NELSON MANDELA UNIVERSITY

# A LITERATURE REVIEW OF THE FACTORS PROMOTING INNOVATION IN FRACTAL SYSTEMS: A SOUTH AFRICAN ENTREPRENEURAL PERSPECTIVE

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**DECLARATION:**

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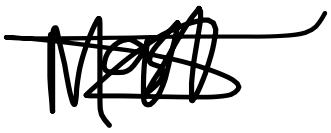

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## ABSTRACT

Innovation within fractal systems in contemporary business environments is inherently complex, reflecting the dynamic and interconnected nature of modern organisational structures. As businesses advance toward innovative pathways, they increasingly draw upon fractal principles of self-similarity, self-organisation, and recursive adaptation to manage complexity and foster sustainable growth. This study undertakes a desktop study of five selected organisations from an entrepreneurial perspective, employing a qualitative research approach to achieve its objectives. The findings shows how organisations across various sectors promote innovation within fractal systems to minimise repetition of self-similar patterns in their organisations. Hence, the study provides deep insights for entrepreneurs seeking to enhance organisational growth and competitiveness in both micro and macro market contexts.

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## CHAPTER 1

### 1.1 INTRODUCTION AND SETTING THE SCENE.

The conceptualisation of promoting innovation in fractal systems in the context of business environment is complex. The business sectors in modern days are accelerating in the direction of new modern developments and innovative pathways (Chaikin, 2021). These changes and adaptations are seen through existing business organisations shifting their industrial winning games and evolving with modern conditions from internal and external environment (Thompson, Peteraf , Gamble, & Strickland, 2016). Mosteanu and Faccia (2021) as well as Mosteanu, Faccia, Torrebruno, and Torrebruno (2019) articulates that fractal systems utilising geometric objects and infinite copies of different scales allow business organisations to fully [describe the complexity and chaoticity] present in real processes to verify the repeating patterns and how to continuously innovate in future events. Hence, business organisations complexities continuously increase and force organisations to address their complex issues within their internal environment (Hoverstadt, 2011)

Bider, Perjons , Elias, and Johannesson (2017) characterises fractal concept as self-organisation ability, self-renewal, and self-optimizing in a dynamic internal and external environment. The idea of fractal structure is based on such a feature of natural systems such as self-similarity (Mosteanu, et al 2019). Furthermore, Mosteanu, et al (2019) states that in complex business systems, self- similarity is associated with the similarity of their elements in business process's organizational structure, management system, and goals hierarchy. Fractals in business organisations are grounded in the idea that entrepreneurial efforts focus on every level of the business structure, rather than being limited to the high organisational levels (Chaikin, 2021). This consist of presenting heterogeneity of systems, dealing with conflicting objectives, accounting for dynamic changes in the network, information sharing, knowledge exchange, and providing different specialized inputs of the system (Grabis, 2009).

Hence, this study seeks to identify the factors that are promoting modern innovation in fractal systems through entrepreneurship and whether these factors can be used to anticipate future solutions through analysing the repetition of patterns to foresee the future events to entrepreneurs.

## 1.2 PROBLEM STATEMENT

Innovation can be best understood as the optimal technique to address complicated issues or take advantage of complex opportunities, rather than as a value, an end goal, or the sole purview of research and development. According to Legrand and Weiss (2011), the lack of innovation in many well-established firms can be attributed to the leader's inability to make innovation systematic. However, as business organisations attempt to become more inventive in the information economy, some of the management techniques that helped them succeed in the industrial economy are now significant barriers such as centralised control, adaptation, and leadership.

Critical challenges became more complex as transitions from the industrial economy to the information economy during the last 25 years (Legrand and Weiss 2011). Applying reasoning and prior knowledge can resolve complex problems. By this, it just comes down to organizing, simplifying, and implementing ideas that have been successful in a comparable circumstance. Conversely, complex challenges or opportunities are more vague, unpredictable, and special. To understand the intricacies and find creative answers, leaders must use innovative thinking. Best practices or solutions from the past could be useful, but they can never fully and consistently address the challenges of innovation in a fractal system (Legrand & Weiss (2011).

According to Stamler (2016), the inability of top management teams (TMTs) to foster an innovative culture is the cause of the innovation divide. Despite the acknowledged risk of perishing, top management teams choose to keep things as they are. Stamler (2016) states that more than 80% of leaders polled by Legrand and Weiss (2011) said that innovation is critical to the long-term viability of their companies, while fewer than 30% expressed satisfaction with the degree of innovation attained. Moreover, Stamler (2016) found that senior organisational business executives prioritize short-term plans above bridging the innovation gap to create long-term economic sustainability. The problem that small entrepreneurs face in businesses is that the economic environment is dynamic and need to identify the factors that can promote innovation for long-term sustainability.

## 1.3 RESEARCH OBJECTIVES:

Taking into consideration the above problem statement of the study, the primary, secondary, and methodological objectives are provided in the following sections.

### 1.3.1 PRIMARY RESEARCH OBJECTIVE

The primary objective of this study is to assess factors that are promoting innovation in fractal systems within small entrepreneurial industry.

### 1.3.2 SECONDARY RESEARCH OBJECTIVES

To achieve the primary objective, the following secondary objectives were formulated:

SO1: To assess the variables that promote innovation in a fractal system

SO2: To evaluate the challenges of promoting innovation in a fractal system.

SO3: To develop a framework that can be used to promote innovation in a fractal system within the entrepreneurial setting.

### 1.3.3 METHODOLOGICAL OBJECTIVES

The following methodology objectives have been identified to accomplish the primary and secondary objectives:

MO1: To conduct a literature overview on the nature and importance of adopting factors to promote innovation in a fractural system.

MO2: To determine the best-suited research methodology to address the primary and secondary objectives.

MO3: To collect the data from selected organisations that are relevant to the primary objective.

MO4: To analyse the collected data in accordance with appropriate methods.

MO5: To develop the theoretical frameworks that could be used to promote innovation within the entrepreneurial setting.

MO6: To provide conclusions and recommendations for existing and future entrepreneurial organisations.

## 1.4 DEFINITIONS AND CONCEPTS

### 1.4.1 Innovation

The process of developing and putting into practice novel ideas, methods, goods, or services that add value or improvement. It entails introducing something innovative or much better that addresses issues, satisfies demands, or creates new possibilities (Geissdoerfer, Vladimirova, & Evans, 2018).

### 1.4.2 Fractal system

Refers to a process or structure defined by scaling, self-similarity, and frequently complexity arising from straightforward principles (Banerjee, Easwaramoorthy, & Gowrisankar, 2021).

### 1.4.3 Self-similarity

Self- similarity is associated with the similarity of their elements in business processes, organizational structure, management system, goals hierarchy (Chaikin, 2021).

### 1.4.4 Internal environment

In this study, internal environment referred to the collection of underlying characteristics, regulations, connections, and feedback loops that regulate the system's fractal behaviour at various organizational levels (Cherunilam, 2021)

### 1.4.5 Organisational structure

Refers to the structure through which tasks, responsibilities, communication, authority, and resources are organized and coordinated inside a firm or organization to accomplish its objectives (Canbolat, 2025).

### 1.4.6 Entrepreneurship

The process of identifying, developing, and bringing innovative ideas, products, services into the market that aim of generating growth, and profit (Lim, Bansal, Kumar, Singh, & Nangia, 2024).

## 1.5 SIGNIFICANCE OF THE STUDY

This study will review the entrepreneurial sectors research and assess factors that are promoting innovation in fractal systems within small entrepreneurial sector within South Africa. This research aims to offer actionable insights and frameworks that can support innovation and long-term sustainability in small entrepreneurial business environments.

## 1.6 OUTLINE OF STUDY

Chapter one explores how innovation is fostered within fractal systems in the dynamic entrepreneurial business environment. It begins by setting the scene around the complexity of modern business systems and the role of fractal structures. The research identifies a critical problem in established firms, where traditional leadership and outdated management systems hinder innovation in the face of increasing complexity and rapid change. The primary objective is to assess key factors promoting innovation in fractal systems, with secondary goals focused on identifying variables, challenges, and developing a guiding framework. Furthermore, it outlined the methodology objectives to accomplish the primary and secondary objectives. In contrast, definition of concepts are outlined.

Chapter Two provides a literature overview of fractal systems. The importance of innovation in fractal systems and challenges they are subjected to are discussed. Furthermore, the factors promoting innovation in fractal systems are identified and discussed. Chapter Three outlines the research design and methodology. The research philosophy, approach to theory development, methodological choice, purpose of the study, research approach, research strategy and data collection and analysis is explained. Lastly, chapter three conclude with ethical consideration.

Chapter three will discuss the following topics of research philosophy, approach, design, and methodology. It will again include how the data will be collected as well as how the data will be analysed. Hence, the contribution of this study will be discussed for more insight as well as the research time framework.

Chapter four present the empirical findings of the study, which examines how small entrepreneurial businesses navigate and foster innovation in uncertain market environments. The empirical findings in this chapter subject to address the secondary objectives SO1, SO2, SO3 to achieve the primary objective. Hence, the results of the empirical investigation conducted are presented, commencing with descriptive analysis and lastly with thematic analysis.

## 1.7 SUMMARY

Chapter one begins by setting the scene around the complexity of modern business systems and the role of fractal structures. The research identifies a critical problem in established firms. It then provided the primary objective with secondary objectives

focused on identifying variables, challenges, and developing a guiding framework. Furthermore, it outlined the methodology objectives to accomplish the primary and secondary objectives. In contrast, definitions and concepts are provided thus followed by the significance of the study. Chapter Two will provide a comprehensive understanding on the history of fractal system. Furthermore, it provides what a fractal system is and its importance in entrepreneurial sector. A more complete understanding of factors was also provided with previous research on fractal systems.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 INTRODUCTION

The previous chapter explores how innovation is promoted within fractal systems in the dynamic business environment, where complexity and continuous change demand adaptive, self-organizing structures. It identifies a gap in established organisations where innovation is stifled by outdated leadership and management practices. The primary goal is to assess factors that promote innovation in entrepreneurial fractal systems, while secondary goals include identifying key variables, challenges, and developing a supporting framework. Methodologically, it involves a literature review, selecting a suitable research approach, collecting, and analysing data, and building a theoretical model to guide innovation efforts.

This chapter provides the nature and importance of innovation in fractal system, as well as the challenges small entrepreneurs face. Furthermore, factors that promote innovation in fractal system will be discussed with definitions and their challenges in business organisations. However, the importance of innovation in fractal system and its factors will be discussed before concluding the chapter with previous research studies on fractal system for a more collective understanding of innovation in fractal system within small entrepreneurial environment.

## 2.2 OVERVIEW OF THE FRACTAL SYSTEM

Philosophers before the 20$^{th}$ century believed that fractal system shapes the galaxies as well as found everywhere in nature using science and mathematics as it imposes its self-similarity and repetition (Nutu & Axinte, 2022). Although, modern researchers believe that fractal system can be also seen through business organisations in internal and external environment (Boddy & Donnelly, 2020). However, the concept of a fractal system is derived from the Latin word Fractus which means broken (Nutu & Axinte, 2022). Furthermore, through the work of early mathematicians and scientists such as Gottfried Wilhelm Leibniz, Georg Cantor Henri Poincaré and Giuseppe Peano between 1642 and 1932. Their work contributed to the recognition of fractals by using mathematics and sciences to formulate and articulate the concept of a fractal system and how its repetition influences the universe and shapes nature in terms of adaptation and evolution (Doungmo Goufo, 2020).

**TABLE 2.1** shows the outline the contributors in fractal concept.

| CONTRIBUTOR | CONTRIBUTION | DATE |
|---|---|---|
| ***Georg Cantor*** | Cantor set (early self-similar structure) | 1883 |
| ***Helge von Koch*** | Koch snowflake (infinitely detailed curve) | 1904 |
| ***Wacław Sierpiński*** | Sierpiński triangle/carpet | 1915 |
| ***Gaston Julia*** | Julia sets in complex dynamics | 1918–1920 |
| ***Benoît Mandelbrot*** | Named and unified the fractal system | 1975–1982 |

Source: (Nutu & Axinte, 2022; Akhmet, Fen, & Alejaily, 2020)

The mentioned contributors in their philosophical and mathematical musings on infinite divisibility laid groundwork for later fractal ideas (Akhmet et al, 2020). Scientists, Engineers, Chefs, Public servants, Astronauts, and Doctors believe that all humankind and nature is the repetition of self-similarity under evidence that every object seen through naked eyes in regardless of large scale and small scale have its complexity (Brands, 2020). For instance, doctors have proved that the system of human blood vessels nearly fills up the entire volume of the body, with arteries dividing into lesser vessels that subdivide into capillaries that suffuse every corner of every tissue (Goldstein, Hazy, & Lichtenstein, 2023). Yet the blood vessels have a total volume far smaller than that of the whole body (Nutu & Axinte, 2022). Furthermore, meteorologists observes that clouds in the atmosphere display shapes and textures that are independent of the distance from the viewer's naked eye (Boddy & Donnelly, 2020). Hence, these observations affirm that fractal patterns of self-similarity and complexity are intrinsic to both natural systems and human understanding across disciplines (Nutu & Axinte, 2022).

## 2.3 THE IMPORTANCE OF FRACTAL SYSTEMS

Applying innovation in fractals provide solid business models of recursive functions and infinite structures (Akhmet et al, 2020), serving as teaching tools in infinity complexity and nonlinear dynamics. Furthermore, Business structures are built or organised using the same transformation to the prior structures (Tomchuk, 2020). Tomchuk (2020) Believes that recursive algorithms define fractals where in business organisation rules and strategies for survival in the industry are applied repeated without considering the innovative changes or patterns occurring intensively.

However, fractal system is linked through iterated functions and feedback systems (Biesenthal, Maczewsky, Yang, Kremer, Segev, Szameit, & Heinrich, 2022). The function of iteration when applied to fractal systems enables business organisations to simulate the changes in terms of price, levels, consumer demands, inventory cycles, and economy growth rates which lead to stable prices and unpredictable volatility (Biesenthal et al, 2022).

The ability of fractal system that promote flexibility, scalability, and creativity in complicated and unpredictable situations have gained importance in the entrepreneurial sector (Akhmet, Fen, & Alejaily, 2020). Fractal structures, distinguished by decentralised control and self-similarity, enable entrepreneurial organisations to replicate successful patterns across various organizational levels, fostering strategic coherence and operational agility (Nonaka & Takeuchi, 2021). Akhmet, et al (2020) states that Continuous learning, quick decision-making, and localised innovation are all supported by this recursive architecture. They are essential drivers of competitiveness in today's entrepreneurial environment (Goldstein, Hazy, & Lichtenstein, 2023) Furthermore, the use of fractal concepts improves resilience by allowing business organisations to adapt to environmental shifts without compromising structural integrity (Pissarra, Ferreira, & Ratten, 2022). However, fractal systems provide a solid foundation for dealing with the challenges faced by entrepreneurs in the digital and post-pandemic economy in South Africa.

## 2.4 CHALLENGES FACED BY ENTREPRENUERS TO PROMOTING INNOVATION IN FRACTAL SYSTEM

Entrepreneurs in the entrepreneurial sectors face significant challenges when attempting to innovate within increasingly complex environments (Usman, Kess-Momoh, Ibeh, Elufioye, Ilojianya, Oyeyemi, 2024). One of the most common barriers is innovation overload, where the rapid emergence of new digital tools and platforms creates fatigue and confusion (Usman, et al., 2024). Instead of driving efficiency, the abundance of technologies often overwhelms entrepreneurs, leading to fragmented adoption and wasted resources (Breznitz & Taylor, 2024). Similarly, concerns around AI ethics and trust including issues of bias, transparency, and accountability create hesitation in fully adopting AI, as entrepreneurs fear reputational and operational risks if the technology makes flawed or opaque decisions. These barriers hinder the ability

of entrepreneurs to confidently leverage advanced technologies for innovation (Indrawati, Caska, & Suarman, 2020).

External ecosystem and policy constraints further limit innovation potential (Kantis, Federico, & García, 2020). Many entrepreneurs, particularly those in rural or underdeveloped areas, struggle with fragmented ecosystems where incubators, support networks, and collaborative spaces are inaccessible, reducing opportunities for knowledge sharing and partnerships (Dal Bello, Marques, Sacramento, & Galvão, 2020). Compounding this is policy and regulatory uncertainty, especially regarding data protection and digital compliance, which makes entrepreneurs hesitant to invest in modern technologies due to fear of shifting legal requirements (Serpa & Forouharfar, 2021). However, a persistent talent mismatch constrains innovation, as the skills required for adopting advanced digital tools and systems often exceed the available workforce capacity (Canbolat, 2025). This disconnects between innovation demands and talent readiness limits scalability and slows the pace of digital transformation in entrepreneurial organisations (Gebayew, Hardini, Panjaitan, & Kurniawan, 2018).

## 2.5 FACTORS PROMOTING INNOVATION IN FRACTAL SYSTEM WITHIN ENTREPRENURIAL SETTING

### 2.5.1 ADVANCED TECHNOLOGY

Advanced technology refers to the tools and systems in existing processes beyond methods that are not limited to the boundaries of current knowledge and capabilities (Schilling, 2020). Fractal systems depend on recursive processes, in which core operating concepts are applied consistently across various levels (Serpa & Forouharfar, 2021). The use of innovative technologies like artificial intelligence (AI) and machine learning (ML) allows organisations to improve these procedures by leveraging data-driven insights (Karaca, Baleanu, Zhang, Gervasi, & Moonis, 2022). These technologies are built on recent research and developments (R&D) to allow fractal units to act autonomously while aligning with the organisation's broader goals (Review, 2024). Furthermore, robotic process automation (RPA) simplifies recurring operations, allowing workers to concentrate on innovative problem-solving (Karaca et al, 2022).

In a fractal system, RPA can be implemented across departments, ensuring that process improvements at one level (like automating invoice processing in finance) are duplicated across others (like automating customer service responses) (Grizzi, Spadaccini, Chiriva-Internati, Hegazi, Bresalier, Hassan, Carrara, 2023). Continuous improvement, a hallmark of innovation in fractal organizations, is encouraged by this recursive optimisation. Entrepreneurial organisations may concentrate resources on creative endeavours like creating new products or breaking into new markets by utilizing advanced technology such as AI and ML to improve process efficiency.

### 2.5.2 BUSINESS AGILITY

Business agility refers to the ability of how a business organisation can predict and analyse the changes to make fast decisions to uncertain environments (Setiawati, Eve, Syavira, Ricardianto, & Endri, 2022). Setiawati and Eve et al (2022) emphasise that business organisations and entrepreneurs must be able to constantly adapt and innovate to live in a volatile environment. They must react swiftly and efficiently to take benefit from several resources, particularly those pertaining to the increased usage of information technology (Serpa & Forouharfar, 2021). By understanding the volatile environment, entrepreneurs and business organisations may foresee future needs by becoming proficient in technology and able to react swiftly and effectively.

The capacity that allows entrepreneurs to be agile in business is the most important to have the capacity to recognise environmental changes and respond appropriately to them preserve and enhance long-term performance (Marhraoui & Manouar, 2017). However, they must possess the skills necessary to analyse current and potential scenarios to be able to make the proper decisions choices for dealing with unpredictable future events (Setiawati & Eve et al, 2022).

By fostering decentralised decision-making and self-organising teams that can react quickly to changing market circumstances, business agility encourages innovation in fractal systems (Ghezzi & Cavallo, 2018). Each unit in a fractal system is given the authority to operate independently in accordance with agile principles, but still in line with the company's overall strategy (Botha, et al., 2016). Due to its versatility, it promotes experimentation, ongoing feedback, and rapid idea iteration. Therefore, innovation occurs organically at all levels of the an organisation. Ultimately, agility promotes a flexible, dynamic framework in which innovation and responsiveness are

the key drivers of competitive advantage (Isibor, Ewim, Adaga, Sam-Bulya, Ibeh, & Achumie, 2025).

### 2.5.3 DIGITAL TRANSFORMATION

Digital transformation can be defined a s the fundamental way on how business is done and how value is provided to customers is transformed by the use of digital technology across all business sectors (Gebayew, Hardini, Panjaitan, & Kurniawan, 2018). Digital transformation plays a pivotal role in fostering innovation within fractal systems, particularly in entrepreneurial business environments. As businesses navigate increasingly complex and dynamic markets, digital technologies enable the agility and responsiveness needed for self-organising, self-similar structures inherent in fractal systems (Bider et al., 2017).

Digital transformation involves advanced digital tools such as cloud computing, AI, and big data analytics into all areas of business operations, thus facilitating real-time data access, decentralised decision-making, and enhanced adaptability (Borges, Laurindo, Spínola, Gonçalves, & Mattos, 2021). These capabilities mirror the self-renewal and recursive nature of fractal systems, allowing organisations to respond quickly to internal and external stimuli while maintaining coherence across different scales of operation (Mosteanu et al., 2019). By embedding digital capabilities, entrepreneurial businesses can systematically recognise repeating patterns, adapt to chaotic environments, and continuously innovate, thereby gaining a competitive edge in the information economy (Cherunilam, 2021).

Moreover, digital transformation allows for more fluid information sharing and collaboration across various levels of the organisation, aligning with the fractal principle that innovation should not be confined to upper management but should occur at all hierarchical layers (Chaikin, 2021). This decentralisation enables various departments to operate autonomously yet harmonious (Maretha, 2023). Furthermore, it creates multiple points of innovation across the organisational structure (Ries, 2020). In doing so, digital transformation mitigates the traditional limitations of centralised control and rigid management systems, which have historically stifled innovation in many established firms (Legrand & Weiss, 2011).

Entrepreneurs face increasing complexity and rapid changes in their external environments, digital platforms provide the infrastructure necessary to simulate, test,

and scale innovative solutions rapidly (Banerjee, Easwaramoorthy, & Gowrisankar, 2021). Thus, digital transformation is not merely a technological upgrade but a strategic enabler of the fractal approach to innovation driving continuous evolution, learning, and renewal within entrepreneurial systems (Doungmo Goufo, 2020).

## 2.6 SUMMARY

Chapter Two provided a comprehensive understanding on the history of fractal system. Furthermore, it provided what a fractal system is and its' importance in entrepreneurial industry. A more complete understanding of factors was also provided with previous research on fractal systems. However, the following topics of research philosophy, approach, design, and methodology will be discussed in chapter three. It will again include how the data will be collected as well as how the data will be analysed.

# CHAPTER 3

# RESEARCH METHODOLOGY

## 3.1 INTRODUCTION

After conducting the literature review on chapter two, chapter three will discuss the following topics of research design approach, design, and methodology. It will again include how the data will be collected as well as how the data will be analysed. Moreover, research philosophy, approach to theory development, trustworthiness ethical consideration will be discussed.

## 3.2 RESEARCH DESIGN

Research design refers to how the research of a study will conduct to gather critical information required (Creswell & Creswell, 2018). Headley and Plano Clark (2020) Believes that research design imposes of structure for collecting, analysing, and measuring date in such a manner that it addresses the research questions (Headley & Plano Clark, 2020). Dannels (2018) defines research design as the plan of laying out underlying structures to combine all the elements of the research. The research design specifies the variables to be included and how they will be manipulated, the methods used to collect and analyse data, the selection of participants, and the strategies used to manage external variability to answer the study question. The following subsections explains how research designs will be used:

### 3.2.1 RESEARCH PHILOSOPHY

Research philosophy is referred to the framework of every study defined by the set of assumptions upon which the research is based (Sileyew, 2019). Research philosophy consists of positivism, critical realism, interpretivism, post-modernism, and pragmatism. (Tamminen & Poucher, 2020) This research adopts a positivist research philosophy to explore the factors promoting innovation in fractal systems within entrepreneurial sectors. Positivism, traditionally associated with the natural sciences, holds that reality is objective, measurable, and independent of human perception (Maretha, 2023). Positivism is applied to structure and interpret observable patterns and systematic behaviours in fractal systems as they emerge in dynamic business environments (Sileyew, 2019). The philosophy assumes that real-world phenomena, such as innovation and organisational structures, exist independently and can be

observed through consistent patterns of behaviour, interaction, and adaptation (Park, Konge, & Artino Jr, 2020).

This study does not seek to quantify innovation through statistical generalisations. Instead, it aims to understand how and why innovation occurs within fractal systems through detailed examination of behaviours, structures, and adaptive strategies in entrepreneurial settings. Although positivism is traditionally linked with quantitative analysis, it can support a structured qualitative analysis when investigating phenomena that exhibit regular, repeatable patterns as fractal systems do (Maksimovic & Evtimov, 2023).

Exploration aligns with the positivist paradigm by maintaining objectivity in data collection, using logical reasoning and evidence-based interpretation of phenomena (Creswell & Creswell, 2018). Concepts such as recursive processes, decentralisation, and adaptability will be treated as observable elements whose presence or absence influences the level of innovation within entrepreneurial organisations.

In line with positivist ideals, the research maintains a clear separation between the researcher and the subject of study, ensuring that interpretations are guided by verifiable evidence, not subjective bias (Aspers & Corte, 2019). While recognising the complexity of social systems, the philosophical stance assumes that through systematic analysis, consistent principles and causal relationships can be identified, such as the influence of advanced technologies or agile processes on innovation outcomes (Ghezzi & Cavallo, 2018). Thus, by grounding the study in positivism under a qualitative lens, the research provides a structured, evidence-based exploration of how fractal systems foster innovation in entrepreneurial sectors, allowing findings to be generalised to similar complex, adaptive business contexts (Maksimovic & Evtimov, 2023).

### 3.2.2 APPROACH TO THEORY DEVELOPMENT

This research will use an inductive research approach to develop a theory on how innovation is promoted within fractal systems in entrepreneurial sectors. Inductive approach involves developing theories from research, not beginning a project with a theory as a foundation base (Saunders, Lewis, & Thornhill, 2019) . An inductive approach is appropriate when existing theories are insufficient to explain a phenomenon in a specific context (Bingham & Witkowsky, 2021). This approach seeks

to generate new insights and conceptual frameworks grounded in data and empirical observation (Saunders et al, 2019).

The inductive process begins with the collection and analysis of qualitative and conceptual data from secondary sources such as academic journals, industry reports, and expert insights focusing on innovation, fractal systems, and entrepreneurial strategies (Serpa & Forouharfar, 2021). By critically examining real-world cases and the recurring structures that typify fractal organisations, patterns and relationships will be identified. These patterns may reveal how recursive processes, self-similarity, decentralisation, and technological integration function as innovation enablers in entrepreneurial contexts. The iterative analysis will focus on identifying emerging variables, such as advanced technology adoption, business agility, and digital transformation, and how these factors interact within fractal systems to generate innovative outcomes. Through coding and categorizing concepts, the research will progress from specific observations to the formulation of broader theoretical generalisations.

The result of this inductive inquiry is the development of a theoretical framework that captures the mechanisms through which innovation emerges and evolves in fractal-based business models (Dannels, 2018). This framework will be grounded in empirical evidence and conceptual reasoning, offering a new lens to understand and manage innovation in the context of fractal entrepreneurship. The inductive research strategy is particularly suitable for this study due to the novelty and complexity of applying fractal principles in entrepreneurship, a subject still underrepresented in mainstream business theory. However, the approach not only builds new theory but also contributes to expanding the scholarly understanding of adaptive, self-organising innovation systems in modern business organisations.

### 3.2.3 PURPOSE OF THE STUDY

The purpose of this study will use the descriptive research design to be able to describe the factors and challenges of promoting innovation in fractal system within entrepreneurial sectors. Descriptive research design will assist this study to identify trends and patterns in how fractal system changes over time and to fasten the process of conducting the research.

### 3.2.4 METHODOLOGICAL CHOICE

In alignment with the primary research objective to assess the factors that promote innovation in fractal systems within the entrepreneurial sectors, a mono-method research design has been selected. This approach involves the use of a single data collection technique and a corresponding data analysis procedure within either a qualitative or quantitative research strategy (Saunders et al, 2019). Given the exploratory nature of this study, which seeks to understand complex systems, organisational behaviour, and innovation dynamics, a qualitative mono method hold to be most appropriate.

The qualitative mono method enables the in-depth exploration of the subjective experiences, patterns, and contextual factors underpinning innovation within fractal systems (Creswell & Poth, 2018). This method will allow the researcher to gather rich, detailed insights into how advanced technologies, business agility, and digital transformation function as innovation drivers within entrepreneurial environments.

### 3.2.5 RESEARCH APPROACH

Qualitative research approach in its approach to the subject matter, qualitative research is multimethod, encompassing an interpretive and naturalistic orientation. Flick (2018), Aspers, and Corte (2019) claims that qualitative research approach is used as the umbrella of numerous approaches to conduct research (Campbell et al, 2020). This implies that qualitative researchers examine events in their natural context, trying to understand or interpret them considering the meaning’s individuals ascribe to them (Aspers & Corte, 2019). It makes use of a wide range of empirical data that describes every day and problematic events and meanings in people's lives, including case studies, first-hand experiences, introspection, life-term histories, interviews, observation, and visual texts (Creswell & Creswell, 2018). Furthermore, it enables in-depth examination of the interactions and mechanisms at work, considering the complexity and context-dependent character of organizational behaviour (Headley & Plano Clark, 2020).

Using a qualitative research methodology, this study examines and comprehends the elements that foster innovation in fractal systems in the entrepreneurial sector. This study is well suited to the qualitative paradigm since it aims to discover the complex interactions, contextual dynamics, and in-depth insights that support innovation in

fractal-based business settings. Therefore, it places a greater emphasis on meaning than measurement, concentrating on the subjective experiences, procedures, and interpretations of organizational players within dynamic and adaptive structures (Creswell & Poth, 2018).

### 3.2.6 RESEARCH STRATEGY

A structured literature review approach is used to address the primary objective of this research, which is to assess the factors of innovation in fractal systems in the entrepreneurial sectors. The objective of this approach is to find, assess, and integrate current academic research pertaining to the confluence of fractal systems, innovation, and entrepreneurship. The review utilises a wide range of materials from business studies, systems theory, innovation management, and technological advancement because of the topic's interdisciplinary character.

### 3.2.7 TECHNIQUE AND PROCEDURES

Peer reviewed academic journals, Government policy documents and reports, White papers and research briefs, conference proceedings and case studies, credible media articles by means of a desktop study, will be used. In the case of this study secondary data will be that of data from websites. In this study, data will be collected from various database and documents reports. Database that meets the following criteria will be included in the Review; pertain to research done on Innovation in fractal system. Furthermore, the data collected from document reports, and non-participant observations will be analysed using prescriptive analysis.

## 3.3 DATA COLLECTION

Data collection is referred to the systematic approach to gather and measure pieces of information from various sources to be able to complete a focus area on a research (Creswell & Creswell, 2018). Black (2019) argues that data collection is a procedure to gather data from a sample or population for a statistical analysis whereby it involves surveys, experiments, observations and live records. In this study, data will be collected from various database and document reports, credible and authoritative sources, and recent publications. The database will include sites such as Websites, Google scholar, Mendeley and Academia. Edu. These will assist the study by providing all necessary information to articulate and collect the data for the success of the study. Furthermore, the technique and procedures utilised will be that of Publicly

available documents or secondary data, which has been collected by means of a desktop study, will be used. However, this study will adopt a qualitative research approach, aimed at exploring how factors discussed in chapter two promote innovation in fractal systems within the entrepreneurial sectors.

### 3.3.1 SAMPLING

Sampling refers to the process of selecting of individuals, items, or observations from a larger population to represent the characteristics of that population in a research study (Saunders, Lewis & Thornhill, 2019). This study will use a type of sampling of Purposive sampling. Purposive sampling is defined as the deliberate selection of sampling units from the segment of the population that is most knowledgeable or relevant to the characteristic being studied, rather than relying on random selection (Campbell, Greenwood, Prior, Shearer, Walkem, Young, Walker, 2020). Campbell et al (2020) states that researchers intentionally choose participants in purposeful sampling based on certain traits or attributes that are pertinent to the study's goal. Hence, purposive sampling will assist this study to select organisations known for decentralisation and innovation.

## 3.4 DATA ANALYSIS

Data analysis is defined as an approach to review, interpret and transform to find the linked relationships and data driven insights that addresses the research goals and questions (Kenny, Kashy, & Cook, 2020). Creswell (2018) believes that data analysis involves organising data in a meaningful way, applying analytical techniques, and drawing conclusions that support evidence-based understanding. This study aims to examine the data collected from internet, document reports, and non-participant observations by using descriptive analysis from five selected Organisations. Data analysis is useful as it can be used to extract data to make effective business decisions (Dannels, 2018). Furthermore, the method of descriptive analysis is selected for its flexibility and effectiveness in identifying, analysing, and reporting patterns within qualitative data (Hao, Zhang, & Wei, 2022). However, data analysis will help this study to provide Recommendation actions based on data-driven insights on how to promote innovation in fractal system in business organisations and reduce challenges faced. .

## 3.5 TRUSTWORTHINESS

- Credibility: Adoption of appropriate, well-recognised research methods.

- Transferability: Provision of background data to establish context of study and detailed description of phenomenon in question to allow comparisons to be made.
- Dependability: In-depth methodology description to allow study to be repeated.
- Confirmability: In-depth methodological description to allow integrity of research results to be scrutinised.

## 3.6 ETHICAL CONSIDERATION

It is important to consider ethics when conducting a research (Wang, et al., 2023). This is under a particular circumstance of selecting necessary research methods and methodology (Dave, Athaluri, & Singh, 2023). However, the researcher signed the ethical clearance of Nelson Mandela University. An ethics form (Form E) include both approval from the study leader, and the Head of the Department of Business Management. Form E is attached as Annexure A.

## 3.7 SUMMARY

Chapter Three described the research design and methodology adopted in this research with regards to the secondary research and research design. However, the techniques and steps for data collection and analysis were elaborated in detail. Chapter Four will provide an overview of the sample and the pertinent empirical findings.

# CHAPTER 4

# EMPIRICAL FINDINGS

## 4.1 INTRODUCTION

Previously in chapter three, research design and data analysis and data collection is adopted. However, Chapter four present the empirical findings of the study, which examines how entrepreneurial sectors navigate and foster innovation in uncertain market environments. The empirical findings in this chapter subject to address the secondary objectives SO1, SO2, SO3 to achieve the primary objective. Hence, the results of the empirical investigation conducted are presented, commencing with descriptive analysis and lastly with thematic analysis.

## 4.2 DEMOGRAPHIC PROFILE OF THE FIVE SELECTED ORGANISATIONS

**TABLE 4.2** Demographic profile of five selected organisations

| NAME OF ORGANISATION | TYPE OF INDUSTRY | ESTABLISHMENT YEAR | NUMBER OF EMPLOYEES | HEADQUARTERS |
|---|---|---|---|---|
| BATHU SNEAKERS | FASHION | 2015 | 400 | MIDRAND, GAUTENG |
| BRIMA LOGISTICS | LOGISTICS | 2005 | 125 | JOHANNESBURG |
| CHALIFOUR CONSULTING GROUP | TECHNOLOGY | 1995 | 9 | CAPE TOWN |
| SIDEBAR INTERNATIONAL INC | BOUTIQUE DIGITAL MARKETING | 2017 | 2 | CAPE TOWN |
| HAZILE GROUP HOLDINGS | AGRICULTURE | 2018 | 500 | KWA-ZULU NATAL |

Source: (Bathu shoes, 2024; Brima Logistics, 2020; Chalifour consulting group, 2025; Sidebar international, 2021; Hazile group, 2025)

The following sections consists of the descriptive analysis of five selected organisations based on their database and sectors. The researcher used checklist to identify the basic areas that need be covered in the study.

## 4.3 DESCRIPTIVE ANALYSIS FOR BATHU SNEAKERS

### 4.3.1 ADVANCED TECHNOLOGY

- **Data and Intelligence:** The use of innovative technologies like AI and ML allows companies to improve these procedures by leveraging data-driven insights (Karaca et al, 2022).
- **Automation and Robotics:** standardise quality while still allowing creative design variations. This supports core identity of innovation in sneaker design, while small product lines can experiment quickly with new styles (Bathu Sneakers, 2025).
- **Emerging Technologies:** Fosters agility, creativity, and continuous scaling of innovative ideas across different business units and markets (Bathu Sneakers, 2025).
- **Cybersecurity and Privacy:** safeguard digital infrastructure, protecting customer data and business processes, which builds trust and resilience (Bathu Sneakers, 2025)

### 4.3.2 BUSINESS AGILITY

- **Strategy and Innovation:** ensures that innovative ideas move quickly from design to production scale creative solutions without exposing the organisation to unnecessary risks (Bathu Sneakers, 2025).
- **Customer Focus:** aligns product development with real time consumer needs, ensuring designs and solutions are highly relevant (Bathu Sneakers, 2025).
- **Governance and Risk Management:** ensures structured decision-making, regulatory compliance, and controlled experimentation (Bathu Sneakers, 2025).

### 4.3.3 DIGITAL TRANSFORMATION

- **Business Models:** enables the organisation to experiment with unique designs, local collaborations, and direct-to-consumer strategies that differentiate it in the footwear market (Bathu Sneakers, 2025).
- **Operational Processes:** streamlines production and supply chain workflows, (Bathu Sneakers, 2025).

- **Customer Experience:** uncovers evolving customer needs and preferences, enabling the company to adapt designs and services in uncertain market conditions (Bathu Sneakers, 2025).

## 4.4 DESCRIPTIVE ANALYSIS FOR BRIMA LOGISTICS

### 4.4.1 ADVANCED TECHNOLOGY

- **Data and Intelligence:** Access to operational data such as fleet performance, route efficiency, and delivery times that enables standardised data flows across all levels of the fractal structures (Brima Logistics, 2025).
- **Automation and Robotics:** Real-Time Data Capture whereby automated systems such as robotic scanners, sensors, and automated guided vehicles (AGVs) continuously collect operational data (Brima Logistics, 2025).
- **Emerging Technologies:** enables the creation of virtual replicas of physical assets or operations such as regional hub to facilitate continuous simulation, monitoring, and optimization (Brima Logistics, 2025).
- **Cybersecurity and Privacy:** minimises disruptions from attacks, meaning innovations can scale across all units of the fractal system without risking operational downtime (Brima Logistics, 2025).

### 4.4.2 BUSINESS AGILITY

- **Strategy and Innovation** aligns organisational goals with adaptive decision-making at every level (Brima Logistics, 2025).
- **Customer Focus:** aligns with real-time client needs. This recursive responsiveness encourages continuous problem solving, service customisation, and the development of agile logistics solutions that mirror customer expectations (Brima Logistics, 2025).
- **Governance and Risk Management:** structured risk management empowers teams to experiment safely, adapt to supply chain uncertainties (Brima Logistics, 2025).

### 4.4.3 DIGITAL TRANSFORMATION

- **Business Models:** acts as a blueprint that guides thus motivates continuous and scalable innovation throughout their operations (Brima Logistics, 2025).

- **Operational Processes:** Turns each lane into a mini operations cell with its own Standard Operating Procedures, dashboards, and improvement backlog (Brima Logistics, 2025).
- **Customer Experience:** emphasis on precision logistics that reflects a commitment to understanding and meeting specific customer requirements (Brima Logistics, 2025).

## 4.5 DESCRIPTIVE ANALYSIS FOR CHALIFOUR CONSULTING GROUP

### 4.5.1 ADVANCED TECHNOLOGY

- **Data and Intelligence:** Market intelligence, client analytics, and internal knowledge management systems allow consultants to identify emerging trends and client needs quickly (Chalifour Consulting Group, 2024).
- **Automation and Robotics:** Robotic process automation (RPA) in document processing, client reporting, and data analytics (Chalifour Consulting Group, 2024).
- **Emerging Technologies:** assists clients in navigating complex business environments and implementing innovative solutions (Chalifour Consulting Group, 2024).
- **Cybersecurity and Privacy:** offer clients secure digital transformation strategies, ensuring that business processes are protected from cyber threats (Chalifour Consulting Group, 2024).

### 4.5.2 BUSINESS AGILITY

- **Strategy and Innovation:** creates self-contained units within the organisation that can innovate independently while adhering to the company's core values and strategies (Chalifour Consulting Group, 2024).
- **Customer focus:** allows for customised strategies that evolve based on client feedback and market dynamics (Chalifour consulting group, 2024).
- **Governance and Risk Management:** enable consulting teams to innovate with new methodologies and digital tools while maintaining ethics, trust, and compliance (Chalifour Consulting Group, 2024).

4.5.3 DIGITAL TRANSFORMATION

- **Business Models:** depends on knowledge-based services and customised client solutions (Chalifour Consulting Group, 2024).
- **Operation processes:** Each client pod runs a mini delivery lifecycle with standard sprint ceremonies that require one process experiment per sprint (Chalifour consulting group, 2024).
- **Customer Experience**: understanding the unique challenges and opportunities of each client, leading to innovative solutions that drive growth Chalifour consulting group, 2024).

## 4.6 DESCRIPTIVE ANALYSIS OF SIDEBAR INTERNATIONAL INC

4.6.1 ADVANCED TECHNOLOGY

- **Data and Intelligence:** Collects user behaviour, campaign performance, and competitive intelligence enables each marketing or creative unit to test innovative approaches and measure results effectively (Sidebar International INC, 2025).
- **Automation and Robotics:** AI-powered tools for market research, robotic data collection, and automated social media engagement (Sidebar International INC, 2025).
- **Emerging Technologies:** fosters innovation at various levels (Sidebar International INC, 2025).
- **Cybersecurity and Privacy** ensures that client data and creative assets are protected, fostering an environment where innovation can thrive without the risk of data breaches (Sidebar International INC, 2025).

4.6.2 BUSINESS AGILITY

- **Strategy and Innovation:** tailor its offerings and strategies to diverse cultural and economic contexts, thereby driving innovation through localized insights (Sidebar International INC, 2025).
- **Customer focus:** mirrors the fractal system's focus on individual needs within a larger structure (Sidebar International INC, 2025).
- **Governance and Risk Management:** experiments the innovative strategies (digital platforms, partnerships, or international expansion) while ensuring

alignment with objectives and minimising risks (Sidebar International INC, 2025).

4.6.3 DIGITAL TRANSFORMATION

- **Business Models:** operates on a creative services and project-based revenue model, in marketing, design, or media (Sidebar International INC, 2025).
- **Operation processes:** Mandate API-ready steps (orders, invoices, and shipment status) whereby new vendors can be plugged into a cell without enterprise-wide disruption (Sidebar International INC, 2025).
- **Customer Experience:** brings unique insights, contributing to a collective pool of knowledge that drives innovation (Sidebar International INC, 2025).

## 4.7 DESCRIPTIVE ANALYSIS FOR HAZILE GROUP HOLDINGS

4.7.1 ADVANCED TECHNOLOGY

- **Data and Intelligence:** Community-level data, resource tracking, and project performance metrics allow local entrepreneurial projects to adapt quickly to rural market needs (Hazile Group Holdings, 2024).
- **Automation and Robotics:** Smart production lines, robotic assembly, and AI-driven inventory management in rural projects (Hazile Group Holdings, 2024).
- **Emerging Technologies:** offers AI-powered procurement software designed for government teams (Hazile Group Holdings, 2024).
- **Cybersecurity and Privacy** protect donor information and organisational data by integrating robust security measures (Hazile Group Holdings, 2024).

4.7.2 BUSINESS AGILITY

- **Strategy and Innovation:** experiment and iterate on processes can lead to incremental innovations that collectively contribute to the company's overall growth and adaptability (Hazile Group Holdings, 2024).
- **Customer focus:** involves empowering teams to make decisions based on localized customer insights, leading to innovative solutions that are both relevant and responsive to client needs (Hazile Group Holdings, 2024).

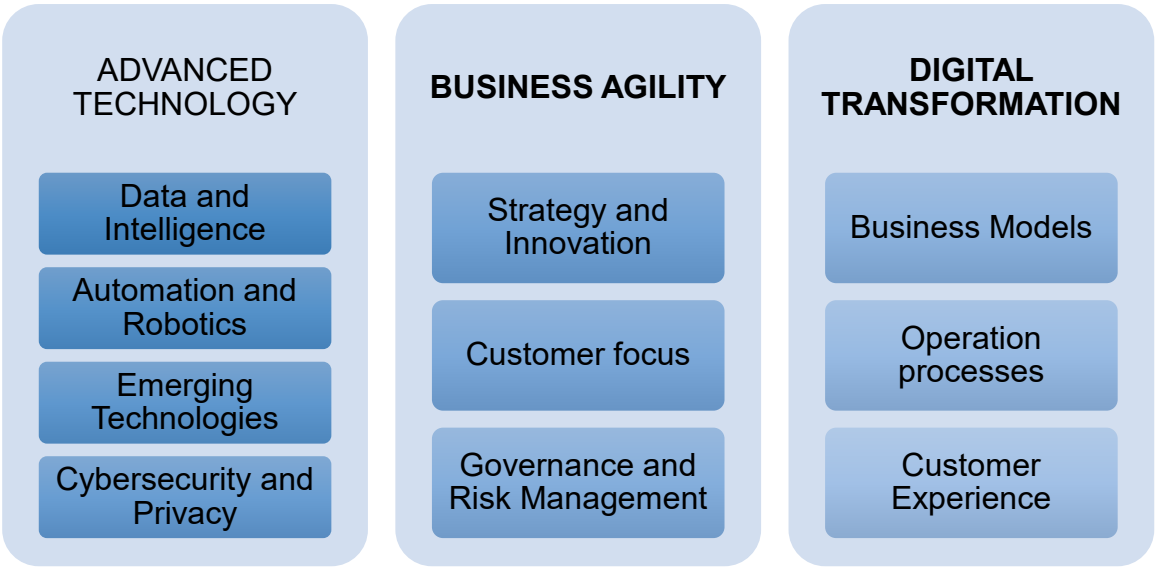
- **Governance and Risk Management:** allows entrepreneurial units to innovate in products, services, and community projects while anticipating challenges and minimising operational risks. (Hazile Group Holdings, 2024).

4.7.3 DIGITAL TRANSFORMATION

- **Business Models:** uses a community-centred, resource-leveraging model, integrating local labour, suppliers, and technology (Hazile Group Holdings, 2024)
- **Operation processes:** Treat each site/venture as a micro-enterprise with the same operating rhythm (Hazile Group Holdings, 2024).
- **Customer Experience:** create solutions that are both relevant and impactful to customers (Hazile Group Holdings, 2024).

Overall comparison following the analysis of the five selected organisations, which becomes common themes:

**Figure 4.1** common themes in five selected organisations analysis




(Source: researcher's own construct, 2025)

## 4.9 SUMMARY

Chapter four presented the empirical findings of the study. However, the results presented are based on five small entrepreneurial organisations in fashion, logistics, technology, boutique digital marketing, and agriculture industry. Furthermore, the result of thematic analysis was presented. Chapter five will present the overview of

this study together with the outline of research objectives. The results of thematic analysis will be summarised in this chapter, and a theoretical framework will be proposed. Hence, conclusion and recommendations for existing and future entrepreneurs will be provided.

# CHAPTER 5

# SUMMARY, RECOMMENDATION, AND CONCLUSION

## 5.1 INTRODUCTION

Chapter five is the last chapter for this study. Overview of the study will be summarised on how the study is structured. Furthermore, the secondary research objectives formulated to achieve the primary objective of the study will be outlined. Additionally, the methodological objectives will be provided to achieve the primary and secondary research objectives. The findings of descriptive and thematic analysis are discussed. Hence, limitations and recommendations will be outlined and conclude with the summary of the study.

## 5.2 OVERVIEW OF THE STUDY

The primary objective of the study is to assess the factors that promote innovation in fractal systems within the entrepreneurial sectors in South Africa. Five selected organisations were selected from fashion sector, logistics sector, technology sector, boutique digital marketing sector, and agricultural sector. However, this study outlines the purpose of each chapter as follows.

Chapter one introduced and provided the setting of scene of the study. It is followed by the primary objective that is to assess key factors promoting innovation in fractal systems within the entrepreneurial sector, with secondary objectives focused on identifying variables, challenges, and developing a guiding framework. Methodologically, the study reviewed relevant literature, adopt appropriate research strategies, and analyse scholarly data to construct a theoretical foundation. It is then followed by the key concepts of the study. Lastly, chapter one concluded with the significance of the study and provided the outline of the forthcoming chapters.

Chapter Two provided a literature overview of fractal systems. The importance of innovation in fractal systems and challenges they are subjected to are discussed. Furthermore, the factors promoting innovation in fractal systems are identified and discussed. Chapter Three outlined the research design and methodology. The research philosophy, approach to theory development, methodological choice,

purpose of the study, research approach, research strategy, and data collection together with the analysis are explained. Lastly, chapter three concluded with ethical consideration.

Chapter three discussed the following topics of research philosophy, approach, design, and methodology. It again included how the data was collected as well as how the data will be analysed. Hence, the contribution of this study was discussed for more insight as well as the research time framework.

Chapter four presented the empirical findings of the study, by using descriptive analysis from five selected organisations and thematic analysis. The empirical findings in this chapter subjected to address the secondary objectives SO1, SO2, SO3 to achieve the primary objective. Hence, the results of the empirical investigation conducted are presented, commencing with descriptive analysis and lastly with thematic analysis.

The following secondary objectives were formulated to achieve the primary objective

- SO1: To assess the variables that promote innovation in a fractal system
- SO2: To evaluate the challenges of promoting innovation in a fractal system.
- SO3: To develop a framework that can be used to promote innovation in a fractal system.

The following methodology objectives have been identified to accomplish the primary and secondary objectives:

- MO1: To conduct a literature overview on the nature and importance of adopting factors to promote innovation in a fractural system.
- MO2: To determine the best suited research methodology to address the primary and secondary objectives.
- MO3: To collect the data from academic journals that are relevant to the primary objective.
- MO4: To analyse the collected data in accordance with appropriate methods.
- MO5: To develop the theoretical frameworks that could be used to promote innovation within small entrepreneurial sector.

- MO6: To provide conclusions and recommendations for existing and future businesses.

Hence, the overview of the study shows that the primary, secondary and methodology objectives are accomplished.

## 5.3 MAIN FINDINGS FROM LITERATURE REVIEW

### 5.3.1 FACTORS PROMOTING INNOVATION (SO1)

The study confirmed that three factors strongly promote innovation in fractal entrepreneurial systems:

Firstly, Advanced Technology. AI, machine learning, robotics, and automation enabled organisations to scale processes, increase efficiency, and free resources for creative problem solving. Technologies reinforces the recursive and self-similar nature of fractal systems by replicating improvements across organisational levels. Secondly, Business Agility. It allows organisations to experiment with solutions while staying aligned with overarching goals. Lastly, Digital Transformation. It enables seamless information sharing, decentralised control, and continuous adaptation. Digital transformation facilitated innovation at multiple organisational levels by aligning local units to overall strategy.

### 5.3.2 CHALLENGES OF PROMOTING INNOVATION (SO2)

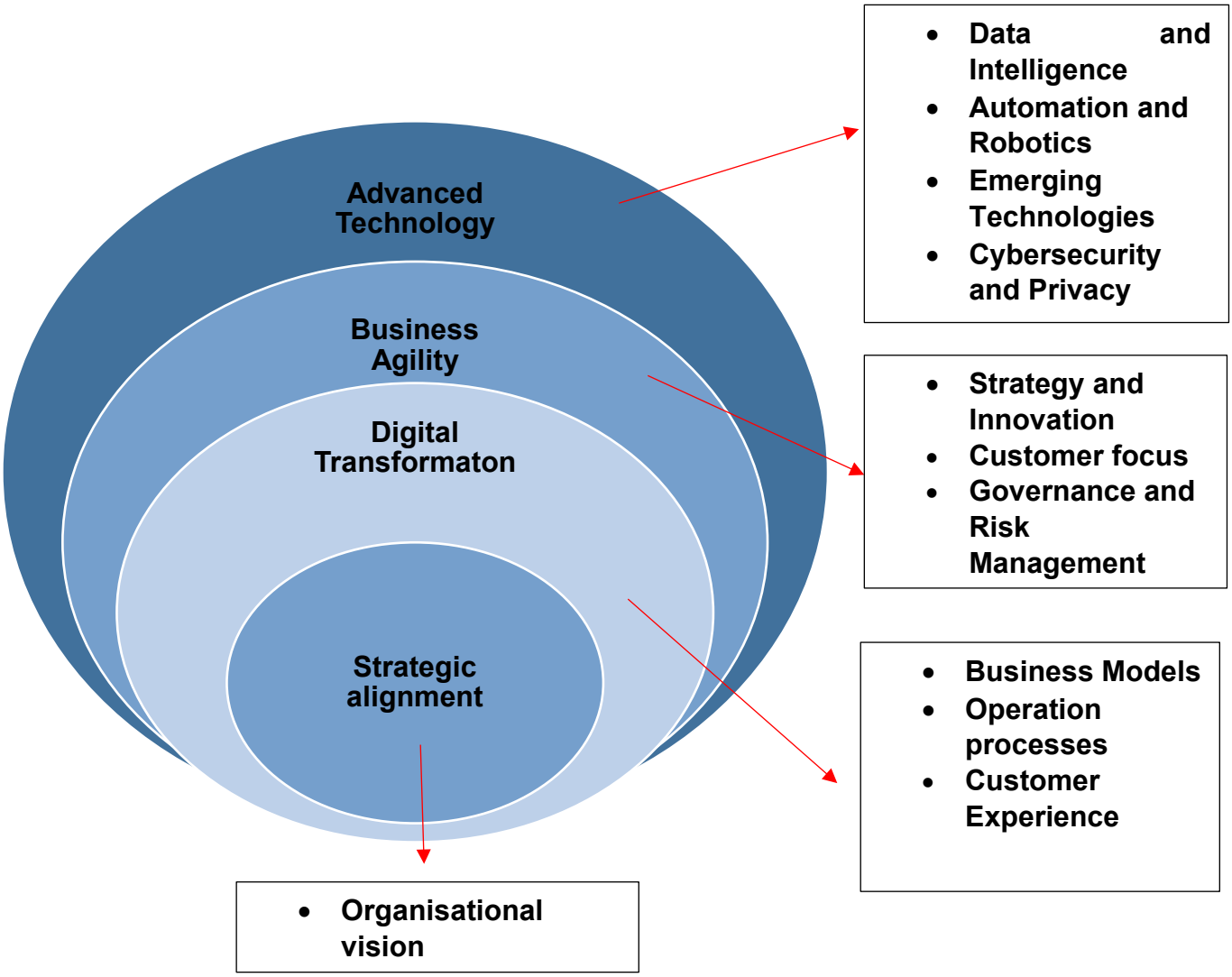
Participants highlighted several barriers as follows:

- **Innovation Overload:** Tool fatigue from the constant emergence of modern technologies.
- **AI Ethics and Trust Issues:** Concerns about bias, transparency, and accountability in AI systems.
- **Fragmented Ecosystems:** Lack of accessible incubators and support networks in rural or underdeveloped regions.
- **Policy and Regulatory Uncertainty:** Frequent changes in laws around data protection and technology adoption created hesitation.
- **Talent Mismatch:** Skills gaps limited the capacity to adopt and integrate innovative technologies effectively.

5.3.3 FRAMEWORK DEVELOPMENT (SO3)

The findings informed the development of a fractal innovation framework that joins advanced technology, business agility, and digital transformation as recursive processes.

Figure 5.2 guiding framework of factors promoting innovation in fractal systems




## 5.4 MAIN DESCRIPTIVE FINDINGS IN THE FIVE SELECTED ORGANISATIONS

The descriptive analyses of Bathu Sneakers, Brima Logistics, Chalifour Consulting Group, Sidebar International Inc., and Hazile Group Holdings (2024) demonstrate how diverse organizations employ advanced technology, business agility, and digital

transformation as key factors of innovation within fractal systems. Across these organisations, the use of data intelligence, automation, emerging technologies, and cybersecurity frameworks serves as a foundation for enhancing operational efficiency, scalability, and resilience. For example, Bathu Sneakers prioritises artificial intelligence and robotics to balance creativity with standardized production (Bathu Sneakers, 2025). Meanwhile Brima Logistics employs digital, twins and real-time tracking to optimize supply chain operations (Brima Logistics, 2025). However, Chalifour Consulting Group adopts robotic process automation and knowledge management tools to enhance client engagement (Chalifour Consulting Group, 2024). Sidebar International applies AI-powered marketing tools to global contexts (Sidebar International INC, 2025), and Hazile Group Holdings utilises smart technologies and security mechanisms to support localized entrepreneurial initiatives (Hazile Group Holdings, 2024).

Equally significant are the dimensions of business agility and digital transformation emerge as essential drivers of adaptability and competitiveness in dynamic environments (Breznitz & Taylor, 2024). Agility is reflected in strategies that prioritize responsive decision-making, customer-centred innovation, and governance mechanisms that balance experimentation with risk management (Bathu Sneakers, 2025; Brima Logistics, 2025). Digital transformation is evident in the adoption of innovative business models, reconfigured operational processes, and enhanced customer experiences, which enable organisations to anticipate and respond to evolving market demands.

Bathu's emphasis on direct-to-consumer strategies (Bathu Sneakers, 2025), Brima's recursive supply chain optimisation (Brima Logistics, 2025), Chalifour's customized consulting services (Chalifour Consulting Group, 2024), Sidebar's localised creative solutions (Sidebar International INC, 2025), and Hazile's community-centred initiatives (Hazile Group Holdings, 2024) exemplify the fractal principle of self-similarity across different contexts. Collectively, these cases illustrate how organisations across sectors harness fractal-inspired approaches to sustain innovation, balance structural coherence with adaptability, and achieve long-term growth in complex and uncertain environments.

## 5.6 RECOMMENDATIONS OF THE STUDY

### 5.6.1 ADVANCED TECHNOLOGY

- Entrepreneurs should use *data and intelligence* practices designed to replicate across different organisational units, ensuring self-similarity and scalability.
- In terms of *Automation and Robotics*, entrepreneurs should implement RPA to streamline repetitive tasks such as invoicing, order tracking, and reporting, thereby freeing human capital for strategic and innovative functions.
- Entrepreneurs should adopt a future-oriented approach by strategically engaging with *emerging technologies* such as block-chain, quantum computing, and extended reality (XR).
- In terms of *Cybersecurity and Privacy,* entrepreneurs should regularly practice penetration testing, and investment in advanced encryption day in day.

### 5.6.2 BUSINESS AGILITY

- *Strategy and innovation* for entrepreneurs should foster a culture of continuous experimentation in the dynamic environments for rapidly iterate solutions.
- In *Customer focus, entrepreneurs* should leverage data-driven insights for personalised engagement to understand shifting customer needs.
- In terms of *governance and risk management*, Entrepreneurs should implement agile governance frameworks in all levels of organisation to empower employees to act quickly to risk and decision-making processes.

### 5.6.3 DIGITAL TRANSFORMATION

- Entrepreneurs in different *business models* should adopt Hybrid Revenue Streams to integrate digital platforms alongside traditional sales model.
- In terms of *operation processes*, entrepreneurs should implement small-scale innovations that can be tested locally before being scaled across the organisation to reduce risks.
- In terms of *customer experience*, entrepreneurs should involve customers in the design and innovation process through surveys, beta-testing, and interactive platforms to create value-driven relationship.

## 5.7 SIGNIFICANCE OF THE STUDY

This study contributes to theory by extending the concept of fractal systems into the entrepreneurial business environment, demonstrating how principles such as self-similarity, decentralisation, and recursive learning foster innovation in organisations. By using the drivers of advanced technology, business agility, and digital transformation, the research develops a guiding fractal Innovation framework that illustrate how innovation can be scaled, replicated, and sustained in uncertain environments. Furthermore, this provides a fresh theoretical lens for understanding how entrepreneurial organisations can remain adaptive, resilient, and competitive in complex markets.

The study provides guidance for entrepreneurs, policymakers, and practitioners by identifying both the opportunities and obstacles facing entrepreneurial organisations in South Africa. Challenges such as tool fatigue, regulatory uncertainty, and skills mismatches are addressed through strategies like incremental innovation, customer focus, and agile governance. However, the research highlights the value of qualitative thematic analysis in capturing the complexity of entrepreneurial innovation. Hence, in combining theory with practice, it offers a roadmap for building sustainable innovation within the business ecosystems.

## 5.8 LIMITATIONS OF THE STUDY AND RECOMMENDATIONS FOR FUTURE RESEARCH

Although the study provides valuable insights into factors promoting innovation in fractal systems, it is not without limitations. The research focused on a small sample of five entrepreneurial sectors in South Africa, which limits the generalisability of the findings across other sectors and regions. The reliance on a qualitative approach and thematic analysis means the results are interpretive and context-specific rather than statistically representative. Furthermore, time and resource constraints restricted the scope of data collection and prevented longitudinal analysis, which would have captured how fractal innovation evolves over time. Based in these limitations, they create opportunities for future studies to test, refine, and extend the proposed framework in broader contexts.

## 5.9 CONCLUSION REMARKS

This study undertook a literature review focusing on entrepreneurial sectors within South Africa, with the aim of gaining deep insights on the factors that promote innovation in fractal system within entrepreneurial sectors perspective. The findings shows that the entrepreneurial sectors are influenced by the factors, such as advanced technology, business agility, and digital transformation to promote innovation. However, understanding these factors and how they promote innovation is important to entrepreneurs if they wish to grow their organisations from micro to macro markets.

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## ANNEXURE 1: ETHICAL CLEARANCE FORM (FORM E)

ANNEXURE 1: ETHICAL CLEARANCE (FORM E)

NELSON MANDELA
UNIVERSITY

**FACULTY OF BUSINESS AND ECONOMIC SCIENCES**

**DEPARTMENT OF BUSINESS MANAGEMENT**

**ETHICAL CONSIDERATION FOR HONOURS TREATISE (non-publication route)**

**INSTRUCTIONS**

- Should be completed by study leader and student.
- Must be signed off by the student, study leader and HOD.
- Submit the completed and signed form to the module coordinator who will submit to Mrs Kim.Alexander@mandela.ac.za.
- Please ensure that a summary of the research methodology section of the treatise is attached to this form *(Complete Annexure A to this Form).*
- ***Please note that by following this ethics route, the study will NOT be allocated an ethics clearance number.***

**SECTION A – STUDENT ACKNOWLEDGMENT**

- The student acknowledges that their research project is for academic qualification purposes only. As such, the research report or any sections thereof ***may not be published.***

- The student also acknowledges that their research project ***will be a desktop study*** and will ***make use of publicly available documents or secondary data***. No human subjects will be involved in the study as primary sources of data.

## ANNEXURE 1 (Continue)

Secondary data, in this instance, refers to data that was collected and processed by someone else for some other purpose but is now being used by the researcher for another reason (Tripathy, 2013). Research utilising secondary data that both exists and has been collected in a public, academic database, for example Google Scholar, is considered desktop research, and generally does not require full ethical approval (Creswell & Poth 2017).

**SECTION B – STUDENT AND RESEARCH PROJECT DETAILS**

| | |
|---|---|
| **Student name & surname** | **ROLIVHUWA MASHAMBA** |
| **Student number** | **S225327376** |
| **Title of treatise** | **Assess the factors that promote innovation in fractal system** |
| **Qualification** | **BCOM HONOURS(BUSINESS MANAGEMENT)** |

–

| | |
|---|---|
| **Department** | **BUSINESS MANAGEMENT** |
| **Study leader** | **DR MSUTHWANA** |

## ANNEXURE 1 (Continue)

### SECTION C-ETHIC CRITERIA

| *X* | *(Please tick the appropriate block)* | YES | NO |
|---|---|---|---|
| 1. | Is there any risk of harm, embarrassment of offence, however slight or temporary, to the participant, third parties or to the communities at large? | | X |
| 2. | Is the study based on a research population defined as 'vulnerable' in terms of age, physical characteristics and/or disease status? | | X |
| 2.1 | Are subjects/participants/respondents of your study: | | |
| 2.1.1 | Children under the age of 18? | | X |
| 2.1.2 | NMU staff? | | X |
| 2.1.3 | NMU students? | | X |
| 2.1.4 | The elderly/persons over the age of 60? | | X |
| 2.1.5 | A sample from an institution (e.g. hospital/school)? | | X |
| 2.1.6 | Handicapped (e.g. mentally or physically)? | | X |
| | | | |
| 3. | Does the data that will be collected require consent of an institutional authority for this study? (An institutional authority refers to an organisation that is established by government to protect vulnerable people) | | X |
| 3.1 | Are you intending to access participant data from an existing, stored repository (e.g. school, institutional or university records)? | | X |

| | | | |
|---|---|---|---|
| | | | |
| 3. | Does the data that will be collected require consent of an institutional authority for this study? (An institutional authority refers to an organisation that is established by government to protect vulnerable people) | | X |
| 3.1 | Are you intending to access participant data from an existing, stored repository (e.g. school, institutional or university records)? | | X |
| 4. | Will the participant's privacy, anonymity or confidentiality be compromised? | | X |
| 4.1 | Are you administering a questionnaire/survey that: | | |
| 4.1.1 | Collects sensitive/identifiable data from participants? | | X |
| 4.1.2 | Does not guarantee the anonymity of the participant? | | X |
| 4.1.3 | Does not guarantee the confidentiality of the participant and the data? | | X |
| 4.1.4 | Will offer an incentive to respondents to participate, i.e. a lucky draw or any other prize? | | X |
| 4.1.5 | Will create doubt whether sample control measures are in place? | | |
| | | | |
| 5. | Do you wish to publish any research output (i.e. article) from this study? | | |

1

## Annexure 1 (Continue)

The student hereby certifies that he/she has given his/her research careful ethical consideration and full ethics approval is not required.

**SECTION D INFORMATION TO BE INCLUDED INTO THE RESEARCH REPORT**

*(The section below should be edited and aligned to the specifics of the study)*

### 1. ETHICAL CONSIDERATIONS

This study will follow the ethical research considerations that apply to all research in the social sciences, which are defined as moral rules and professional codes of conduct to the collection, analysis, reporting, and publication of information about research subjects (Pietilä, Nurmi, Halkoabo & Kyngäs, 2020:49). The research will, at all times, adhere to the following ethical considerations:

#### 1.1 Informed Consent

Where data is freely available on the Internet, books or other public forum, permission for further use and analysis is implied, however, the ownership of the original data must be acknowledged (Tripathy, 2013).

#### 1.2 Anonymity and Confidentiality

To ensure privacy and to protect individuals or institutions within the secondary data, a privacy plan or protocol will be in place to protect the confidentiality of the users. This may include removing identifiable information, securely storing the data and removing any sensitive information prior to distribution of the outcome of the study (where needed).

#### 1.3 Action and Competence of Researchers

The study will be undertaken in an ethically correct manner. Under no circumstances would the researcher in this study make judgments about data, falsify data or plagiarize.

## ANNEXURE 1 (Continue)

### 1.4 Respect of Intellectual Property

Intellectual property is the creation arising from intellectual activity, and this study will acknowledge and reference all ideas and sources used in the study.

### 1.5 Beneficence

The study topic being researched is for degree purposes only and will not be published.

### 1.6 Non-Maleficence

Non-maleficence makes sure that what is being done is not harmful and that harm is not done by omitting care or treatment. This study will make sure that no harm will come to anyone connected to the study. This body of work and the documents consulted will also adhere to the Protection of Personal Information Act (PoPIA). POPIA governs the collection, processing and sharing of personally identifiable information (PII).

### 1.7 Applying for ethical consideration

The researcher will apply for ethical consideration from the ***Department of Business Management*** (Nelson Mandela University) to have the right to research within the intended domain. The research process, in particular data collection, may only be conducted once ethical clearance has been granted, i.e., the ethics form has been signed by the student, the study leader and the Head of Department.

**SECTION E – SIGNATURES AND DATES**

| | |
|---|---|
| STUDENT | 15 April 2025<br>DATE |
| STUDY LEADER | 05/05/2025<br>DATE |
| HEAD OF DEPARTMENT | 5 May 2025<br>DATE |

**REFERENCES**


Cilliers, L. & Viljoen, K. (2021). A framework of ethical issues to consider when conducting internet-based research. *South African Journal of Information Management*, 23(1).

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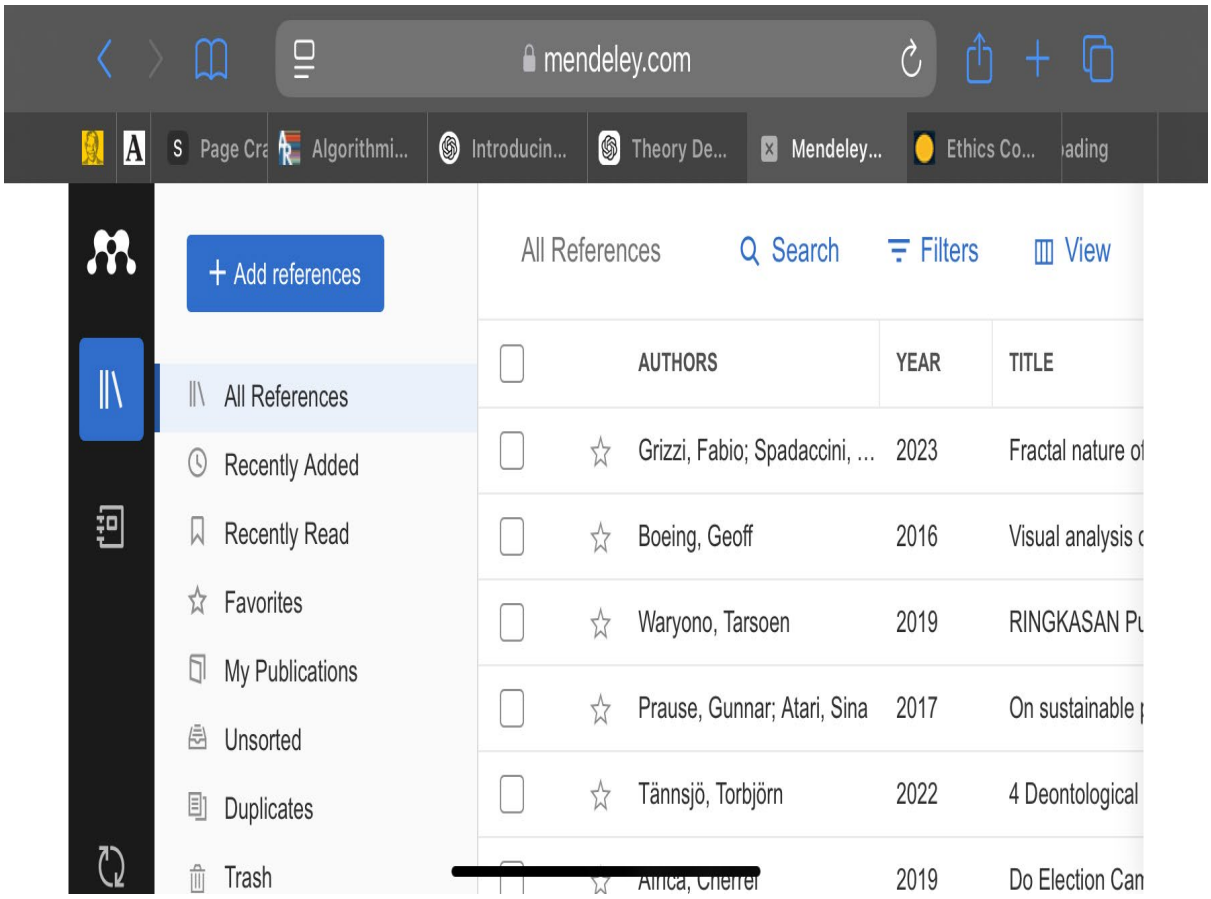
## ANNEXURE 2: SCREENSHOT OF MENDELEY



**ANNEXURE 3: LEARNING AGREEMENT**

NELSON MANDELA UNIVERSITY

## FACULTY OF BUSINESS AND ECONOMIC SCIENCES

## LEARNING AGREEMENT BETWEEN SUPERVISOR(S) AND POSTGRADUATE STUDENT FOR FULL RESEARCH QUALIFICATIONS

The aim of this learning agreement is to provide postgraduate students and their supervisors an opportunity to develop a sound and productive working plan. This document should be read in conjunction with the following Nelson Mandela University Policy documents:

- The General Prospectus
- Faculty of Business and Economic Sciences Prospectus
- Masters and Doctoral Degree Policy (M & D Policy)
- Code of Conduct for Researchers
- University Code of Ethics Policy
- Policy on Intellectual Property
- Promotion of Academic Integrity and Prevention of Plagiarism

These documents are available on the Nelson Mandela University's website (http://my.mandela.ac.za/default.asp?id=308&IRCno=) and are available on request from Ms Lindie van Rensburg (lindie@mandela.ac.za).

The Faculty of Business and Economic Sciences requires all postgraduate students and their supervisor(s) to complete a learning agreement within **TWO** months of the commencement of the research degree programme.

## ANNEXURE 3 (CONTINUES)

Postgraduate students and their supervisor(s) should discuss the issues outlined in this agreement, to have clarity and consistency regarding the conduct of the Postgraduate student and supervisor(s). Should a co-supervisor be appointed, he/she should be part of the discussion process.

The postgraduate student and supervisor should keep a copy of this learning agreement, including a copy send to Ms Lindie van Rensburg (lindie@mandela.ac.za).

---

### PART A: DETAILS OF POSTGRADUATE STUDENT, SUPERVISOR(S) AND QUALIFICATION

| | |
|---|---|
| **NAME & SURNAME:** | **ROLIVHUWA MASHAMBA** |
| **STUDENT NUMBER:** | **225327376** |
| **QUALIFICATION:** | **BCom Honours in Business Management** |
| **FIRST YEAR OF REGISTRATION:** | **2024** |
| **DEPARTMENT:** | **Business Management** |
| **SUPERVISOR:** | **DR VM MSUTHWANA** |
| **CO-SUPERVISOR** | **Prof FARRINGTON** |

### PART B: ROLES AND RESPONSIBLITIES OF THE POSTGRADUATE STUDENT AND SUPERVISOR(S)

**POSTGRADUATE STUDENT:**

As a postgraduate candidate, the student is expected to apply him- or herself to meeting the following reasonable responsibilities.

## ANNEXURE 3 (CONTINUES)

The postgraduate Student accepts and undertake the following responsibilities as outlined in the M & D Policy (Rule 5.3):

| RULE | DESCRIPTION | INITIAL |
|---|---|---|
| 5.3.1 | Complete all the required components of the academic programme as stipulated. | R.F |
| 5.3.2 | Plan and execute the research study as agreed to with the guidance of the supervisor (and co-supervisor, where applicable). | R.F |
| 5.3.3 | Ensure that the research proposal is submitted for approval within the stipulated timeframe in accordance with the university's rules (*6 months for Master's degree & 12 months for Doctoral degree*). | R.F |
| 5.3.4 | Adhere to the principles of accepted safety and health standards, ethical research practice as per Nelson Mandela University Code of Conduct for Researchers (IRC 404.01), Policy on Research Ethics (IRC 404.02), specific codes of the discipline (where applicable) and conventions regarding plagiarism as per Nelson Mandela Policy for the Promotion of Academic Integrity and Prevention of Plagiarism (IRC 305.04). | R.F |
| 5.3.5 | Make regular appointments with supervisor(s) to update supervisor(s) on progress or any difficulties encountered in executing the academic project as planned to ensure timeous remedial action where required. | R.F |
| 5.3.6 | Keep written record of supervision sessions and the decisions agreed to. | R.F |
| 5.3.7 | Submit regular outputs from the academic project to ensure effective guidance and input by supervisor(s). | R.F |
| 5.3.8 | Ensure that written work submitted has been proofread and of an acceptable academic standard. | R.F |
| 5.3.9 | Ensure that the necessary amendments or revisions decided upon with supervisor(s) are made regularly and resubmitted as agreed for further guidance. | R.F |
| 5.3.10 | Take responsibility for the final production of the treatise/dissertation/thesis for examination and final submission in accordance with university or faculty-specific rules | R.F |
| 5.3.11 | Submit a manuscript to the supervisor prior to the time of the approval of examiner reports (for purpose of awarding the doctoral degree). | R.F |
| 5.3.12 | Renew annual registration for the academic programme within the periods as stipulated by the university. | R.F |
| General | The postgraduate student has read all the relevant strategic and policy documents related to their relevant qualification. | R.F |
| General | The postgraduate student has familiarised him- or herself with the internet-based plagiarism detection service; Turnitin software. | R.F |
| General | The postgraduate student endeavours to partake in workshops and training related to | R.F |

**ANNEXURE 3 (CONTINUES)**

| | | |
|---|---|---|
| General | The postgraduate student endeavours to partake in workshops and training related to the research project | R.F |

## SUPERVISOR / CO-SUPERVISOR:

The responsibilities outlined below are reasonable expectations of academics or any other persons who are undertaking the supervision of master's and doctoral candidates.

The supervisor(s) accepts and undertake the following responsibilities as outlined in the M & D Policy (Rule 5.

| RULE | DESCRIPTION | INITIAL |
|---|---|---|
| 5.2.1 | Manage the administrative aspects related with candidate's studies according to Nelson Mandela University rules. | VM |
| 5.2.2 | Liaise and co-operate with the HOD/DOS and/or the Executive Dean and relevant academic support units to ensure that the student is able to access basic resources (such as library, laboratory space, chemicals, accessing bursaries and scholarships where the student meets the criteria, etc.) reasonably required by a postgraduate candidate | VM |
| 5.2.3 | Clarify respective roles of student, supervisor, and co-supervisor (where relevant) to ensure that student and supervisor (s) are clear about channels of communication as well as expectations. Preferably such clarification should be contained in a supervisory or learning agreement | VM |
| 5.2.4 | Confer or make contact with the student regularly (minimum once an academic term) to provide academic guidance to ensure the development and mastery of research skills and competencies relevant to the discipline and the specific study, and to ensure adherence to university requirements and/or discipline standards. | VM |

## ANNEXURE 3 (CONTINUES)

| | | |
|---|---|---|
| 5.2.5 | Monitor progress of the student and submit reports on student progress as required by the university and by relevant scholarship funding bodies. | VM |
| 5.2.6 | Keep a record of supervision sessions and provide feedback, within the timeframe agreed upon, to enable student progress. | VM |
| 5.2.7 | Supervisors must maintain an adherence to accepted safety and health standards, as well as ethical research practice as per Nelson Mandela University Code of Conduct for Researchers (IRC 404.01), Policy on Research Ethics (IRC 404.02), specific codes of the discipline (where applicable) and conventions regarding plagiarism as per Nelson Mandela Policy for the Promotion of Academic Integrity and Prevention of Plagiarism (IRC 305.04) and advise their students to maintain these standards as well. | VM |
| 5.2.8 | Provide the relevant information to the student so that the candidate submits the treatise/dissertation/thesis for examination and final submission in accordance with university or faculty-specific rules (see Addendum 8 for format guidelines). | VM |
| 5.2.9 | Advise the student regarding the submission of declaration of manuscript at the time of approval of examiner reports for the purposes of awarding of doctoral degrees (for doctoral degrees only). | VM |
| General | The supervisor(s) to consult Turnitin report submitted by the student to the internet-based plagiarism detection service; Turnitin software. | VM |
| General | The supervisor assists the student with the ethics application. | VM |

### PART C: TERMS OF LEARNING AGREEMENT

| **FREQUENCY OF COMMUNICATION** | | |
|---|---|---|
| The contact details of the supervisor(s) were provided to the postgraduate student. | **YES** ☒ | **NO** ☐ |
| Specify frequency and communication channel for meetings (i.e. telephone, email, face-to-face). | *All consultations must be by appointment (be it face-to-face, online or via email), the frequency may vary according to the complexity of the enquiry.* | |
| In case of the appointment of a co-supervisor(s), how will meetings and communication between all be organised? | *Joint meetings will still be organised through face-to-face, online or via email.* | |
| Specify who is responsible for scheduling meetings and how far in advance these meetings should be scheduled. | *Supervisor will be responsible to organise the meetings and will give all parties at least 2 days to prepare, however it may vary according to the complexity of the enquiry.* | |

## ANNEXURE 3 (CONTINUES)

| | |
|---|---|
| Specify the procedure for changing the meeting date and time. | *By agreement with all parties* |
| Specify frequency and duration of meetings (approx.). | *Depending on the enquiry, meetings may be every 2-3 weeks, monthly or quarterly, and may not be more than 2hrs a session.* |
| Specify who will set the agenda and take notes. | *For academic progress, it will be the supervisor*<br>*For student enquiries, it will be the student* |
| Clarify whether there will be any expectation regarding regular email communication. | *It is expected that formal communication be done through emails for traceability* |
| Indicate the availability of communication of supervisor during period of research and/or ordinary leave. | *All consultations will be by appointment (be it face-to-face, online or via email), if supervisor is not available or on leave, alternative arrangement will be made between supervisor & student.* |
| List the roles, responsibilities of supervisor, co-supervisor(s) and student. | *- Supervisor to give direction to student on how to write an academic research.* |

| | |
|---|---|
| | *- Supervisor, with collaboration with the student, should set up due dates for submission on each section of the study.*<br>*- Supervisor to support student with any questions/queries student has.*<br>*- Student may require assistance with conducting statistical analysis of raw data.*<br>*- Student must communicate with the Supervisor for any research training required.* |
| **Comments:** | It is the responsibility of the student to ensure that all the agreed plans of action are adhered to |
| **RESEARCH PLAN / TIMEFRAME** | |
| Specify the research plan and timeframe | *- Research is scheduled for over a minimum period of 2 years, any deviation or extension must be discussed with the supervisor* |

## ANNEXURE 3 (CONTINUES)

| | | |
|---|---|---|
| | *- Student must draft a written schedule and make scheduled submissions (every 2-3 months), at various stages of the research work until completion.* | |
| Specify how changes to the research plan / timeframe will be dealt with. | *As required, amendment may be done on the plan in consultation with the supervisor.* | |
| Was the postgraduate student informed of the timeframes regarding the submissions of research proposals as per the M & D Policy *(Rule 5.1.5.1 & 5.1.5.2)*? | **YES** ☒ | **NO** ☐ |
| Specify remedial action if schedule is not adhered to? | *If the planned schedule is not adhered to, a student must write a detailed reason for the deviation, then a supervisor should come up with alternative action going forward.* | |
| **Comments:** | It is the responsibility of the student to ensure that all the agreed plans of action are adhered to | |
| **SUBMISSION OF WRITTEN MATERIAL AND FEEDBACK** | | |
| Specify how often written work should be submitted to the supervisor(s). | *- Student work shall be reviewed periodically (between 2 – 3 weeks) depending on the complexity of the work.*<br>*- Feedback shall be given to student via Microsoft Word with supervisor's comments and required changes attached.* | |
| Specify the timeframe for feedback. | *- Feedback shall be provided at least 1 week after the date of submission.* | |
| Specify remedial action if feedback agreement is not adhered to? | *If feedback agreement is not adhered to with no reason, student has a right to escalate.* | |
| **ETHICS APPROVAL** | | |
| | **YES** | **NO** |
| The postgraduate student was informed that all research projects require ethical approval? | ☒ | ☐ |
| The postgraduate student was informed that it is his/her responsibility to apply for ethics? | ☒ | ☐ |
| The postgraduate student was informed that data collection cannot commence before ethical approval was obtained *(i.e. the approval letter* | ☒ | ☐ |

## ANNEXURE 3 (CONTINUES)

| | | |
|---|---|---|
| The postgraduate student was directed to the Rec-H Website to access ethics application and supporting documents? | ☒ | ☐ |
| **Comments:** | It is the postgraduate student's responsibility to apply for ethics | |

| | | |
|---|---|---|
| | | |
| **INTELLECTUAL PROPERTY** | | |
| | **YES** | **NO** |
| The postgraduate student was informed that all intellectual property resulting from research conducted for postgraduate degrees, including all publications, is governed by the Intellectual Property Policy (IRC 401.01) | ☒ | ☐ |
| The student was informed that the intellectual property rights resulting from a postgraduate's research shall vest in the University | ☒ | ☐ |
| **Comments:** | | |
| **ANNUAL PROGRESS REPORT** | | |
| | **YES** | **NO** |
| Student and supervisor(s) are aware that annual progress reports should be submitted by 1 October for each year of registration? | ☒ | ☐ |
| Student and supervisor(s) are aware that failure to submit annual progress report will result in a student to be blocked from registration for the following academic year? | ☒ | ☐ |

## ANNEXURE 3 (CONTINUES)

| EXPECTATON REGARDING SUBMISSION FOR EXAMINATION | | |
|---|---|---|
| | YES | NO |
| The postgraduate student was informed that when the research project nears completion, he/she must inform Faculty Academic Administration in writing of his/her intention to submit it for examination. Such notice must be given at least **three** months before the prospective date of submission. The postgraduate student understand that it remains his/her responsibility to submit the intention to submit form. | ☒ | ☐ |
| The postgraduate student was informed that should he/she not submit the research project by the submission dates indicated in the General Prospective, graduation is not guaranteed and the postgraduate student will have to re-register for the academic year. | ☒ | ☐ |
| **Comments:** | | |
| **FUNDING OF RESEARCH PROJECT** | | |
| Specify who will be responsible for the cost related to the research. | | |
| Indicate any scholarships and bursaries with timeframes, and how this might affect studies and research. | | |
| **Comments:** | | |

The **STUDENT** and the **SUPERVISOR** confirms that:

1. They have read and understood this Learning Agreement,
2. They agree to accept its content for the duration of the study period as per the qualification stipulated above.

**SIGNATURES:**

Student: .....

Supervisor: .....

Co-supervisor: .....

## ANNEXURE 4: TURNITIN REPORT

ORIGINALITY REPORT

| 16% | 14% | 7% | 5% |
|---|---|---|---|
| SIMILARITY INDEX | INTERNET SOURCES | PUBLICATIONS | STUDENT PAPERS |

PRIMARY SOURCES

| | | |
|---|---|---|
| 1 | busman.mandela.ac.za<br>Internet Source | 4% |
| 2 | Submitted to Nelson Mandela Metropolitan University<br>Student Paper | 1% |
| 3 | ageconsearch.umn.edu<br>Internet Source | 1% |