ensure initiatives success and alignment with government priorities.

- **Clarify roles and responsibilities:** Clear roles and responsibilities for facilitators/co-ordinators help to establish clear expectations and boundaries between members and can help to prevent any confusion or misunderstandings. This can also help to ensure that the necessary tasks are completed in a timely manner and that any conflicts are resolved quickly and efficiently.

- **Capacitate the RINPs:** RINPs must be fully capacitated to work efficiently and effectively towards their mandate. The importance of capacitating the RINPs is that it enables them to fulfil their roles effectively and efficiently by providing them with the necessary knowledge, skills, and competencies to practise their profession.

- **Ensure sufficient financial resources:** The RINP should develop a long-term financial strategy that outlines how the RINP will sustain itself in the future. The strategy should define the RINP's objectives and how they will be achieved, including the sources and uses of funds. In addition, the RINP should increase the diversification of income sources. This can include seeking new funding sources from international organizations, government grants, and private donations.

- **Improved monitoring and evaluation practices for innovation outputs:** Each regional platform should have an approach to monitoring and evaluating

the RINP's outcomes and provide sufficient resources to carry out this process. This will help identify areas of improvement and where resources may need to be reallocated to maximize the effectiveness of the RINP. Improved monitoring and evaluation practices help to ensure that the RINP is cost-effectively achieving its intended results.

- **Conduct regular awareness sessions about the national system of innovation and their role at a regional level:** The regions must ensure that all employees are inducted, trained, and aware of national innovation systems. This will ensure that everyone is knowledgeable and understands each member's role.

6.5 RECOMMENDATIONS FOR FURTHER RESEARCH

The study revealed several aspects amenable to further investigation and could be pursued by individuals, practitioners, or scholars active in innovation value co-creation. The following recommendations for future research are made:

- Conduct a comparative analysis of the unique regional innovation network platforms in South Africa and their respective value co-creation processes. The study could aim to find commonalities and differences in how value is co-created on each platform and could further evaluate the effectiveness of these approaches.

- Conduct long term research to observe the effectiveness of value co-creation in regional innovation network platforms in South Africa over time. This could involve surveying participants to measure the impact of their participation in value co-creation activities and contentment with the results.

- Develop a strategy for refining the efficacy of value co-creation in regional innovation network platforms in South Africa. This could include an assessment of existing models of value co-creation, as well as identifying potential opportunities and challenges associated with implementation. Additionally, the strategy should examine how to secure the long-term viability of value co-creation initiatives.

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APPENDICES

APPENDIX A: SEMI-STRUCTURED INTERVIEW SCHEDULE

Thank you for agreeing to a meeting promptly. The purpose of the interview is to address research questions on the topic “value co-creation in regional innovation ecosystems in South Africa” with a special focus on the significance of ecosystem actors and their collective practices for value co-creation.

Information of key informant interviewed
Full Names:
Organisation:
Province:

Introductory Questions

1. What is your role in your organisation?
2. What is your relationship with the case company?
3. How did you get into working with the case company?

Research Questions

4. Do you think there is strategic alignment between the provincial/regional government priorities and the Regional Innovation Networking Platform
5. To what extent do ecosystem actors have understanding of the set priorities and intended outcome?
6. In your opinion, to what extent is there understanding of innovation among ecosystem actors?
7. In your personal experience, are ecosystem members knowledgeable about the national system of innovation and the role that the regional level plays in it?

8. Have the governing body's roles and duties, including the facilitator/coordinator, been outlined? Kindly outline the governing body structure.
9. How often does the governing body meet, and engage with the administrative office?
10. In your experience, how do interested actors participate or join the innovation ecosystem? Briefly provide an overview or profile of the ecosystem i.e., sectors, size of organisations.
11. Briefly outline innovation-enabling activities implemented in the regional innovation networking platform, and how frequent?
12. In your opinion, is the level of capacity sufficient to achieve the set objectives?
13. In your experience, what are the fundamental competencies required in an effective innovation ecosystem?
14. In your opinion, do all members have the same expectations from the regional innovation network platform?
15. What are the expected outputs of the regional innovation networking platform?
16. How are the outputs evaluated?

Closure

17. What are your closing comments?
18. Are you able to suggest any other persons who might have different perspectives, to possibly interview? Your suggestions are valued.

Thank you for your consideration, input, time and for granting this interview at short notice.

APPENDIX B: RESPONDENT CORRESPONDENCE



The Graduate School of Business Administration
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PO Box 98, WITS, 2050
Telephone: +27 11 717 3600
Facsimile: +27 11 717 3514
Website: www.wbs.ac.za

11 Month Year

Dear Respondent,

I am a Master of Management in Innovation Studies student at the University of the Witwatersrand's Graduate School of Business in Johannesburg. As a component of the prerequisites for the degree, I am obliged to perform research. The purpose of this research is to explore activities leading to value co-creation in two regional innovation networking platforms in South Africa.

I will be interviewing respondents who are familiar with regional innovation systems as part of my research study, and You were identified as a knowledgeable and insightful source of information. Please allow me to interview you about your expertise and experience with regional innovation systems. The interview should last about 45 minutes. Your time and assistance are greatly appreciated. Information provided during the interview will be solely used for scholarly purposes, and if you desire, you may, request that your opinions remain anonymous. I will communicate to plan a good and suitable time for the interview.

If you have any questions concerning the research process, you may contact Dr Diran Soumonni at his email: diran.soumonni@wits.ac.za

Kind regards
Tshegohatso Chifokoyo
MM Innovation Studies Student, Wits Business School