Gordon Institute of Business Science
University of Pretoria

The role of eco-innovative manufacturing and marketing within the South African clothing and textile industry

by

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A research proposal submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Philosophy in International Business

25 November 2024

ABSTRACT

This research report aims to enhance understanding of the significance of eco-innovative manufacturing within the South African clothing and textile (C&T) sector and the respective marketing implications. Utilising the diffusion of innovation theory, the report will examine the factors that facilitate adopting eco-innovation and analyse how companies based in South Africa are capitalising on the advantages of eco-innovative manufacturing. Additionally, the research report will explore the potential role of government in creating a more conducive environment for promoting the adoption of cleaner manufacturing practices within the industry.

The research employed a qualitative methodology to interview industry experts, clothing manufacturers, and retailers in the C&T domain. A key finding was the emphasis on waste management strategies, such as utilising offcuts to create additional products, which emerged as a motivating factor for manufacturers pursuing eco-innovation. Furthermore, some participants highlighted the significant financial advantages of resource optimisation, particularly regarding water and electricity savings, when implementing cleaner production processes. This financial motivation can inspire more companies to adopt eco-innovative practices.

Some recommendations speak to improving coordination efforts for manufacturers to combine their industry challenges and solutions with eco-innovation, thereby improving regulations and describing the benefit of receiving government incentives.

KEYWORDS

Innovation, manufacturing, sustainability, brand marketing, clothing and textile

GLOSSARY OF ACRONYMS

BCI	Better Cotton Initiative
C&T	Clothing & Textile
CE	Circular Economy
CF	Carbon Footprint
CSR	Corporate social responsibility
CTLF	Clothing, textiles, leather, and footwear
DIT	Diffusion of Innovation Theory
DTI	Department of Trade and Industry
DTIC	Department of Trade Industry and Competition
EI	Eco-innovation
ESG	Environmental Social Governance pillars
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
QDA	Qualitative Data Analysis
R&D	Research and design
RA	Relative Advantage
SDG	Sustainable Development Goals
SASB	Sustainability Accounting Standards Board
SME	Small and medium-sized enterprises
SRQ	Secondary Research Question

DECLARATION

I declare that this research project is my work. It is submitted in partial fulfilment of the requirements for the Master of Philosophy International Business degree at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination at any other university. I further declare that I have obtained the necessary authorisation to conduct this research.

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CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM

Chapter 1 of this research report will provide a comprehensive overview of the background related to the research problem, thereby setting the stage for the deeper exploration of the issues at hand. It will articulate the rationale behind focusing on the clothing and textile (C&T) industry, a vital sector in many economies, including SA. Similar to other industries, the South African clothing and textiles sector is under growing pressure to implement sustainable practices in response to environmental challenges and shifting consumer preferences. The chapter will explore the significance of working in South Africa and how, economic, and environmental factors shape the industry. Furthermore, it will discuss the pivotal role that marketing plays in advancing the discourse of environmental sustainability. Effective marketing campaigns can enhance awareness and influence consumer behaviour towards more sustainable options, making them essential for the industry's shift towards eco-innovation. In addition to contextualising the research, this chapter will underscore the business and theoretical relevance of the study. It will address businesses' crucial role in fostering environmental sustainability through manufacturing processes. By ensuring that their practices are both innovative and sustainable, companies can enhance their competitive edge and contribute positively to the environment.

The discussion will encompass various sustainable manufacturing and marketing practices that can be adopted, illustrating how these approaches benefit the planet and align with growing consumer demand for responsible production. Ultimately, this chapter will lay a solid foundation for understanding the interconnectedness of business operations, marketing, and environmental sustainability within the South African C&T industry context.

1.1 Introduction

Organizations around the globe are increasingly pressured to tackle environmental sustainability issues throughout all their operations and across the entire value chain, including their manufacturing and marketing operations. The Brundtland Report describes sustainable development as development that satisfies the current needs of today's generation without jeopardizing the ability of future generations to fulfil their own needs (Ray & Nayak, 2023). The environmental sustainability conversation continues to be a crucial area of concern for corporations around the world, particularly those that strive to contribute towards the United Nations Sustainable Development Goals (SDG), i.e., SDG number 12, which refers to the goal of establishing sustainable consumption

and production patterns by 2030, achieved through the execution of a ten-year framework of global initiatives focused on sustainable consumption and production., (Biermann et al., 2022). The SDGs are also pertinent to the clothing and textiles industry, which is one of the largest and most significant sectors globally, boasting a market value of 1.7 trillion US dollars (Smith, 2024).

Typically, the C&T industry is characterised by the consumption of substantial quantities of water, the development of inexpensive materials that contain hazardous chemicals, and the high level of energy consumption to accommodate the increasing demand for rapidly changing global fashion trends (Niinimäki et al., 2020a). The clothing and textiles industry is the second most polluting sector globally, closely trailing the energy industry (Papasolomou et al., 2023). Estimates show that the C&T sector accounts for 20% of the world's wastewater and 8% of its carbon emissions worldwide, with greenhouse gas emissions expected to increase by 50% by 2030 (K. Bailey et al., 2022). The physical risks associated with climate change put pressure on the current supply chains, business models, and decision-making processes of C &T companies (Woetzel et al., 2020). The industry is under increasing pressure to tackle environmental sustainability issues, as its manufacturing and marketing practices directly influence production and consumption patterns.

The traditional economy of the clothing and textiles sector—encompassing fabrication, usage, and disposal—leads to more than two-thirds of textiles being discarded in landfills after their use (Leal Filho et al., 2022). At the same time, only approximately 15% is recycled (Shirvanimoghaddam et al., 2020). The C&T industry, which creates a significant environmental impact from the cultivation of raw materials through to the disposal of post-consumer products in landfills, encounters major environmental and resource challenges. These issues arise from growing concerns about environmental and social sustainability, as well as energy and water consumption, pollution, the depletion of natural resources, and greenhouse gas emissions (Niinimäki et al., 2020). Growing environmental concerns have led to implementing eco-innovation in the industry to promote more environmentally sustainable manufacturing practices.

The adoption of sustainability initiatives and responsible investment practices within companies has been shaped by several challenges, including resource depletion and climate change (Eslami & Moghaddam, 2022). Consequently, the increasing importance of eco-innovation that promotes environmentally conscious management practices and operations has resulted from confronting these grand environmental challenges (Karaman et al., 2024). Therefore, through their manufacturing and marketing

campaigns, business plays a key role in driving sustainable production patterns through the uptake of eco-innovation, which is defined as the use of alternative, environmentally safer technologies or practices compared to what is currently on the market (Harsanto et al., 2023). Through their marketing strategies, companies influence consumer consumption patterns, highlighting how sustainable apparel is marketed as a holistic approach to addressing environmental sustainability in the industry (Hermundsdottir & Aspelund, 2022). Eco-innovative technologies, which include the use of technology to enhance environmental management or green product design, recycling, and pollution avoidance, are therefore essential for businesses that are dedicated to environmental sustainability (Salo et al., 2020). Given the growing demand for environmental responsibility, eco-innovation is a business strategy aimed at boosting enterprises' competitive advantage (Demirel & Kesidou, 2020). In this sense, eco-innovation refers to both gradual and significant improvements in goods, procedures, and techniques that reduce their negative effects on the environment (Harsanto et al., 2023). A more detailed discussion of eco-innovation and sustainability marketing can be found in Chapter 2 of this research report.

A company's long-term financial outcomes and viability are consequently influenced by its social and environmental performance (Hermundsdottir & Aspelund, 2022). It can be argued that innovation lies at the centre of addressing the environmental challenges faced by the C&T industry today while still delivering value to shareholders (Zheng & Iatridis, 2022). Mady et al. (2023) outlined how environmentally friendly innovation can be a vital tool for increasing operating effectiveness, by cutting waste, and lowering expenses. Cillo et al. (2020) explained how eco-innovation involves purposefully changing an organization's beliefs and philosophy in addition to its goods, procedures, or practices in order to create and achieve economic benefit as well as social and environmental value. This may, in turn, positively impact a company's market value. By investing resources in eco-innovation, companies can cultivate dynamic capabilities and skills, thereby improving their overall performance (Mady et al., 2023).

Moreover, (Karaman et al., 2024) posited that innovative companies may generate greater profits and reduce emissions, consequently, a link may be created between eco-innovation, brand market share, and the relationship between environmental performance and market stock prices can be linked to innovation. Borrowing from Rogers' diffusion on innovation theory, which explains how innovations are diffused and accepted in society (Rogers, 2003); this research report seeks to investigate the following: (1) the role of eco-innovative manufacturing practices of C&T companies in

SA, as well as (2) how and why manufacturers promote their products' environmental sustainability claims by employing different marketing strategies. Using qualitative data collection and interpretivism based analysis, this research report will determine whether there is any added value in the manufacturing and marketing of eco-innovative practices in the C&T industry.

1.2 Background to the research problem

This research report explores the role of eco-innovative manufacturing processes within South African based C&T companies. It investigates how these "green" processes and their environmental benefits can be incorporated into marketing strategies and what other benefits they derive. In 2007, through the Industrial Policy Action Plan, the South African government created several subsidies and incentives to help SA's C&T industry gain a competitive edge (Department of Trade and Industry, 2007; 2010; 2014; 2016). The South African C&T industry's GDP contribution fell from 6% to 3% in 2013 (Statistics South Africa, 2013), suggesting that the industry's incapacity to create a competitive edge against lower-priced imports may have contributed to the industry's declining GDP contribution (Mbatha, 2021).

Although the South African government's strategies have been recognized for slightly enhancing the competitive advantage of the country's clothing and textiles industry, there remains significant potential for further improvement (Mbatha, 2021). Porter (1990) purported that policies implemented by the government have the power to either favourably or unfavourably alter an industry's competitive advantage, which may lead to an increase in domestic demand. He suggested that domestic demand affects economies of scale and showed how businesses can innovate and advance to gain a competitive edge.

The Republic of South Africa presents unique challenges and opportunities as an emerging market. Strategically positioned in the industry, its current Department of Trade and Industry (DTI) offers companies grants and an incentive structure. SA has the potential to introduce and enforce innovative policies that drive carbon-neutral manufacturing in the C&T industry. At the December 2009 Climate Change Summit in Copenhagen, former President Jacob Zuma pledged to reduce the nation's greenhouse gas emissions by 34% by 2020 and by 44% by 2025 (Baker et al., 2014). By keeping to these commitments and in line with the Paris Agreement signed in 2015 and the 2030 Agenda, South Africa is advocating for a fair shift from an economy reliant on fossil fuels to one with reduced carbon emissions. It recently began implementing stakeholder

dialogues on pathways for a just transition through its National Planning Commission (Hägele et al., 2022). Government, labour, civil society, and business are exploring various solutions to address environmental sustainability while guaranteeing a fair transition towards a low carbon economy through these organised and concerted efforts (Baker et al., 2014). This process is crucial for promoting a common goal and vision between government and private sector stakeholders to ensure progress in the country's socio-economic low carbon transition without obstructing the attainment of other SDGs (Ahirwal & Maiti, 2022).

1.2.1 Business perspective

Climate change has become an undeniable part of social existence, with companies in various industries continuously finding new ways to limit their ongoing contribution to the climate crisis (Saharti et al., 2024). With the introduction of environmental, social and governance (ESG) sustainability measures, companies seeking to attract responsible investments are finding innovative ways to lower their carbon footprint across their value chain to address the environmental sustainability pillar in ESG (Deloitte, 2024). In so doing, companies are introducing more eco-innovative carbon-neutral processes into their day-to-day activities.

Companies are currently under growing pressure from investors, regulators, consumers, and employees to be effective stewards of financial, environmental and social capital. Additionally, they are expected to develop appropriate governance frameworks to facilitate this (Deloitte, 2024). ESG standards have also become crucial in the corporate world since companies that implement them are said to be improving their financial prospects, as well as their environmental and social impact (Sun, 2024). Investors often prefer ESG-compliant businesses because of their commitment and adherence to sustainability (Saharti et al., 2024). Sun (2024) explained that carbon emissions such as greenhouse gases and air, water, and earth pollutants are integral components of the environmental sustainability pillar of ESG. Resource utilization in manufacturing processes involves considerations such as whether a business uses virgin or recycled materials and how it maximizes the recycling of materials from its products back into the economy (circular economy) rather than allowing them to end up in a landfill (Ki et al., 2020).

Redesigning products, manufacturing processes, and supply chains to keep resources continuously circulating in a closed loop could help eliminate the concept of waste in the circular economy (Jia et al., 2020). Similarly, businesses must ensure that they also

manage other environmental resources by reusing and continuously using them, thereby limiting the amount of production waste (Doppelt, 2003). These are some ways businesses can contribute towards a low carbon economy while lowering their carbon footprint in their manufacturing processes. This research report is significant to the business community because it highlights the critical role a business can play in promoting environmentally sustainable practices in the primary activities of its value chain (manufacturing and marketing).

1.2.2 Theoretical perspective

Globally, sustainability has emerged as a major concern in recent years. With social support, it is feasible for businesses to grow in sustainable ways. Sustainability pertains to an organisation's responsibilities towards the environment and society and sound governance. Consequently, the question emerges about how these responsibilities can be effectively fulfilled through marketing (Jung et al., 2020). C&T companies use different brand marketing techniques to differentiate themselves from competitors while attracting customers.

Despite the criticism that marketing encourages overconsumption, there are opportunities to inform customers about these concerns and provide them with the knowledge they need to make more informed consumption decisions (Nislin et al., 2019). The field of marketing exerts significant influence over social and environmental conditions via its direct effects on product development and consumption promotion (Kemper & Ballantine, 2019). This underscores the significance of businesses implementing low carbon operational processes and considering incorporating sustainability into their marketing message. Sustainability marketing initiatives positively impact the enhancement of brand image, the development of corporate profits, and the long-term viability of organisations (Maignan & Ferrell, 2001).

Jung et al. (2020) defined green management within an organisation as encompassing environmental sustainability practices such as using green materials and demarketing initiatives. Through a diverse range of sustainability-oriented initiatives, these practices can establish the groundwork for lasting growth of organisations. How environmentally sustainably manufactured C&Ts are marketed to the public may enable customers to make informed decisions about their consumption choices at the point of purchase, i.e., eco-labelling. The academic relevance of this research report is that it seeks to make a small contribution to the diffusion of innovation theory by testing some of the basis of the

theory‘s rate of innovation adoption. Through active data collection, this research report will contribute new insights into the theory in a different geographical context.

1.3 Definition of the research problem and research aims

1.3.1 Impact of C&T on the environment

Due to globalisation and industrialisation, the C&T industry is characterised by multitiered supply chain operations, and it remains complex and sometimes opaque. The industry’s impact on the environment, society, and the economy can be extensive. In 2019, the global industry was valued at 1.9 trillion US dollars. By 2030, that figure is projected to rise to 3.3 trillion US dollars (Statista, 2020). Despite its substantial contribution to the global economy, the fashion industry has faced widespread condemnation for being among the most significantly polluting sectors worldwide; fossil fuel energy remains the main energy source in this sector, thereby causing adverse impacts on the environment (UN News, 2019).

The C&T industry consumes significant energy due to its lengthy and complex supply chains (Tien et al., 2020). The environmental threats it causes are mostly attributable to the linear value chain, production, and consumption system (Demirel & Kesidou, 2020). With an estimated 1.2 billion tonnes of CO2 equivalent produced annually, the C&T industry is one of the most polluting industrial sectors and accounts for 10% of global greenhouse gas (GHG) emissions (Leal Filho et al., 2022). It has also been estimated that the textile industry causes up to 20% of industrial wastewater pollution (Salo et al., 2020).

To meet the demands of rapidly evolving fashion trends at affordable prices, brands depend on synthetic materials derived from fossil fuels, which are more accessible, versatile, and cost-effective than natural alternatives (Pucker, 2022). Polyester, made from raw petroleum products, has become the most commonly used fabric in fashion, surpassing cotton, which has led to increased carbon emissions and has further exacerbated the climate change crisis (Leal Filho et al., 2022). Businesses are responsible for ensuring profitable dividends for shareholders while driving impactful social and environmental sustainability. This research report is important for international business as the conversation on environmental sustainability continues to be a crucial area of concern for corporations around the world. These corporations strive to contribute towards SDGs. The Intergovernmental Panel on Climate Change (IPCC) mitigation report highlighted that "behaviour, lifestyle, and culture significantly impact energy use and related emissions. Stabilizing or reducing consumption, shifting towards a sharing

economy, and embracing other behavioural changes offer substantial mitigation potential" (Edenhofer et al., 2014 p. 20). Nevertheless, it can be argued that the onus is on both the producer and the consumer to ensure that the transition to sustainable consumption yields a cumulative positive effect. This is particularly true when manufacturers offer environmentally friendly products.

1.3.2 Innovation in the SA C&T industry

To remain competitive, South African textile industries must consistently innovate in response to pressures from other globally competitive countries, such as China and India. A company's success in innovation may be a determining factor in maintaining its competitive advantage (Padilha & Gomes, 2016). Emerging technologies such as robotics, artificial intelligence, big data analytics, the Internet of Things, smart sensors, and 3D printing are seen as disruptive forces, anticipated to transform both our daily lives and the manufacturing industry (Whitfield & Mkhabela, 2023). Arguably, largely driven by the sustainability shift, these technologies have the potential to enhance industrial productivity and flexibility by enabling C&T companies to manage their supply, production, and dispatch relations better in real time (Whitfield & Mkhabela, 2023).

Mbatha (2021) indicated that the South African C&T industry needs to be more proficient at implementing innovative strategies to coordinate its manufacturing companies, production methods, and value chain than its global competitors. He further explained that the South African C&T industry's low levels of innovation are due to the limited availability of sector education, upskilling, and training programmes and the scarcity of domestically produced manufacturing inputs. In addition to other structural constraints in the South African C&T industry and the general domestic economy (characterised by low purchasing power), these have restricted the adoption of sustainability technologies and promoted the fourth industrial revolution wave (Whitfield & Mkhabela, 2023). Thus, South Africa's C&T industry is not competitive globally or domestically against imported garments.

1.3.3 Aims of the research report

This research report aims to thoroughly investigate the role of eco-innovation in the C&T industry in South Africa by examining various companies' practices and processes. It seeks to understand how these companies leverage the financial and environmental benefits of eco-friendly manufacturing once eco-innovation has been implemented. Additionally, the paper explores how companies market their sustainability claims and

whether these resonate with South African consumers. This will involve analysing how C&T companies promote sustainable production and consumption behaviours through their marketing campaigns.

Finally, this research report intends to identify the critical and unique role the South African government can play in fostering eco-innovation adoption within the C&T industry by instituting various interventions and national regulations. By analysing the collected data, the paper aims to provide recommendations on the advantages the industry could gain from adopting eco-innovative practices, particularly in competing with other global market players. It will also address the true value of the circular economy alongside issues related to C&T waste management and resource optimisation in manufacturing that drive environmentally sustainable production.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 2 will focus on the systematic literature review of eco-innovation within the C&T industry, particularly within South Africa as an emerging market. The study begins by a) analysing the theoretical anchor of Rodgers' diffusion of innovation theory, which gives insights into how innovation is adopted within society and the variables that determine the rate of adoption, b) examining the current state of South Africa's C&T industry, with a detailed historical account that gives context to the current state of the industry, c) the rise of fast fashion driven by consumer demand; d) the environmental impact of the C&T industry, paying particular attention to manufacturing waste and the circular economy, e) asking how C&T companies in South Africa are using eco-innovation to investigate the role of the C&T industry in contributing to eco-innovation, f) exploring the impact and relevance of marketing and consumer consumption behaviour in the sustainable development discourse.

2.2 Diffusion of innovation theory

To gain better insights and understanding of adopting eco-innovations in society and industry, this research report will use the diffusion of innovation theory as a theoretical framework and explore whether this theory holds in the South African C&T context. The diffusion of innovation theory (DIT) is a comprehensive theory of social and psychological processes that seeks to identify adoption patterns and structural characteristics of innovations to anticipate how individuals and organisations will decide which processes to adopt (Rogers, 1995). To better understand why companies, accept an innovation or how they reach that decision, it is helpful to consider the more detailed features of an innovation, as captured by DIT (Rogers, 1995). Rogers (2003, p. 5) stated that diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication in that the messages are concerned with new ideas".

Therefore, diffusion is a unique form of communication in which participants generate and exchange information to attain a shared understanding. Therefore, the best way to characterise diffusion is as a social process whereby individuals discuss accepting one innovation over another (Min et al., 2019). Consequently, it is impossible to fully appreciate the adoption of an innovation without also understanding the underlying social structure into which it is introduced. For this research report, it is crucial to comprehend

the larger context of the South African C&T industry to more accurately determine the DIT-described rate of innovation uptake.

2.2.1 Rate of adoption variables

Rogers (2003) spoke of five variables that determine the rate of society's adoption of an innovative product or process, as seen in Figure 2.1 below. Firstly, he identified the five attributes of innovation:

1) Relative Advantage compared to existing technologies. Relative advantage (RA) is a key factor in the Diffusion of Innovations Theory (DIT). It is a core concept within the DIT, defined as the degree to which an innovation is perceived to provide greater benefits than previous models or existing alternatives (Rogers & Shoemaker, 1983). This perception can encompass various dimensions, including improvements in efficiency, cost-effectiveness, convenience, quality, and overall user satisfaction. When evaluating innovations, individuals or organisations often weigh the potential advantages against more familiar alternatives. If an innovation is seen as significantly superior, it is more likely to be adopted (Min et al., 2019). Factors influencing this perception of RA may include tangible benefits, such as enhanced performance or reduced costs, and intangible aspects, such as social status or compatibility with existing values and practices related to environmental sustainability.
2) Compatibility in an organizational context refers to how effectively the innovation fits with the company's current values, beliefs, practices, and past experiences. As Rogers (1995) defined, compatibility reflects how innovation is perceived as harmonious with users' existing frameworks. This concept is crucial for understanding how users' prior experiences with similar technologies can influence their perceived ease of use. Previous research indicated a positive correlation between compatibility and the likelihood of companies adopting new technology.
3) Complexity within the DIT refers to the ease of implementation. It pertains to how challenging an innovation is perceived to be in terms of comprehension and usability. When an innovation is viewed as more complicated, the likelihood of individuals or organizations adopting it decreases (Rogers, 2003). Complexity can involve technical intricacies, the required training level, the need to alter existing workflows significantly and the organisational culture on the perception of innovation adoption (Rogers & Scott, 2021). All these factors that deal with

innovation complexity can either impede or encourage the rate of innovation adoption.

4) Trialability refers to how much an innovation can be tested on a small scale before becoming widely adopted (Kahn & Mentzer, 2021). This element enables C&T enterprises to test the innovation in a realistic setting, which can impact their decision to implement it. Trialability can restrict exposure to unforeseen hazards, reduce operational uncertainty, and encourage confidence in decisions to embrace innovation (Wang & Wang, 2019).
5) Transparency regarding the innovation's progression both internally and about competitors. Transparency pertains to how visible an innovation is to the members of a social system, such as other actors in the communication and technology industry, and how easily its benefits can be recognized and communicated (Rogers, 2003). It refers to the clarity and openness with which information about an innovation is shared. When organisations provide clear and accessible details regarding the features, benefits, and potential challenges of innovation, they are enabled to enhance trust and facilitate adoption among users (Goh & Sia, 2020). Improved transparency helps to demystify the innovation process, thus making it easier for businesses to grasp how the innovation corresponds with their requirements and expectations (Eslami & Moghaddam, 2022). Consequently, transparent communication can significantly influence the rate at which innovations are adopted.

All attributes above play a crucial role in predicting the adoption rate of innovative manufacturing processes in the C&T industry. C&T manufacturers have some influence and control over this aspect as they trial and introduce new standard operating procedures in their value chain systems.

2.2.2 Innovation decisions

Secondly, Rogers (2003) breaks down the type of innovation decision into three categories: (1) optional innovation decisions, which pertain to individuals' choices regarding the adoption or rejection of innovation without influencing the decisions of other system members; (2) collective innovation decisions, which involve consensus among system members regarding adoption or rejection of innovation; and (3) authority innovation decisions, which pertain to a limited number of individuals in a system who possess sufficient power, status, or technology and make decisions regarding adoption or rejection of an innovation; e.g., the South African DTI’s C&T grant incentive rules (García-Avilés, 2020). Additionally, there are impersonal communication channels such

as mass media, advertising, and (of great interest to this research report) brand marketing, all of which businesses have direct control and influence over (Dearing & Cox, 2018). Rogers argued that “mass media channels are more effective in creating knowledge of innovations, whereas interpersonal channels [through social systems] are more effective in forming and changing attitudes towards new ideas, and thus in influencing the decision to adopt or reject it” (Rogers, 2003, p. 36). Finally, one should not overlook the dissemination of technology advances through the role of change agents and innovation champions, who are seen as "opinion leaders" in the process (Dearing & Cox, 2018).

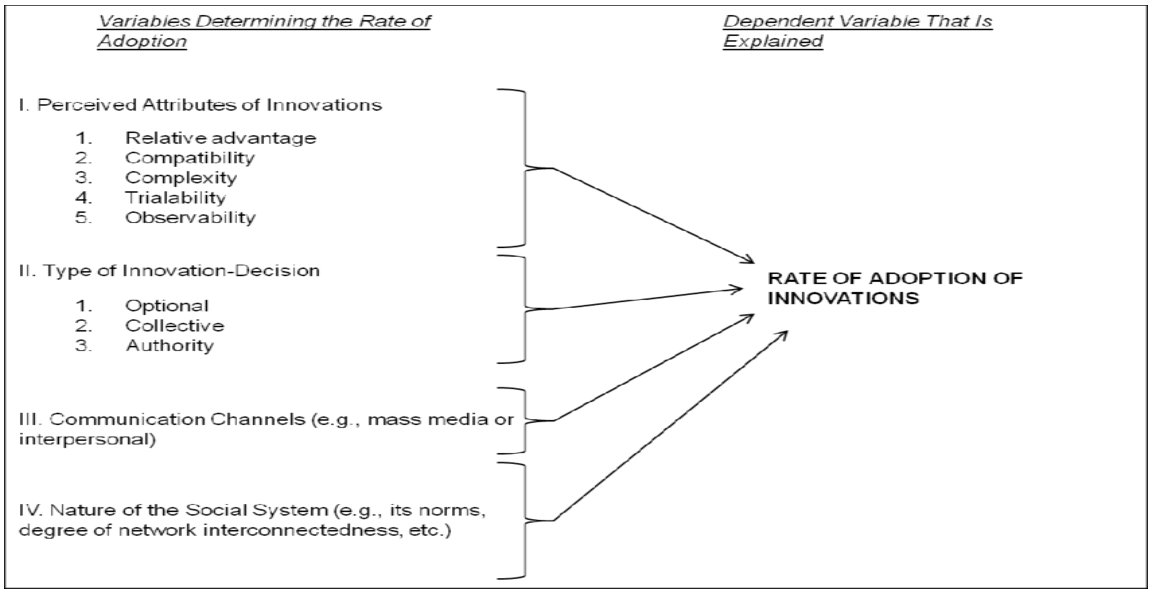

Figure 2.1: Variables Determining the Rate of Adoption of Innovations
Source: (Rogers, 2003, p. 222)

By employing the DIT lens to examine innovation adoption, one can discern critical domains in which organisations can exert substantial influence over adopting environmentally friendly innovations and reducing operational carbon emissions. By leveraging mass media through marketing and communication channels, C&T manufacturers can impact societal adoption of sustainable practices and innovations among other fellow industry players using either a business-business approach or a business-customer approach.

2.2.3 Gaps in the theory

Several scholars contend that DIT needs to fully account for contextual elements impacting the adoption of innovations, such as cultural, economic, and social dynamics, which can vary significantly from country to country (Ladds et al., 2023). This is particularly relevant in diverse settings where local traditions and practices may affect

the diffusion process (Kumar & Gupta, 2023), i.e., South Africa's innovation readiness and regulatory frameworks will affect the level of innovation adoption by industry companies. Critics have noted that DIT often portrays innovation users as passive recipients rather than active participants in the adoption process (Lim et al., 2021). This highlights the need for a more nuanced understanding of user behaviours and motivations when adopting innovations. The rapid evolution of technology has also presented some challenges for DIT, which may only partially adapt to the speed at which innovations develop and, after that, become obsolete. As new technologies emerge, understanding how they diffuse and are adopted becomes increasingly complex (Ladds et al., 2023). Some researchers propose that DIT should evolve by reflecting the lifecycle of innovations and the continuous changes in channels and technologies that might disrupt traditional diffusion patterns, such as the introduction of social media and other digital communication disruptors (Trivellato et al., 2021).

2.3 The South African clothing and textile industry

2.3.1 Historical context

The current South African C&T industry faces a structural crisis of competitiveness as it battles against cheap imports and the historical challenges of what was once a highly protected industry. Under apartheid, the economic system was heavily influenced by a racial division of labour, which ensured that different racial groups had access to varying levels of economic opportunity and job types (Sonnenberg et al., 2022). This system was often referred to as 'radical Fordism,' characterized by mass production methods that prioritized efficiency and standardization (Zalk, 2021). The Apartheid regime maintained a protectionist industrial policy, establishing a large-scale C&T industry characterised by the inefficient use of low-cost and unskilled labour (Wood & Smith, 1998).The demise of racial Fordism in the late 1980s resulted in significant upgrades in pay and productivity, although the new approach allowed for significantly fewer personnel (Morris et al., 2021). After apartheid ended in 1994, the new South African government pursued trade liberalization, arguing that the country could not afford to support uncompetitive businesses through import substitution or protectionist policies (Mbatha, 2021). This shift aimed to integrate South Africa into the global economy, promote competition, attract foreign investment, and increase exports (Zalk, 2021). However, it also posed challenges in balancing economic efficiency with the need for job creation and addressing historical inequalities. (Whitfield & Mkhabela, 2023).

The opening of global markets and increased domestic competition forced many South African businesses to rethink their work and production methods. While some sectors, like motor vehicles, managed to compete internationally, others, such as C&T's, faced significant challenges (Whitfield & Mkhabela, 2023). With reduced tariffs and the removal of quotas, South African textile and apparel firms struggled to compete against imports from Asian countries that had more competitive industries (Morris et al., 2021).

South African firms became less efficient as they fell behind the technological frontier due to insufficient re-investment and a focus on the domestic market (Sonnenberg et al., 2022). This led to diversified product portfolios with smaller production runs, preventing them from achieving the economies of scale seen in large factories in China and other Asian countries that exported to South Africa (Zalk, 2021).

2.3.2 Current state of the South African C&T industry

As an emerging economy, SA is characterised by increasing consumption, particularly among the expanding middle and higher-income consumer segments (Arunachalam et al., 2020). The growth and employment of the South African C&T sector is contingent upon the increased consumption of newly manufactured apparel. However, Sonnenberg et al. (2022) contended that this would further exacerbate Africa's already elevated textile waste excess. As the fast fashion age characterises current consumption trends, South African C&T companies struggle to compete worldwide. They now face growing competition from global brands like Zara, GAP, and H&M, which are expanding their presence in SA. C&T manufacturers continue to encounter challenges in modernising their production processes and broadening the selection of products manufactured in SA. Many South African C&T companies experience inefficiencies compared to their international counterparts, resulting from a lack of modern equipment and information technology (IT) systems and poor production processes (Barnes & Hartogh, 2018).

The industry experienced a decline in fabric production capabilities, particularly in woven fabrics, as many skilled managers departed, thus causing a lack of innovation at the company level and an inability to manage change (Whitfield & Mkhabela, 2023). Numerous South African C&T companies are experiencing escalated operating expenses due to inadequate infrastructure in industrial areas and electricity and water infrastructure issues (Barnes & Hartogh, 2018).

Morris et al. (2021) argued that, rather than addressing the challenges posed by the changing global economy, C&T companies and trade unions in South Africa reacted to the industry's declining competitiveness by advocating for policies like those from the past era of import substitution industrialisation. Instead of enhancing operational efficiency to tackle competitive pressures, they sought to reintroduce protectionist measures like tariffs and import controls. In 2016, South Africa imported over 54% of its apparel from China, followed by Mauritius (7.5%), Madagascar (6.2%) and Lesotho (6.2%).

In 2019, South Africa imported clothing valued at 35.9 billion rands, with approximately 58% of these imports coming from China. In contrast, locally manufactured clothing generated an estimated R25 billion (Department of Trade Industry and Competition, 2022). The historical legacy of protectionism policies of the South African C&T industry and the lack of innovation resulted in the industry’s inability to keep up with global competitors, which then led to a continuous decline of the industry’s contribution to the country’s GDP from 6% in 2005 to 3% in 2016 and 0.7% in 2021 (Hatzenburg & Mazema, 2023).

2.3.3 Retail Clothing Textile Footwear Leather Master Plan 2030 (R-CTFL) - Master Plan 2030

To tackle these challenges, the South African government introduced the Retail Clothing, Textile, Footwear, and Leather Sectors (R-CTFL) Master Plan, finalized in 2019, aimed at strengthening the industry (Department of Trade Industry and Competition, 2022). This initiative involved collaboration among retailers, manufacturers (in textiles, clothing, and footwear), cotton producers, organised labour, and the government. The Master Plan aimed to create a competitive, sustainable, and dynamic R-CTFL value chain to increase employment to 330,000 jobs by 2030 by boosting local retail sales to 250 billion rands and raising local retail procurement from 45% to 65%, amounting to 66 billion rands (Hatzenburg & Mazema, 2023). Many contend, however, that it has been challenging to coordinate efforts among many parties, including manufacturers, labour unions, retailers, and the government, and to implement rules. Because it has been difficult to match policies with more general national economic policies and government activities, these issues caused conflicts or strategic gaps (Morris et al., 2021).

The literature on the role of the apartheid government in the South African C&T industry is vast. However, there are clear gaps in the literature on how the current democratic government seeks to address the systematic challenges that the industry faces beyond

the Master Plan, such as the influx of cheap imports and improving innovation that can enhance global competitiveness. The industry's uncompetitive nature, characterised by confusing industry regulations and the influx of cheap imports, still requires clear strategic government interventions that address the social and environmental sustainability of the C&T industry (Hatzenburg & Mazema, 2023).

The DIT highlights the difference between the authoritative, collective and optional innovation decision-making options. Many South African C&T companies are currently driven by the optional decision to drive eco-innovation through their company values, which has led to uncoordinated efforts yielding limited results (Zalk, 2021). Government regulations, i.e., the European Union's Green Deal, may ensure authoritative decisions that enforce more wide eco-innovation adoption, as nationally set regulations call for stricter adherence to eco-friendly manufacturing processes (Hatzenburg & Mazema, 2023)

2.4 The environmental impact of the manufacturing process in the C&T industry

Worldwide, the prevailing 'fast fashion' or 'just-in-time delivery' models have driven the industry toward mass industrial production on a global scale, allowing multinational corporations to manufacture in one country and market their products in another (Luo et al., 2021). This strategy enabled the production and sale of affordable clothing that can swiftly respond to fast-changing trends, short life cycles, and quick delivery times. As a result, this model has become one of the most environmentally harmful industries, accounting for 4% to 10% of annual global greenhouse gas emissions (Hatzenburg & Mazema, 2023). Although fabrics are thought to be unlikely to pollute the atmosphere, the manufacturing and finishing processes have exponentially increased greenhouse gas emissions (Haseeb et al., 2020). As a result, when C&T are manufactured, fossil fuels are burnt, which releases direct greenhouse gas emissions into the environment, directly and indirectly contributing to environmental deterioration. The heavy reliance on coal-generated electricity in South Africa has increased harmful emissions throughout the industry's entire value chain. It also generates significant waste during production and at the end of a garment's life, with an estimated 21 billion tonnes of textiles ending up in landfills each year (6%) and accounting for 20% of global wastewater (Morris et al., 2021). Furthermore, many garments are not used for their entire lifespan, and global recycling rates for clothing are low, estimated at only 13%, thus raising doubts about the environmental benefits of the circular economy (Niinimäki et al., 2020).

The current business model in the C&T industry is deemed unsustainable, thus necessitating a major transition toward a low carbon approach that uses fewer resources and has a reduced environmental footprint (K. Bailey et al., 2022). While the circular economy may offer a viable short-term solution for addressing waste and recycling challenges within the sector, implementing a clear and coordinated strategy for resource optimisation from the onset of the manufacturing process may provide a more proactive and systematic way to decrease the industry's environmental impact.

2.4.1 The rise of fast fashion and waste

The term "fast fashion" describes the readily available, low-cost clothing of today. The "fast" aspect highlights how quickly retailers can translate runway designs into store offerings to satisfy the constant demand for a diverse range of styles (Bick et al., 2018). The fast fashion model enables retailers to take advantage of shifts in consumer shopping habits due to the rapid spread of information and trends through digital media. Brands now launch twice as many collections as before the 2000s, marking the onset of fast fashion (Bailey et al., 2022). By maintaining low quality and prices, these brands promote consumer consumption through extensive marketing campaigns encouraging quick disposal of garments (Bick et al., 2018).

The reduction in fashion cycles creates a continual demand for fresh ideas and designs and the ongoing necessity to discard outdated items to make way for new, trendy ones. The United Nations designates the C&T industry as the second most polluting sector worldwide, accounting for approximately 8% of global carbon emissions and 20% of global wastewater (Peters et al., 2021). The C&T industry is said to consume over 93 billion cubic meters of water each year and produces more carbon emissions than international travel and shipping combined (Niinimäki et al., 2020).

The rising global population and the fast fashion trend have significantly increased textile production, causing per capita fibre consumption to triple from 3.7 kg to 10.4 kg per person by 2020 (Bailey et al., 2022). The literature suggests that shifts in consumer behaviour may result in changes in the fast fashion market as individuals reassess their consumption patterns. This could encourage suppliers to adopt more sustainable production methods and responsible marketing practices, leading to stricter regulations regarding waste discharges and solid waste management at municipal and national levels within South Africa, where many manufacturers operate. Future research is needed to highlight the extensive adverse effects of the C&T industry on the

environment, with a particular focus on methods and best practices that reduce carbon emissions and wastewater generation in the industry.

2.4.2 Water, carbon, and chemical footprints

The current manufacturing process for textile products consumes significant natural resources and can lead to serious environmental issues, particularly by depleting resources like water (Janaina et al., 2020). Water, fossil fuels, and chemicals are crucial resources in the textile industry and are used in large quantities. Globally, the sector consumes over 3 trillion gallons of fresh water each year for fabric production (Harsanto et al., 2023). Moreover, approximately one-third of all chemicals released into the environment originate from textile treatment and dyeing processes (Salo et al., 2020).

This research report will focus on the environmental impact of the manufacturing process in the C&T industry, as this stage has the most significant environmental effects, with the manufacturing process consuming large amounts of energy, water, and chemicals (Harsanto et al., 2023). The decentralized and complex structure of the industry requires the integration of a wide range of materials, equipment, technologies, and processes, each with its own specific environmental impacts (Luo et al., 2021). In the C&T industry, water, carbon and chemical footprints are the most frequently used indicators applied to the manufacturing process of products, and these will be the key focal areas of analysis for this paper to deduce the environmental impact of the C&T industry.

2.4.2.1 Water usage

The C&T industry uses significant amounts of water, with an average consumption of 79 billion cubic meters recorded in 2015, and approximately 200 tons of water required to produce 1 ton of textiles (Niinimäki et al., 2020). Most of the industry's water consumption is attributed to cotton cultivation and the wet processes involved in textile manufacturing, such as bleaching, dyeing, printing, and finishing (Silvestre, 2015). Figure 2.2 below illustrates the significant impact of clothing production on water consumption, revealing that the manufacturing of a T-shirt contributes a staggering 88% to the total water footprint associated with its production. Similarly, the production of a pair of jeans is even more resource-intensive, accounting for 92% of the total water footprint. The C&T industry contributes to water scarcity and generates significant water pollution, including effluent that affects both local water supplies and water quality. Improperly treated wastewater can infiltrate local groundwater, leading to the degradation of entire ecosystems, as some of the chemicals used during manufacturing process are toxic

(Hossain & Khan, 2020). This contamination poses serious risks not only to the environment but also to the health of communities relying on these water sources

The C&T industries utilise various synthetic dyes and chemicals, releasing large volumes of highly polluted water into the environment. This wastewater, rich in dyes, significantly impacts the photosynthetic processes of aquatic plants and animals, including fish (Adane et al., 2021). Additionally, it poses risks to human health due to harmful substances such as heavy metals and chlorine found in synthetic dyes (Hossain & Khan, 2020).

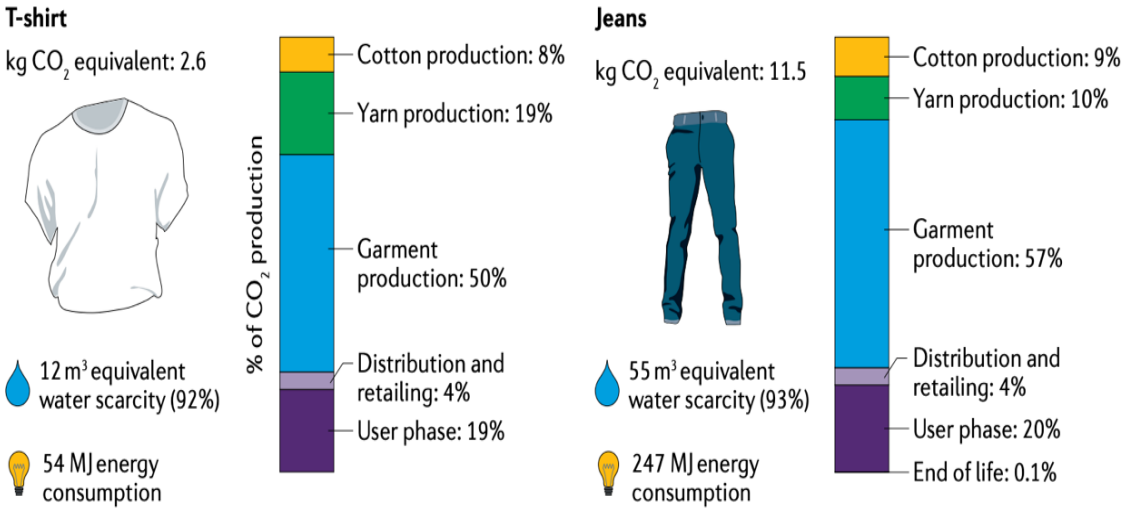

Figure 2.2: The Average Environmental Footprint of the Manufacturing of Common C&T Items

Source: (Niinimäki et al., 2020)

2.4.2.2 Carbon footprint

The carbon footprint (CF) is a metric used to measure the environmental impact of human activities by quantifying the greenhouse gases (GHGs) emitted, expressed in tonnes of carbon dioxide. CF represents the total amount of CO_2 and other GHGs released throughout the entire life cycle of a process or product, typically expressed in grams of CO_2 equivalent (Serweta et al., 2019). Quantis, a leading environmental sustainability consultancy firm, estimated that the C&T industry emitted 4.0 gigatonnes (Gt) of CO_2 equivalent in 2016 or 8.1% of global CO_2 equivalent emissions (Quantis, 2018).

The C&T industry has a significant carbon footprint (CF) primarily due to high energy consumption, which is further influenced by the type of energy sources used. For example, the CF of textiles produced in South Africa is 40% higher than that of textiles made in Turkey, largely because South Africa's industry relies heavily on coal-based

energy (Whitfield & Mkhabela, 2023). This reliance on fossil fuels contributes to greater greenhouse gas emissions, underscoring the importance of transitioning to more sustainable energy sources in the sector. (Niinimäki et al., 2020) From a singular perspective, the literature posits that the C&T industry's GHG emissions must be lowered by reducing production volumes and non-renewable energy consumption and by substituting synthetic materials like polyester with renewable plant-based textiles (Ellen MacArthur Foundation, 2020).

2.4.2.3 Chemical footprint

Until the early 1800s, fabric dyeing was an environmentally friendly procedure using natural textile colours (Gbolarumi et al., 2021). However, the dynamics of the textile industry have altered since mauvine was created in 1856, resulting in synthetic dyes' emergence (Haseeb et al., 2020). The textile industry currently produces and uses 1.3 million tonnes of dyeing and pigmentation annually, most of which are toxic (Mia et al., 2019). When combined with the demand from manufacturers for low-cost synthetic fabrics and materials, the industry's chemical footprint can be said to be worsening environmental degradation.

The textile industry utilizes over 15,000 different chemicals during the manufacturing process, starting from the production of fibres (Niinimäki et al., 2020). This extensive use of chemicals plays a crucial role in various stages of production, including dyeing, finishing, and treatment, but also raises significant environmental and health concerns due to potential toxicity and pollution. (Roos et al., 2019). The precise quantity of chemicals employed in garment manufacturing is contingent upon the type of garment and the supply chain process. The chemicals typically include detergents, salts, emulsifiers, colourants, finishing solvents, and colourants (Muthu, 2020).

In the environment, agrochemicals used in the manufacturing process, can leach into the soil, leading to a decline in soil biodiversity and fertility. This contamination disrupts essential biological processes and adversely affects microorganisms, plants, insects, and animals, ultimately harming the ecosystem's health and resilience (Niinimäki et al., 2020). For instance, the global impact of chemical use in textile manufacturing is exemplified by the incorporation of waterproofing agents, particularly chemically stable fluoropolymers (Haseeb et al., 2020). These compounds, while effective in providing water resistance, can pose significant environmental concerns due to their persistence in the environment and potential to accumulate in living organisms, leading to harmful ecological effects (Roos et al., 2019)

It is clear and widely acknowledged that fashion companies aim to lower production expenses by operating in areas with relaxed environmental regulations, where they do not need to implement pollution control technologies (Muthu, 2020). Accurate quantities of hazardous chemicals used and emitted are impossible to trace due to the length and complexity of the C&T industry processes (Haseeb et al., 2020). This manufacturing strategy causes significant environmental impacts from using chemicals and increases health and environmental risks. The industry's opacity continues to expose new voids in the research and literature that can be further investigated. Additionally, the need for more consumer awareness regarding the chemical effects of certain clothing items on humans and the environment should be more reported, thus reinforcing the need for sustainable marketing of products to consumers.

2.5 Corporate sustainability

2.5.1 Sustainability marketing

Sustainable development can be defined as a form of progress that not only addresses and fulfils the needs and requirements of the current generation but also ensures that future generations will have the resources and opportunities necessary to meet their own needs (Ray & Nayak, 2023). This concept emphasizes the importance of balancing economic, social, and environmental factors, striving for a harmonious relationship between human activities and the natural world (Kemper & Ballantine, 2019). The discourse surrounding the correlation between marketing and the environment has persisted since the 1960s, with marketing, by its ability to stimulate excessive consumption, being regarded as an antithesis of environmental sustainability (Peattie, 2001). The persistent inquiry remains whether marketing, in its present form, can truly be considered sustainable, given its foundation on the impractical concept of perpetual consumption that disregards ecological constraints; simply replacing products with eco-friendly, low carbon alternatives does not address the core issue of limiting the impact of mass production processes on the environment (Kemper & Ballantine, 2019).

Some researchers define sustainable marketing as the decision-making processes and business activities undertaken by local communities and consumers, encompassing aspects like production and sales, their social context and commitment to environmentally friendly ethics (Jung et al., 2020). The challenge of defining sustainability marketing stems from an inherent contradiction within the term itself. In reality, marketing often fuels global overconsumption by promoting products in ways that make them appear highly desirable (Lloveras et al., 2022). This approach encourages

consumers to purchase items they do not actually need, ultimately undermining the principles of sustainability. As a result, while sustainability marketing aims to promote eco-friendly practices and products, it can inadvertently contribute to excessive consumption patterns that are contrary to sustainable development goals (Kemper & Ballantine, 2019).

While there is some discrepancy in the marketing literature concerning the exact definition of sustainability, one group of definitions recognises the limited availability of the Earth's natural resources. It also highlights how marketing, through its consumption-driven practices, has either intentionally or unintentionally encouraged unsustainable production and consumption behaviours (Sheth & Parvatiyar, 2021).

Other researchers emphasise that reducing excessive consumption fuelled by mass marketing campaigns is also a consumer responsibility. Consumer lifestyles influence their awareness and attitudes toward the environment and their responsible consumption patterns (Lubowiecki-Vikuk et al., 2021). By adopting lifestyles prioritising adequacy, voluntary simplicity, sustainable consumption, or other resource-efficient practices, consumers can significantly contribute to developing a "green economy."

As societal interest in sustainability grows, companies adopt sustainability management practices to deepen customer relationships (Sheth & Parvatiyar, 2021). Efforts in sustainability marketing positively impact brand image, boost corporate profits, and support long-term success (Jung et al., 2020). However, while an organisation’s sustainable marketing initiatives are recognised for building a positive brand image and improving customer perceptions, they may not necessarily achieve systemic environmental sustainability goals (Sheth & Parvatiyar, 2021). This suggests that the competitive advantages gained through brand equity may not be fully aligned with meaningful sustainability outcomes.

Other literature focuses on the potential for marketing to contribute to sustainable solutions as businesses seek to position themselves as responsible corporate citizens through various corporate social responsibility initiatives and self-proclaimed environmentally friendly (low carbon) produced products (W. M. Lim, 2016). More recently, an alternative degrowth argument has entered the sustainability marketing conversation. Lloveras et al. (2022) refer to the reductions in material and energy throughput required to ensure social sustainability and equity. The authors further observe that the degrowth transition would logically imply that the specific marketing approach known as "sustainability marketing" would become redundant, like ecological

marketing, which emerged in the 1970s, and green marketing, which flourished between the 1980s and mid-1990s.

The literature contends that marketing has fostered unsustainable production-consumption practices through its traditional 4Ps (product, placement, promotion, and price) and market-driven consumption-oriented practices (Sheth & Parvatiyar, 2021). Consequently, it is essential for sustainability marketing to shift from a reactive stance in response to market and consumer demands to a more proactive and responsible approach, which involves creating sustainable products and services that actively contribute to the development of sustainable societies. (Ghassim & Bogers, 2019).

The DIT highlights the importance of communication channels in driving the rate of innovation adoption. Therefore, mass sustainability marketing through different digital or in-store marketing mediums at the retail level is a straightforward way for C&T manufacturers to showcase the environmental benefits of their products and eco-innovative processes. Sustainable marketing that has strong, open communication networks may accelerate the spread of information about innovations.

Efforts to align marketing theory and practice with sustainable development principles ultimately constitute sustainability marketing. Although sustainability is becoming more widely discussed, most discussions remain managerial (e.g., consumer and organisational practices), with predominant American and European perspectives (McDonagh & Prothero, 2014). While many articles have concentrated on the consumer market, some have also investigated the business-to-business (B2B) sector. This area, along with regulatory frameworks, is critical for initiating sustainability efforts—particularly within the production process. Despite this, there remains limited understanding of the limits and real-world effects of sustainability marketing, as well as its effectiveness in promoting environmental sustainability and addressing the global warming crisis. Achieving environmental sustainability necessitates a multidisciplinary effort involving various stakeholders and players in the C&T industry, extending beyond just marketing.

2.5.2 Corporate social responsibility

Despite many studies on corporate social responsibility (CSR) and sustainability, academic attention remains primarily focused on developed countries. In contrast, CSR has become an increasingly important concern in developing countries like South Africa. Companies are beginning to acknowledge the necessity of complying with policies,

regulations, codes of conduct, and standards, driven by growing pressure from global buyers and partners (Nguyen et al., 2021). Within the framework of globalisation, CSR policies and regulations are continually evolving, shifting from traditional corporate development to a model of sustainable development that prioritises people, the planet, and profits (Thorisdottir & Johannsdottir, 2020).

Despite the growing pressures, businesses in developing countries often engage in CSR primarily on a voluntary and philanthropic basis. Their main motivations typically focus on improving their public image and increasing profits, rather than making a genuine commitment to social well-being and environmental protection (Nguyen et al., 2021). This approach to CSR often manifests as superficial initiatives that serve more as marketing strategies than authentic commitments to sustainability. Such practices can be "greenwashing," where companies present themselves as environmentally friendly while failing to implement meaningful changes (Tien et al., 2020).

The literature shows that this trend undermines the core principles of sustainable development and raises questions about the true impact of CSR efforts on the environment. By prioritising image over substance, businesses risk perpetuating a cycle where the fundamental sustainability goals are neglected, which are the key desired goals (Thorisdottir & Johannsdottir, 2020). Therefore, it is crucial to reformulate the CSR model by shifting the focus toward genuinely promoting and enhancing sustainability issues. This reform should motivate companies to embrace practices that benefit not only their financial performance but also society and the environment. This would promote a more holistic approach to corporate responsibility that aligns with the principles of sustainable development.

2.6 Innovation in the clothing and textile industry

2.6.1 Eco-innovation

It is widely recognised that innovation is a critical approach to addressing sustainable development issues (Silvestre, 2015). Innovation has always been essential for the continued success of a business, as companies are perpetually seeking new and improved methods to remain competitive, increase their profits, and resolve current environmental concerns (Maier et al., 2020). Bucea-Manea-Ţoniş et al., (2021) explained how, in a highly competitive market, innovation is not only a prerequisite for an organisation's success in the business environment but is also a prerequisite for its preservation.

Although there are many definitions and interpretations of eco-innovation, its core objective is to enable significant improvements in the production and consumption lifecycles of products, akin to a circular economy model. While at the same time, it aims to improve business performance and competitiveness (Bick et al., 2018). Eco-innovation achieves this by promoting innovations that reduce environmental harm and enhance resilience to external challenges. It is regarded as a key driver for advancing and implementing sustainable growth (CSIR, 2022).

In a rapidly evolving global context, the C&T industry continuously seeks to address challenges such as sustainability, efficiency, responsiveness to clients' ever-changing needs, product quality, and regulatory compliance in their operating countries (Ghassim & Bogers, 2019). Furthermore, the consumer-driven economy, the industrial ecosystem, and global sustainable business trends pressure sectors to enhance their sustainability efforts and innovation through research and design while remaining agile (Ain et al., 2019). Companies are adopting innovative business intelligence solutions coupled with more refined solutions to satisfy the increasing ESG demands of stakeholders for sustainable and environmentally beneficial C&T products (Ahmad et al., 2020). Kemp and Pearson (2007, p.7) define eco-innovation as “the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution or other negative impacts of resources use (including energy use) compared to relevant alternatives”. Any solution that is more environmentally friendly than "the relevant alternative" qualifies as eco-innovative.

The applicable alternative is a technology implemented within an organisation or the standard technology within a particular industry that effectively mitigates emissions or lowers the CF level (Arilla-Llorente et al., 2024). Hazarika and Zhang (2019) provided an additional four classifications for eco-innovation: (1) Environmental technologies, (2) Organisational innovation with environmental benefits—the implementation of management systems and organisational methods to address environmental concerns in product development and production, (3) Product and service innovation that provides environmental advantages—the development of new or improved environmentally friendly products and services and (4) Green system innovations, which are alternative environmentally friendly production and consumption systems, compared to those currently in use.

A study conducted by (Andabaka et al., 2019) evaluated the significance of eco-innovations by analysing how factors like recycling rates, institutional quality, and GDP growth impact the Eco-innovation Index in European Union (EU) countries. Several authors have researched the correlations that exist between eco-innovations and employment, and moreover, how eco-innovations and enhanced labour productivity influence the implementation of new work structures and programs. (Bucea-Manea-Ţoniş et al., 2021). Divella and Sterlacchini (2021) performed a micro econometric analysis of the factors influencing the ease with which businesses adopt eco-innovations and referred to how organisations progressively prioritise employee health and safety to foster innovation.

The existing theoretical frameworks on eco-innovation fail to sufficiently encompass radical eco-innovations that arise in niches beyond or on the edge of established production systems. The literature overlooks the lack of support for radical eco-innovations that have the potential to yield systematic change in large polluting industries such as the C&T industry. To aid in resolving environmental sustainability issues in the apparel manufacturing sector, one must ask - are C&T companies in South Africa investing in and adopting eco-innovative technologies and operations? Existing scholarly investigations do not adequately address this issue from a South African perspective.

The literature elaborates on the concept that sustainability can serve as an incentive for innovation. Furthermore, the role of innovation in achieving sustainability has attracted considerable interest from both academics and businesses. It was contended that to remain competitive, firms must implement sustainability-oriented adjustments and changes to their current value chain, product/service offerings, and business models (Maier et al., 2020). Hazarika and Zhang (2019) contended that eco-innovations are intended to introduce new technologies rather than modify existing ones. Instead, they have attempted to reduce the amount of something merely. Disruptive/radical eco-innovations are genuine promoters of environmental sustainability (CSIR, 2022).

The textile industry has considerable opportunities to significantly reduce its environmental impact through various avenues of eco-innovation. This encompasses a wide range of strategies, including the development of innovative business models that prioritize sustainability, as well as advancements in product design that focus on reducing material waste and enhancing the longevity of textiles (De Jesus et al., 2019). Additionally, implementing effective pollution control measures is crucial for minimizing harmful emissions and effluents associated with textile production.

Moreover, the adoption of renewable energy sources can play a pivotal role in reducing the carbon footprint of manufacturing processes. By utilizing solar, wind, or other renewable energy options, textile companies can significantly decrease their reliance on fossil fuels (United Nations Environment Programme, 2019). The creation of green products—those made from sustainable materials and designed with environmental considerations—also contributes to a more sustainable textile sector (Hazarika & Zhang, 2019).

In addition to these aspects, the integration of various clean process technologies can help streamline production methods, making them more efficient and less polluting. Innovations in green energy and transportation technologies can further enhance sustainability by reducing emissions related to the distribution of textile goods (Bucea-Manea-Ţoniş et al., 2021). Finally, effective waste reduction and handling techniques are essential for managing the substantial waste generated throughout the textile lifecycle, thereby promoting a more circular economy. Collectively, these eco-innovative strategies can drive the textile industry toward a more sustainable future while maintaining competitiveness in the market (Hazarika & Zhang, 2019).

2.6.2 Circular economy as a way of waste management

The supply chain of the C&T manufacturing industry produces significant amounts of material waste, necessitating immediate action to manage it effectively, minimise environmental damage, and promote sustainable practices (Fan et al., 2019). Addressing material waste management in upstream C&T manufacturing processes, aligns with circular economy principles, aiming to minimize waste and extend material lifecycles through reuse and recycling (Meidl, 2021). This approach supports Sustainable Development Goal (SDG) 12, which promotes sustainable consumption and production patterns. By adopting effective waste management strategies, companies can reduce their environmental impact while contributing to global sustainability efforts. (Khairul Akter et al., 2022).

A circular economy is a constantly evolving eco-innovative system that seeks to minimise energy consumption, conserve natural resources, and significantly reduce waste generation at the manufacturing stage (Fan et al., 2019). This is achieved by creating closed loops in the flows of utilities and materials, which involves several key strategies. First, it emphasises the importance of minimising the input of raw materials into production processes, thereby reducing the demand for new resources (Chen et al., 2021). Second, it advocates for lowering waste output by optimising processes to

enhance efficiency and reduce excess. Finally, a circular economy promotes the reintegration of products into the economic system once they have reached the end of their useful life (Ferasso et al., 2020). This reintegration can take various forms, such as refurbishing, recycling, or repurposing materials, ensuring that they can be used again rather than discarded (Shirvanimoghaddam et al., 2020). Overall, the circular economy aims to create a more sustainable and resilient system that benefits both the environment and society (Jia et al., 2020).

The circular economy as presented in figure 2.3 is believed to have the potential to disrupt the existing linear model of unsustainable production, consumption, and waste generation. It encourages system innovation that eliminates waste, enhances resource efficiency, maintains the use of materials, and separates economic growth from the consumption of finite resources (Meidl, 2021). This approach aims to create a healthier balance among the economy, environment, and society.

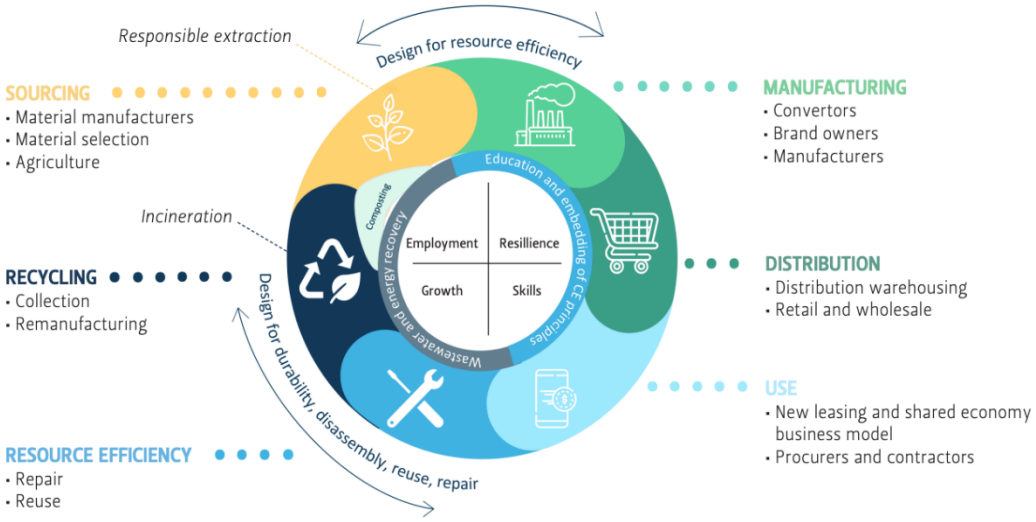

Figure 2.3: Circular economy approach

Source: (Meidl, 2021)

For several years, the C&T industry has been immersed in developing the circular economy (CE); nevertheless, suitable metrics for assessing eco-innovations within the CE remain unestablished (Arilla-Llorente et al., 2024). Regulatory pressures have prompted C&T manufacturers to increase their investments in green technologies designed to reduce emissions and collect products for recycling as raw materials after they have reached the end of their useful lives. Given the interdependence between eco-

innovation processes and the circular economy, it is critical to conduct a comparative analysis of the transition levels to CE, including eco-innovations. Ferasso et al., (2020) and (Kirchherr et al., 2017) showed that the mix of reduce, reuse, and recycle actions is how the CE is usually portrayed, with the need for a systemic change being overlooked.

(Gbolarumi & Olchunde, 2021) suggested that the concept of circularity is steadily becoming more accepted as an eco-innovation recognised as a vital element in transitioning the production and consumption of textiles from a linear model to a CE. Many researchers have praised the CE as a potential solution to the systemic resource issues facing the C&T industry. However, current research has not sufficiently addressed how the CE places most of the environmental sustainability burden on the end user (the customer). This raises the question of whether the CE can be considered an eco-innovation that addresses the industry's resource and environmental challenges.

The DIT suggests that the characteristics of social systems and the degree of interconnectedness within the value chain of South Africa's C&T industry could enhance the effectiveness of the CE as an innovative approach. Social norms and values that emphasise sustainable waste management practices may also contribute to a higher rate of innovation adoption. Additionally, industry leaders can influence smaller industry players in the C&T sector by promoting CE practices. A strong level of social interconnectedness, where manufacturers and society are influenced by the actions of their peers and industry colleagues, could enhance both the quality and quantity of CE method adoption at the micro level.

As previously mentioned, the manufacturing processes for producing a final garment account for most of the industry's resource consumption, and therefore, clear, eco-innovative, and environmentally friendly processes should be implemented at this critical stage. C&T manufacturers are responsible for prioritising environmental sustainability from the beginning of the manufacturing process while ensuring that their post-sale marketing campaigns promote a full life cycle approach to garments. This initiative will reduce landfill waste generated by the industry and limit the environmental pitfalls realised during the era of fast fashion. De Jesus et al. (2019) suggested that further research focusing on the consumer perspective could reveal ways to boost customers' participation in the CE. Future studies on CE should be based on a well-defined conceptual framework. to support the accumulation of knowledge, particularly regarding consumers. This re-emphasises the importance of sustainable marketing in addressing the knowledge gaps related to CE that drive environmentally sustainable production and consumption behaviour.

In summary, chapter 2 highlights that there is substantial literature addressing the environmental challenges faced by the C&T industry. The ongoing heavy reliance on resources like water, chemicals, and electricity remains the primary strategy for C&T manufacturers. South African C&T companies are not immune to these issues, and the historical context shows that they recognize the necessity of transitioning to cleaner manufacturing processes that conserve resources and minimize waste. The literature also emphasizes the important need for companies to foster a culture of continuous innovation to thrive in a globally competitive market.

Through the use of the DIT, chapter 2 identifies the important variables required for any innovation to succeed in society, and this was applied to eco-innovation adoption in South Africa. Different channels in which C&T companies communicate their eco-friendly image such as CSR, circular economy models and sustainability marketing were discussed and analysed to determine their real contribution to the discourse on environmental sustainability.

CHAPTER 3: RESEARCH QUESTIONS

3.1 Introduction

The primary research question seeks to understand what role eco-innovation plays in manufacturing and how the marketing of environmentally sustainable C&T affects the clothing and textiles industry within South Africa. The primary question is derived from Broadstock et al. (2020), who strove to comprehend the role of a company's environmental performance and long-term profitability.

(Broadstock et al., 2020) explained how companies are expected to compete financially and improve their capacity to foster innovation, which are high strategic priorities that ensure longevity and competitive advantage in their respective industries. Through these secondary research questions (SRQ), this research report will seek to explore the current landscape of eco-innovation in South Africa's C&T industry, understand what value-added benefit eco-innovation offers in the manufacturing and marketing process of eco-friendly product offerings, and how government policies and regulations may improve the adoption of eco-innovation in the C&T industry.

SRQ - 1: What are the current eco-innovative manufacturing processes that South African based C&T companies are using?

This secondary research question seeks to understand the dominant eco-innovative manufacturing processes that South African C&T companies are utilising and how these have been implemented over the years. In exploring this question, this research report seeks to understand if these C&T companies are adopting similar eco-innovation while improving the rate of sustainable cleaner manufacturing processes.

SRQ - 2: What benefits, if any, have C&T companies realised through eco-innovation?

This research question explores the economic and environmental benefits that C&T firms are experiencing from transitioning to eco-innovation. How are companies looking to harness the value derived from eco-innovative manufacturing processes? This SRQ also seeks to identify how C&T companies in South Africa monitor their environmental footprint to assist in making data-driven decisions to transition to eco-innovation. Is this a purely organisational culture-driven approach or are there externally driven factors that warrant the transition?

SRQ - 3: How are C&T companies marketing the sustainability benefits of their eco-innovative products?

The DIT tells us how marketing through mass media as a communication channel may affect the rate of eco-innovation. This SRQ was designed to explore how South African C&T companies' market sustainably manufactured clothing and textile. Through this SRQ this research report seeks to identify the reasons behind their CSR, marketing strategies and brand campaigns, while also looking at the different channels used in their marketing of sustainable apparel.

SRQ - 4: What can the South African government do to foster eco-innovation adoption in the C&T industry?

This SRQ seeks to explore the critical role the government can to play in encouraging the rate of eco-innovation adoption to ensure the competitive advantage of the industry. This question explores the gaps in regulations and some bureaucratic challenges the C&T industry faces when adopting eco-innovative manufacturing, and what type of government mechanisms can be put in place to assist C&T companies.

In summary these aforementioned SRQs are important in assisting to answer the main research question of the role of eco-innovation in manufacturing and marketing. These SRQ have clear intentional purposes to help find detailed insights on the successes, gaps and possible opportunities for eco-innovation. This research report will structure its findings and data analysis in line with these SRQ's as a means to refine the DIT in relation to the South African context.

CHAPTER 4: PROPOSED RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

Chapter 4 of this research report sought to showcase the importance of using sound research methods to collect, manage, store and analyse data. This chapter also provided the rationale behind the selected qualitative research methodology. The use of the interpretivist philosophy and ontological assumptions was discussed, as well as the use of semi-structured interviews as a research instrument. This research report employed an exploratory lens to build on the DIT.

4.2 Research design

4.2.1 Research philosophy

Research philosophy refers to the systems and assumptions used to acquire and develop knowledge. The interpretivist paradigm is predicated on the notion that individuals' cognition, thoughts, perceptions, and meaningful interpretations can be understood by investigating their respective cultures. Consequently, the approaches employed to comprehend the human and social sciences are incomparable to those used in the physical sciences (Chowdhury, 2014). Therefore, to better understand people’s behaviours and beliefs, one needs to understand the context, as realities are multi-layered and subjective to people’s lived experiences (Rubin & Babbie, 2017).

Diverse members of society perceive and comprehend the same "reality" in many ways, and their motivations for doing so vary. In contrast to positivism, which seeks to identify universals through data analysis, interpretivism emphasises the significance of comprehending a specific context to interpret the collected data (Alharahsheh & Pius, 2020).

Interpretivism research endeavours to generate novel and deeper interpretations of the social world and its contexts (Saunders et al., 2023). This entails examining organisations from the viewpoint of various individual groupings. The interpretivist philosophy is used to understand how eco-innovation has impacted South African-based C&T companies market their products. This approach will identify which factors drive corporate decisions and how they may differ from business to business based on their nuanced circumstances, context, product demands and customer base. The rationale for an interpretivist study seeks to indicate how various factors influence marketing, thus allowed this research report to build on and refine the insights into the role of eco-innovation and marketing.

4.2.2 Research assumption

The SAGE Online Dictionary of Social Research Methods (2006) defines ontology as a concept that addresses the existence of various elements within society, including social actors, cultural norms, and structures. Ontological issues involve inquiries about the types of entities that exist in society and the relationships among them. According to the SAGE Online Dictionary of Social Research Methods (2006), ontology is the concept that pertains to the presence and interconnection of various societal components, such as social actors, cultural conventions, and social structures. Ontological concerns are centred on inquiries concerning the nature of entities that are currently present in society. Snape and Spencer (2003, p. 67) defined ontology as "what we know about the nature of the world."

This research report used the ontological philosophical lens to better understand the assumptions before data collection (Saunders et al., 2023). It aims was to explore and understand the nature of reality, which influences business operational decisions (Snape & Spencer, 2003), such as how to use eco-innovative production methods and how these are marketed among C&T brands in South Africa. From an ontological standpoint, introducing eco-innovation can be subjective and is open to interpretation as external and internal operational, social and environmental factors change (i.e., location, ESG goals, stakeholder demands and government legislation), influencing a company’s operational decisions.

The need for businesses to address environmental sustainability issues in their respective industries re-emphasises the importance of context, as climate change matters currently affect many businesses. This research report adopted an inductive approach to the Rodgers diffusion of innovation theory (DIT) by observing eco-innovation's role in driving the marketing of South African clothing brands. The report endeavoured to contribute to the present comprehension of these two constructs by explicitly and practically employing the DIT theory and formulating theoretical assumptions.

4.2.3 Purpose of the research design

The purpose of this research report was exploratory, as it sought to gain new insights into the influence of carbon-neutral practices by the C&T industry on sustainability marketing. This area of research was still deemed as being in its intermediate phase.

Therefore, allowing the research report to contribute to the academic discourse on environmentally sustainable consumption and production practices in emerging markets.

4.2.4 Research strategy

The research strategy collected and analysed research data, by way of qualitative methods (Snape & Spencer, 2003). This report will used qualitative research to better understand the complex issue of sustainable production patterns in emerging markets. The paper used key South African-based C&T manufacturing companies already employing eco-innovative practices, to collect and analyse data. The research report used primary data, which will be collected via semi-structured interviews.

4.2.5 Method choice

The research report used a qualitative data approach. Primary data was gathered through in-depth semi-structured interviews with senior marketing and manufacturing employees of C&T companies, and other industry experts who operated in either C&T associations. The primary data collecting method was semi-structured interviews, which formed the raw data element of the research report. The rationale for this approach was to ascertain from the C&T companies, and industry experts, what eco-innovative initiatives were currently being used, how they are being marketed to their customers, and what value the company had derived from such green innovations.

4.2.6 Time horizon

The term "time horizon" indicates the study's duration, including data collection. It is essential to establish a research study's scope and essence (Snape & Spencer, 2003). The time horizon can be defined as either cross-sectional, which provides a static snapshot of current events conducted over a short period, or longitudinal investigation, which is conducted over an extended period. Longitudinal research entails the repetitive observation or measurement of the same subjects to monitor their changes and progressions over time (Rubin & Babbie, 2017). The research report adopted a cross-sectional time horizon to understand eco-innovation's role in how apparel is marketed in South Africa’s C&T industry. Cross-sectional research captured the current state of specific eco-innovations that C&T companies have employed and how their respective marketing strategies have evolved to include their products’ sustainability claims. This is because the benefits of introducing alternative eco-innovative solutions may take time, and this research report sought to understand the phenomenon fully.

4.3 Research method

4.3.1 Population

The population refers to the entire group a researcher wants to conclude about while allowing generalisations that apply to this group (Thacker, 2020). Due to this research report exploring the role of eco-innovative manufacturing and marketing within the South African clothing and textile industry, the population under review was C&T companies operating within South Africa.

4.3.2 Unit of analysis

The primary entity being analysed in a study is referred to as the unit of analysis, a fundamental concept in research methodology (Saunders et al., 2023). It is the smallest unit that can be used to identify and describe a phenomenon; it represents “what” or “who” the researcher intends to study and is considered the focus of the study (Rubin & Babbie, 2017). The unit analysis for this research report were C&T companies in South Africa that already make use eco-innovative manufacturing practices and are marketing the sustainability elements of their products. As a unit of analysis, these companies were explored using data acquisition and analysis from information and insights gathered from semi structured interviews.

4.3.3 Sampling

Sampling involves collecting a subset of the study’s target population (Saunders et al., 2023). It is particularly useful when the research population is too large to study comprehensively. Sampling also helps researchers manage time and money constraints while allowing for a more focused approach to research design and strategy, leading to more effective data collection and analysis (Onwuegbuzie & Leech, 2007). Typically, when conducting a study, the sample size should not be too small to compromise credibility nor too large to compromise depth and breadth. The adequacy of the sample size, which is inherently subjective and necessitates corroborating documentation in the report, is the most critical criterion (Czernek-Marszałek & McCabe, 2024)

There are two main sampling techniques: probability sampling and non-probability sampling. Probability sampling is employed in statistical research, allowing for statistical inferences and explanations that facilitate broad generalizations (Taherdoost, 2020). Non-probability sampling is more suitable for inductive theory research as it contributes insights and understanding of a phenomenon (Saunders et al., 2023). This research

report used purposive sampling, which is a non-probability sampling technique (Onwuegbuzie & Leech, 2007), as a way to select a homogenous target sample, consisting of C&T companies of similar size and nature, such as those in the denim or general clothing and textile subsectors.

For this research report, semi-structured interviews were conducted with senior manufacturing/operation managers, marketing managers, and other industry experts in C&T companies, who provided insights into industry or company specific eco-innovation processes. This specific selection ensured that the rich data and insights could be derived from the participants actively making strategic manufacturing and marketing decisions. These participants were able to give insights on innovative low carbon practices used, why they are used and how their benefits were being marketed to customers. This sample was accessed using requests for personal meetings or professional network referrals. The sample selection criteria targeted senior staff members within the marketing and manufacturing departments of C&T companies, who make decisions on processes and introducing new technology into their respective companies, or have 5 or more years of experience in the C&T industry.

- Industry level: South African companies have produced C&Ts for the past 10+ years.
- Organisational level: companies that have moved to using eco-innovation in their manufacturing processes and are marketing them.
- Decision-making level: key participants who play a role in deciding which green innovation the company should introduce and play a part in leading and designing the marketing strategies for the company’s products.
- Experience level: Participants who have witnessed the company's transition to green technology and craft and implement marketing campaigns for green apparel.

4.3.4 Data gathering

Data gathering, also known as data collection, refers to the systematic acquisition of information and insights that are pertinent to the objectives of a study (Saunders et al., 2023). In qualitative research, data collection means obtaining comprehensive and contextualised information regarding individuals' experiences, behaviours, and interactions (Mouton, 2003). This is essential for comprehending the nuances and intricacies of social processes. Qualitative research historically employed interviews as a data collection method because it emphasises exploration and inquiry into human

phenomena (Halcomb & Davidson, 2006). This research report used 12 semi-structured interviews, each with a 45-60 min duration for the primary data gathering process.

These interviews were conducted with selected participants based on the criteria in section 4.3.3. They included senior decision-making leaders in companies that use eco-innovation manufacturing processes, and other industry subject matter experts. These research participants were accessed through existing networks, referrals, and LinkedIn email outreach. Before the start of the interviewing process, each participant received a consent letter detailing the nature of the study, the duration of the interview, the purpose thereof, and the consent to be recorded without any identifiers. Participants were also assured of confidentiality. An online video calling recording facility was used to collect data from remote respondents participating in the interview, i.e., Zoom, Teams or Google Meets. The recordings ensured for the accurate capturing of information, while also allowing the interviewer to be engaged in the conversation and to probe if and where it is required. For face-to-face interviews, a handheld recorder was used, as well as brief note-taking. The observation data collection process required systematic field viewing and recording (where permissible) of the participants and operational activities in the C&T manufacturing process.

4.3.5 Data analysis

Data analysis involves reviewing results to uncover relationships between ideas, constructs, or variables in order to identify patterns, trends, or themes within the data (Saunders et al., 2023). The goal of thematic analysis is to thoroughly examine the recorded transcripts and find reoccurring ideas or new themes in the data (Baxter et al., 2010). To classify content into themes and subthemes, researchers systematically code portions of observed behaviour or transcripts of interviews. Today, qualitative data analysis (QDA) software enables users to organise and analyse qualitative data by allowing for the flexible storage, retrieval, and cross-referencing of electronic audio recordings (Deterding & Waters, 2021), from which audio recordings were transcribed. The research report used systematic data analysis by way of analysing 4 separate SRQ's.

4.3.5.1 Transcription

The methodological transcription of the conversation into text is a component of all research that observes the conduct of interviews to facilitate the analysis process. (Nascimento & Steinbruch, 2019). Transcribing is the initial stage in data analysis,

presenting audible and observed data in written form. This interpretive process requires making judgements after continuously reading and re-reading the data (Bailey, 2008)

To accurately analyse the data collected during the interview process, the transcribing process began by transcribing the recorded audio into text transcripts. Thereafter the transcripts were organised into clearly defined data sets derived from company-specific participants and any initial identifiable themes that arise (Halcomb & Davidson, 2006). This research report made use of the Otter software to transcribe audio interviews into the written transcripts that were later used in Atlas.ti for coding into themes and subthemes.

4.3.5.2 Coding

Coding in-depth semi-structured interview data is crucial for ensuring reliability. This involves clearly defining codes and making them mutually exclusive, which helps maintain the integrity of the data during analysis (Campbell et al., 2013). This research report compared the transcribed data across all companies identified in the sample. During the first open coding process, the study examined broad, recurring identifiable patterns, similarities, and contrasts within the transcribed data and labelled them with codes. Open coding is advantageous for familiarising oneself with the data, identifying new insights, and formulating initial hypotheses (Deterding & Waters, 2021).

In the axial coding process, these codes were grouped into similar themes or categories of information. The objective of axial coding is to establish a more comprehensive and coherent framework for the data and identify the core category that is indicative of the primary theme or phenomenon of the study. Axial coding helps organise data, refine categories, and establish connections between various themes (Basit, 2003). After that, during the final selective coding process, the codes were and consolidated into initially identified themes, then into the most relevant or recurring patterns that addressed the research question. Selective coding is advantageous for synthesising data, verifying the theory, and discussing the results (Basit, 2003).

Through the use of Atlas.ti, this research report was able to generate over 100 codes relating to the responses the participants gave, then created sub themes and main themes under each of the SRQ's.

4.3.5.3 Thematic analysis

Thematic analysis generates themes from texts, such as interviews or focus group transcripts. This method helps to interpret large amounts of data, allowing for the identification of responses relevant to a research study (Saunders et al., 2023). From an

interpretivist philosophical basis, this research report identified key thematic areas which related to eco-innovation in the C&T industry in South Africa, in line with the responses from the interview participants' operational context and industry knowledge. Thus, while using an inductive approach to Rogers's theory of DIT, the key identified themes had to address the key variables that affect the rate of eco-innovation adoption in the C&T industry. There were clearly identifiable themes that emanated and further analysed in contrasts and comparison to existing literature on eco-innovation.

4.3.6 Quality controls and ethics

Ethical clearance was obtained from the Gordon Institute of Business Science (GIBS) Ethical Clearance Committee before the commencement of data collection. An ethical review guarantees that study protocols follow moral precepts and directives and safeguard participants' rights and well-being (Saunders et al., 2023). In qualitative research, data quality controls are the systematic protocols and measures that are implemented to ensure the accuracy, credibility, consistency, and validity of the data (Mouton, 2003). These controls are essential for ensuring the reliability of the findings and the integrity of the research (Saunders et al., 2023).

For this research report, the following quality controls were used:

- A consent letter was provided to the participants to ensure they comprehend the study's objectives and rights by obtaining informed consent before the interview. The consent letter also included the researcher's contact details.
- Interview protocol was used to ensure consistency across different interviews through a script guide.
- The researcher ensured that company confidentiality was maintained at all times, and the confidentiality of participants as per their request and agreed consent.
- Stored recorded interviews and transcripts were stored on a cloud-based application to ensure data validity and reference.
- A methodical audit trail was used to record each phase of the research process, including data acquisition, analysis, and decision-making. To preserve consistency and integrity in the data, the researcher made use of clear methodical procedures for data management, coding, and analysis that produces clear sets of subthemes and main themes that answered the respective SRQ's.
- Data from the interviews was collected until there was no new information or themes discovered.

4.3.7 Limitations

This research must maintain the highest professional honesty and openness standards throughout the process. This means truthfully expressing the research's objectives, procedures, conclusions, and constraints in media such as publications and presentations.

In qualitative research, researcher bias is the potential distortion of the data and findings due to the researcher's personal beliefs, experiences, and values (Saunders et al., 2023). Although qualitative research is inherently subjective, it is essential to comprehend and mitigate researcher bias to preserve the research's integrity and credibility. Additionally, any conflicts of interest or biased sources must be disclosed.

CHAPTER 5: FINDINGS OF THE STUDY

5.1 Introduction

This research report sought to explore the role of eco-innovative manufacturing processes within South African based C&T companies. It investigated how these 'green' processes and their environmental benefits were incorporated into marketing campaigns and the benefits thereof. To address these focal areas, this study was guided by the following research questions:

SRQ-1: What are the current eco-innovative manufacturing processes that South African based C&T companies are using?

SRQ-2: What benefits, if any, have C&T companies realised using eco-innovation?

SRQ-3: Why and how are C&T companies marketing their eco-innovative apparel?

SRQ-4: What can the South African government do to foster eco-innovation in the industry?

This chapter presents the study's findings, starting with an overview of the sample, including the empirical data's adequacy and relevance. Theme-based findings guided by research questions follow this trend.

5.2 Overview of the sample

5.2.1 Relevance of the sample

Table 5.1 below summarises the participants' roles, experience, locations and the industrial segments they serve. It emphasises the variety of professional experiences, geography, and particular C&T sectors, providing a good balance of perspectives on eco-innovation in the industry. The participants encompassed a variety of professionals in South Africa's C&T industry who have a broad scope of experience in terms of roles, locations, and segments. The participants came from various roles, including accessories designer, marketing and PR, head of manufacturing, executive director, project manager, sustainability manager, and operations manager. They were based in different provinces in South Africa, such as Cape Town in the Western Cape, Johannesburg in Gauteng, East London in the Eastern Cape and Hammarsdale in Kwa-Zulu Natal. This selection paves the way for understanding the sustainability and eco-

innovative practices in C&T manufacturing. They are in authoritative positions and have considerable working experience ranging from five to 35 years. The main keywords in this data were waste, sustainability, manufacturing, product, and eco (friendly). These were all central to investigating the role of eco-innovative manufacturing processes.

Table 5.1: Profile of Participants in South Africa's C&T Industry Study

Participant ID	Current Role	Years of Experience	Location	Industry
RPT 1	Maxhosa – Accessories Designer	5 years	JHB	Clothing and accessories manufacturing
RPT 2	Maxhosa – Marketing and PR	5 years	JHB	Clothing and accessories manufacturing
RPT 3	Owner – Franc Ellis factory and design	15 years	JHB	Clothing design and manufacturing
RPT 4	Da Gamma - Head of Manufacturing	30+ years	East London	Textile manufacturing
RPT 5	Executive Director – National Clothing Retail Federation	23 years	Cape Town	Clothing manufacturing and retail
RPT 6	Project Manager - National Cleaner Production Centre	20+ years	Cape Town	Production oversight
RPT 7	Head of Manufacturing – K-Way Group	35+ years	Cape Town	Clothing manufacturing
RPT 8	Head of Manufacturing & Operations – (Hemporium)	18 years	Cape Town	Hemp product manufacturing
RPT 9	Managing Director - Sven Mill Textiles	22 years	Cape Town	Textile Manufacturing
RPT 10	TFG – Sustainability Manager	11 years	Cape Town	Clothing manufacturing and retail

Participant ID	Current Role	Years of Experience	Location	Industry
RPT 11	TFG – Operations Manager	5 years	Cape Town	Clothing manufacturing and retail
RPT 12	Glodina & Colibri	30+ years	Hammarsdale	Textile Manufacturing

5.2.2 Adequacy of the sample

This empirical data was obtained from 11 interviews with 12 research participants (RPTs), a typical sample size for semi-structured interviews based on narrative design, especially in a homogenous sample, which in this study was based on South African based C&Ts. This met the recommendations of Hennink and Kaiser, (2022) of 9–17 interviews, which posited that this is usually adequate to reach saturation point.

5.3 Eco-innovative manufacturing practices in South African C&T companies

Research SQ-1: What are the current eco-innovative manufacturing processes that South African based C&T companies are using?

This research question aimed to uncover the timeline and milestones of eco-friendly innovations, the driving factors behind eco-innovative practices, and the specific types of eco-innovations. Additionally, it sought to compare today's eco-innovative processes to the old-school manufacturing methods previously adopted in these practices, providing a comprehensive view of eco-innovation integration.

Table 5.2: Timeline and Milestones of Eco-Friendly Innovations

Codes	Theme
• 2017 • 2010 • 3 years ago • 7 years ago	Timeline and Milestones of Eco-innovative Initiatives

5.3.1 Timeline and milestones of eco-innovative initiatives

The history of introducing eco-innovative manufacturing processes in the C&T industries clearly outlines the chronology of levels of concern and adoption. This includes developments in the respective industries and the broader environmental changes that informed these practices in the past. As one of the participants mentioned, the

development dates back to specific events, rough changes in detail or initiatives. It refers to changes in materials and the energy source that was used:

> *We started with innovation to reduce our emissions, and that was changing our coal-fired boilers to a biomass boiler. [RPT7]*

This change showed a shift away from coal, which occurred alongside transitions in practices across industries. Some participants mentioned recycling of materials, which had gradually been incorporated into the industry since 2010, with one industry leader saying:

> *We started really kind of being aware of, let's call it, trying to be more eco-friendly – It was probably in around about 2010. [RPT5]*

The gradual shift toward eco-innovation coincided with individual awareness among industry leaders, where personal conviction catalysed broader organisational changes. One participant said:

> *I started becoming very aware of it about seven years ago, and when I started expanding, I started thinking of ways of making my production line more, and use less energy and be more sustainable, be more eco-friendly. [RPT6].*

With this insight, we see how individual awareness within leadership can drive eco-friendly transitions as decision-makers prioritise sustainability within their operational strategies. Waste management initiatives emerged as part of broader sustainability efforts. One participant stated that a new inter-waste site had been started recently, which was designed to be used for construction, installation of newer equipment, and to facilitate textile waste handling:

> *The inter-waste site has been operational now for about three years. [RPT4]*

The zero waste goals approach taken by some organisations is an essential aspect of eco-innovation, which, in this context, means that production waste should be reduced as much as possible and that recycling should be increased as a business practice. Interestingly, another participant pointed to an early awareness of sustainability in 2017 among students who had begun experimenting with textiles and fabric printing:

> *I do not know when that started; I can tell you where maybe it started…This was probably 2017, the last time I remember, and this was when I think students started using textiles and they started printing fabric. [RPT1]*

This insight suggests that the shift toward eco-innovative practices often emerges from academic and creative spaces within established companies.

5.3.2 Driving factors behind eco-innovation creative spaces

The textile and clothing industries' shift toward eco-innovation arose for various motivations, focusing on environmental, consumer, and business-oriented demands. This transition is rooted in ethical responsibility, market pressures, and internal business values, thus pushing companies toward green transformation.

Table 5.3: Driving Factors Behind Eco-Innovative Practices

Codes	Subthemes	Theme
• Ethical reasons • Commitment to sustainability and business excellence	Ethical and Social Responsibility	Driving Factors Behind Eco-Innovation
• Market demands and customer expectations • Facilitating EU export	Market-Driven Demand	
• Commitment to sustainability practices • Commitment to eco-friendly manufacturing practices	Corporate Sustainability	
• Environmental waste concerns • Minimalism	Environmental Responsibility	

5.3.2.1 Ethical and social responsibility

Often, eco-innovation in the industry stems from ethical and social responsibility when companies want to reduce the environmental effects of some materials. Many of the participants' concerns were about the ethical usage of materials such as leather and fur, which were, in any case, considered to be damaging to the environment and animals' welfare.

One participant said:

> *We are talking about leather and fur; it's also endangered, and animals are killing them as much as we can just to produce luxury fibres. So that became a hoax now in fashion, and people are saying 'no, but we are doing too much*

harm here; we don't need to be killing as much just for our own luxury purposes. [RPT1].

This statement represents a sociological paradigm shift within the fashion industry that has begun to emerge, whereby products and services marketed to consumers across the globe that are considered 'luxury' are fast becoming scrutinised for their environmental and social impact.

5.3.2.2 Market-driven demand

Increased consumer concern for green issues has turned the market and its consumers into crucial influencers of territory for eco-innovation. Notably, major retail customers possess such relevance that they often impose sustainability requirements that the manufacturers must fulfil to continue maintaining partnerships.

One participant emphasised that this was an area the industry needed to work on:

First of all, and probably the most important, I believe it is an environmental meaning … A lot of big retailers do have a real big sense of responsibility with regard to their products about environmental responsibility. [RPT3]

Furthermore, eco-innovation can benefit organisations looking to expand their operations in international markets, especially in the EU, where environmental regulations are very stringent. For some companies, integrating sound environmental practices effectively meets regulative requirements and improves a country's ability to export.

One participant noted:

The idea was to look at exporting to the project's main purpose was to see whether we could get three companies that participated in exporting to the EU. [RPT2]

This view portrays that eco-innovation is a way of meeting compliance requirements, which offers a competitive edge for businesses seeking to penetrate markets requiring extensive sustainability.

5.3.2.3 Corporate sustainability

Many companies consider eco-innovative practices a business strategy offering an internationalisation policy that promotes corporate sustainability and responds to increasing demand for environmental change. Mission-driven practices are often linked

with corporate image and CSR. One participant claimed that they took their social accountability towards environmental matters seriously:

> *We just felt an urgency to do a better job, and we wanted not only a sustainable planet but also a sustainable business in that. [RPT11]*

For some organisations, these principles are ingrained within their DNA, such that globalisation and green values are part of their identity, with sustainability being a core area of their operations. One of the participants remarked:

> *I'd love to say, well, the manufacturing process in terms of hours, from inception. As a brand, I think we have been fully aware of our footprint. [RPT9]*

This insight shows that the early adoption of sustainability led to understanding of how defining structures and values would support green transformation.

5.3.2.4 Environmental responsibility

While many brands appreciate the environmental impacts of waste and the benefits of using less material, environmental responsibility has been another critical factor for eco-innovation diffusion. Minimalist design has been observed to go in hand with sustainable practices, as less use of materials reduces the environmental impact of production.

To quote one participant:

> *After this period came the period of minimalism, where people wanted to design while using less aesthetic and less material, and then with that period of minimalism came the period of sustainability, which is the current period where we are. [RPT6]*

This minimalistic design philosophy can be understood as a life cycle perspective and an approach to effective waste management that reinforces manufacturing efforts that seek to minimise the creation of unnecessary waste.

5.3.3 Specific types of eco-innovations in manufacturing

Table 5.4 below presents specific types of eco-innovations in manufacturing, including reduction of waste and pollution control through repurposing, water savings for resource optimisation, designing for reuse, and transparency striving to use post-consumer waste in production design.

Table 5.4: Specific Types of Eco-Innovations in Manufacturing

Codes	Subthemes	Theme
• Waste reduction and repurposing	Reduction and waste and pollution control	Specific types of Eco-innovations in manufacturing
• Resource optimisation	Water Saving and Pollution Reduction	
• Sustainable material sourcing • Certified organic fabric sourcing and local manufacturing	Sustainable Material Sourcing	
• Use of post-consumer waste in product design	Designing for reuse and transparency	

5.3.3.1 Reduction of waste

The study of waste management and prevention emphasises eco-innovative efforts to reduce production processes to zero waste levels. As one of the participants put it:

> *The biggest change … in the manufacturing process was to really have a look at waste management. So, we could boast, as a company, that we have zero wastages. I mean, when I say it's minimal, it's maybe. I think we were looking at 0.2 percent or something, and it's really minimal. [RPT10]*

This zero waste policy points towards the extraordinary resourcefulness and optimal use of materials. Companies are looking at how to limit their waste output and, where possible, ways to repurpose it into other end products.

5.3.3.2 Water saving and pollution control

Measurable success has also been recorded in eco-innovation, where water conservation is a significant concern, particularly with textile companies that require large quantities of water and produce substantial amounts of effluent. It was sought through greater adoption of machines that use less water and produce little dirty water as waste. As one participant noted:

> *For example, older machines … would use 40% more water compared to the machines currently there. And that is quite significant … for every litre of water you use, 90% of it goes into waste. [RPT3]*

> *There is a reduction towards the generation of more effluent that has to be treated- and that went for every piece of equipment bought. [RPT3]*

This change signifies better resource utilisation and decreases wastewater's adverse impact. When water saving technologies are adopted, companies promote the preservation of the environment and reduce water treatment costs. Companies that adopt eco-innovative processes which save water are also more compliant with municipal waste management by-laws.

5.3.3.3 Sustainable material sourcing

Companies should focus on sustainable material sourcing, which, in turn, contributes to eco-innovation as it helps prevent the mixing of fibres that are unsuitable for recycling, as one participant stated:

> *We've tried not to create dead ends for products by mixing fibres that are not similar and don't have the same sustainability issues. [RPT11]*

This technique allows end users to dismantle and recycle or upcycle materials, in this case, increasing the lifespan of products. Another participant also mentioned the importance of locally manufactured, organically certified fabrics that promote ecological sustainability.

> *We obviously select organically certified fabric, but we obviously import that and manufacture locally. [RPT10]*

5.3.3.4 Designing for reuse and transparency

Sustainable manufacturing also places much focus on the reuse of products and the transparency of sourcing and assembly. As one participant pointed out:

> *We've actually been focusing a lot on… design or re-usage and... There is a process of redefining some of these garments that are being designed and … the materials … also looking upstream and downstream in respect of the chain of custody." [RPT4]*

This strategy emphasises eco-design and chain of custody in holistic project management, stressing that sustainable practice is not limited to the production phase but to any stage of a product's lifetime.

The waste management and minimisation analysis highlights eco-innovative practices for zero waste production. As one participant noted:

> *The biggest change… in the manufacturing process was to really have a look at waste management. So, we pride ourselves on being a zero waste company. So, we have totally no textile landfill. The amount … I mean, when I*

say it's minimal, it's maybe. I think we were looking at 0.2 percent or something, and it's really minimal. [RPT10]

This commitment to zero waste demonstrates a dedication to repurposing materials and minimising the ecological footprint, especially in industries like textiles. Eco-innovations, including water saving methods, sustainable material sourcing, waste reduction, and product life cycle modifications, collectively lower environmental impact and support sustainable production.

5.3.4 Comparison of current and previous manufacturing processes

The C&T industry is experiencing a significant change focused on sustainable production methods and compliance with eco-friendly strategies. This transition is striking as it concerns the confrontation between customary resource consumption and production methods and their newer, eco-innovative counterparts. Looking at this shift, several themes indicate the industry's inclination towards sustainability, focusing, among others, on the transition from resource-intensive processes to sustainable alternatives, waste minimisation and material repurposing initiatives, and sustainable design practices to avoid recycling barriers can be identified.

Table 5.5: Comparison of Current and Previous Manufacturing Processes

Codes	Subthemes	Theme
• Reduced energy consumption and emission • The transition from electricity-intensive to pneumatic-cutting processes	Transition from Resource-Intensive Processes to Sustainable Alternatives	Comparison of Current and Previous Manufacturing Processes
• Enhanced waste management and recycling • Textile recycling practices	Waste Minimisation and Material Repurposing Initiatives	
• Sustainable material sourcing	Sustainable Design Practices to Avoid Recycling Barriers	
• Use of eco-friendly machinery and materials	Accountability Towards Fabric Waste & Remnants Over Time	

5.3.4.1 Transition from resource-intensive processes to sustainable alternatives

Over the years, coal and other fossil fuels have shaped the C&T sector in South Africa, but their overwhelming use comes at a heavy price that negatively affects the environment. One participant argued how a facility was built in the 1950s.

It basically burnt 100 tonnes of coal a day, and a considerable amount of effluent being irrigated on the lands, which is obviously not, in the long-term, great for the environment. [RPT7]

In this case, such coal use is unsurprising, considering it formed the backbone of traditional industrial practices. However, such energy-intensive processes are on their way to being replaced after decades of use. In an interview, a participant discussed using less energy by employing technology.

It was electricity-intensive… we also used the heat. We used the heat for blocking after cutting. Now, it's purely pneumatic. It means that once you cut, you put a knife, and once the knife cuts. [RPT6]

If such trends continue, one can easily argue that they will facilitate moving the industry towards more sustainable practices.

5.3.4.2 Waste minimisation and material repurposing initiatives

Today, it has become second nature for industries to actively minimise waste, repurpose textile waste, and encourage a CE. Companies are actively learning new ways to minimise waste; some have even formed new company departments dedicated to repurposing initiatives.

The "Nyaope project", for instance, "chop[s] up all the pieces that we can work with and then we make clothing again. [RPT1]

This method reshapes certain pieces of textile that would normally be regarded as scraps or waste into clothing pieces. Also, alongside this approach, some manufacturers have taken steps to recover spent materials by breaking them down and using them in production. For instance, one participant shared,

We've then subsequently bought machines to help unravel the material to return to its core state and reproduce another material. We didn't have that in the previous factory we were producing off. [RPT9]

All these technological changes advocate for the industry's effort to ensure that it produces little to no waste, which is achieved through the maximal utilisation of raw materials and the creation of new end products. This leads to new products while reducing the need for new raw materials.

5.3.4.3 Sustainable design practices to avoid recycling barriers

Moreover, manufacturers are increasingly aware of the consequences of mixing incompatible fibres, which can hinder recycling and sustainability efforts. As one participant noted,

> *They are trying not to create dead ends for products by mixing fibres that don't behave in the same way. [RPT11]*

From a sustainability perspective, this insight shows a deeper consideration of product life cycles and how initial design choices can impact end-of-life options for materials.

5.3.4.4 Accountability towards fabric waste and remnants over time

Historically, fabric remnants were seen as an afterthought, with little regard for the waste created in production processes. One participant highlighted the previous industry norm, where leftover materials were not a concern for fabric suppliers, noting:

> *What happened to the remnants of the leftover fabrics wasn't our problem. [RPT10]*

This attitude has changed as companies seek responsible ways to manage fabric waste, ensuring that production by-products are recycled or repurposed instead of contributing to landfills. Figure 5.1 below summarises the eco-innovative manufacturing practices in South African C&T companies.

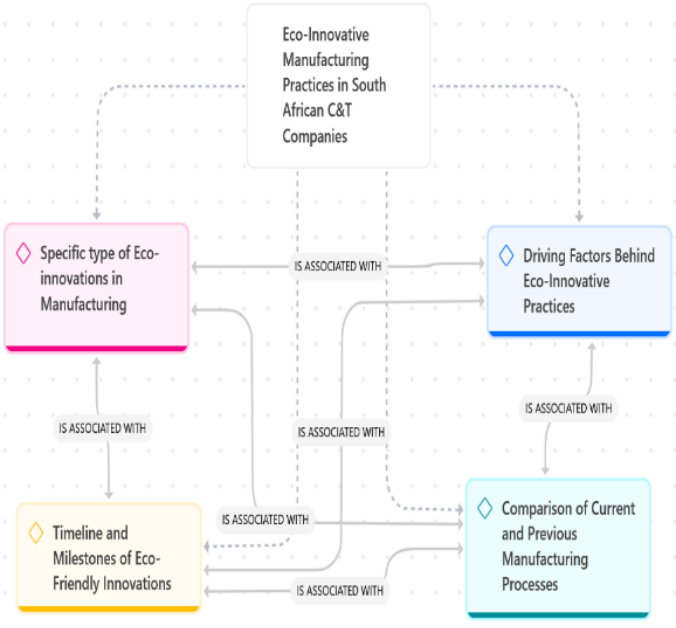

Figure 5.1: Eco-Innovative Manufacturing Practices in South African C&T Companies

5.4 Strategic value and sustainability benefits of eco-innovation

Research SQ-2: What benefits, if any, have C&T companies realised using eco-innovation?

This research question sought the concrete and strategic values that benefit organisations due to integrating eco-innovative manufacturing practices. Insights were gathered on how companies capitalise on eco-innovations, including the operational and reputational gains made along the eco-innovation ladder. Participants shared their experiences with tools and metrics employed to monitor and report environmental impacts, shedding light on how these tools contribute to their sustainability objectives. The findings in this section of the study provide a comprehensive view of the **benefits**, **challenges**, **monitoring and reporting** and **mitigation strategies** associated with eco-innovation in the South African C&T industry, thereby offering valuable insights into the sector's transition towards more sustainable practices.

5.4.1 Strategic value and sustainability benefits

Eco-innovation has also improved multiple advantages, including C&T companies' market competitiveness, increased financial benefits, storytelling about the brand, and eco-clustering (Table 5.6).

Table 5.6: Strategic Value and Sustainability Benefits of Eco-Innovation in the C&T Industry

Codes	Subthemes	Themes
• Customer benefit • Strong presence	Competitive advantage	Strategic Value and Sustainability Benefits of Eco-Innovation in the C&T Industry
• Storytelling • Traceability and authenticity	Storytelling and PR Value	
• Waste minimisation • Profitability	Waste minimisation and profitability	
• Resource optimisation • Financial and environmental benefit	Environmental and financial advantages	

Eco-enhancing moves implemented by the C&T companies minimised their environmental impacts and opened new opportunities for companies to enhance their market and market share.

5.4.1.1 Competitive advantage and customer value

C&T companies, through the incorporation of eco-innovations, have secured a place in the market, thereby primarily differentiating from imported products in the markets. Participants noted this benefit as follows:

> *Our customer, this advantage over importing is also enabling us to remain competitive, and sales are high. [RPT5]*

> *We do have the opportunity to interface at trade shows and trade fairs and with technology partners and others in terms of what is happening globally in terms of best practice from an environmental point of view. [RPT3]*

The eco-innovation strategy enables companies to provide the market with sustainable products that are attractive to consumers and are locally produced. Companies adopting eco-innovative processes also compete and export to foreign markets that demand environmentally friendly products accompanied by certifications.

5.4.1.2 Brand storytelling and PR value

The integration of storytelling with sustainability framing has become a strategic move for companies engaged in eco-innovation. Positioning eco-sustainability as part of the core message has proven effective in creating enduring customer connections. This, therefore, eases the process of creating stories relevant to eco-minded individuals interested in eco-friendly companies. One participant describes this as follows:

> *We do agree that it's a huge opportunity to engage the audience and the community simply by staying on brand and conveying their story. Based on the organisational behaviour practice, we are brands, and we practice or perform the storytelling aspect of the brand, which is one of the aspects of the value provided. [RPT9]*

Apart from reinforcing the brand's image in the eyes of its customers, storytelling provides an opportunity for companies to showcase their initiatives in sustainability. This content wins the interest of eco-friendly consumers who are aware of environmental issues. As shown, brands are open to incorporating their consumers' green ideology into their practices, which helps to build trust in the brand.

In eco-innovation storytelling, sincerity and the ability to tell one's story are vital as consumers become more aware, sophisticated and ethical about which products to buy. Eco-innovation allows companies to tell a convincing, authentic story, thus developing

trust among consumers concerned about greenwashing and false sustainability narratives. One of the participants made an interesting comment regarding the brand story that highlights how vital transparency is:

> *... so, we are looking at the story value and linking to something like certain NGOs that do blockchain-style traceability as being quite important, so those obviously come with a cost, so a mixed bag of factors can be. [RPT 11]*

These blocks allow companies to resolve the problem of backing up their statements about sustainability to the customers. Measures like these protect brand equity, ensuring customers that it is backed by substantial evidence of its eco-friendly values when they buy something.

5.4.1.3 Waste minimisation and profitability

Ecosystems have provided companies with a new type of innovation that allows them to minimise their waste, which lowers their disposal costs and increases their profitability. Companies can maximise their resources by finding new uses for materials that would otherwise be wasted. One of the participants said:

> *There's a lot of waste that we get from there, and for me personally and the heads of the company, it's a great waste. So, you don't want to discard that, and if you discard it, where would you throw it, you know, because that's our IP? As a company, we always strive to minimise waste as much as possible and make a profit, right? So, nothing ever should be wasted. [RPT1]*

By minimising waste generation, organisations not only save on costs that would have been caused by disposing of such waste but also get creative in finding new uses for some of the resources, thereby increasing value in the production cycle and achieving more profitability.

5.4.1.4 Environmental and economic advantages

The eco-innovation environmental benefits are continuously paired with economic ones. Companies meet their environmental obligations and reduce business costs by implementing water and electricity conservation and pollution reduction interventions. One of the subjects provided an example of the dual impact:

> *We see the financial benefit as well as the environmental benefit working hand in glove. [RPT7]*

While addressing how eco-innovation can work in business to achieve multiple goals, one participant explained:

> *It has an impact on using less water and generating less effluent to treat.* *[RPT3]*

This means that the financial and environmental targets complement each other and make it easy for companies to be more sustainable without caring so much about the balance sheet. Eco-innovation through recycling and waste management has seen an increase in fabric sorting and waste management firms that offer these services to manufacturers, thus creating an entirely new industry.

5.4.2 Barriers to the implementation of eco-innovations

The benefits were not without barriers. Companies operating in the C&T industry experienced plenty of hurdles when attempting to initiate the shift towards eco-innovative policies. Most of these innovations are derived from financial burdens, infrastructure limitations and resource dependencies. Investing in green technologies and establishing a sustainable supply chain are perceived to be valuable trade-offs. These technologies tend to be very complex; some companies deem them too expensive to adopt. The other challenge lies with the difficulty of incorporating new eco-innovative processes into existing ones and the need to upskill and train existing staff on new ways of working.

Table 5.7: Barrier to Implementation of Eco-Innovations

Codes	Subthemes	Themes
• Complexity and interconnected challenges	Financial challenges and Multifaceted market barriers	Barriers to the Implementation of Eco-Innovations
• Cost, Financial burden, Financial Constraints		
• Adaptable infrastructure for sustainable technology • Water infrastructure challenges	Resource and infrastructure limitations	
• Dependency on waste availability for production • Supply chain and market readiness • Translating concepts into marketable products	Resource dependency	

5.4.2.1 Financial constraints and market pressures

In some instances, green technologies and practices are unavoidably expensive and thus must be taken on in their entirety by organisations. The implementation of sustainability initiatives, as one of the participants put it, carries large financial burdens:

> *The quickest answer is that it is one hell of a costly experience. It is costly. It is super costly. So, the biggest challenge is the financial impact. It impacts the business financially. [RPT9]*

A scenario arises where companies have to incur additional costs in converting to greener alternatives while still making a profit. Manufacturing eco-friendly products is expensive, so it entails increasing prices, which scares some customers. This dilemma was also identified by one participant who explained it thus:

> *"The challenges will always be naysayers who look at it in terms of clear cost dimensions and say, well, you're adding cost into this and well, my margins are my margins, and how can I sell a T-shirt that I currently sell for 100 rand for 150." [RPT4]*

Besides the financial aspect, another concern is transferring green ideas into consumers' attractive products. As one participant pointed out:

> *"Articulating that concept into a product that somebody actually wants to buy is a challenge." [RPT 8]*

Such insights demonstrate that such companies, even when they manage to surmount profitability issues, are burdened with the responsibility of developing commercially viable products for the market that are also environmentally friendly. Without financial assistance and incentives, companies must fund green transitions through business revenues, which slows the transition to eco-innovation and pressures them [companies] to prioritise immediate sales over long-term environmental goals. The benefits of eco-innovation are presumed only to bear financial benefits in the long-term. Therefore, companies are not immediately encouraged to implement green technology, as the initial upfront cost reduces immediate profit margins.

5.4.2.2 Infrastructure and technology barriers

The lack of efficient infrastructure and technological backing makes implementing these eco-innovative processes even more difficult. Although government programmes provided some financing for upgrading equipment, these programmes have now been

withdrawn, which makes it difficult for companies to purchase the requisite technology. A participant commented on this deficiency of support as follows:

> *Technology is a big problem. The DTIC (Department of Trade Industry and Competition) used to have an incentive programme in place many years ago, so now they have the Master Plan in place, but there are no real incentives for the industry to upgrade or change the equipment. [RPT2]*

The incapacity of the infrastructure revolving around water and energy resources is also a compounding problem. Businesses need help to comply with production plans and environmental concerns in drought and load-shedding-affected regions. One of the participants said:

> *Impossible to know as yet because there are so many factors affecting the business and the textile industry in South Africa, as well as operational, political, municipal service issues like water, like droughts, like load shedding. [RPT11]*

Another participant reinforced this, noting the long-term nature of water infrastructure challenges:

> *In an area that is basically arid. It has major water infrastructure issues that are not foreseen to be overcome by the local authority, by their own admission within the next 8 to 10 years. [RPT3]*

These infrastructural challenges underscore the need for reliable services and resources, both crucial to supporting sustainable business operations in the textile industry.

5.4.2.3 Resource dependency and waste availability

Eco-conscious companies encounter the issue of relying on specific waste materials for production as a significant problem. Because eco-innovative methods are different from ordinary manufacturing processes, using eco-innovative methods often depends on waste availability, which is sometimes uncertain. One participant confirmed that this dependency created problems as it reduced production flexibility:

> *It is true; it's the influx of waste. Also, how do we create waste if someone orders something that looks like a replica? If you order something, we don't*

wait, and we don't create waste in order to make that product. Waste needs to be there for us to create the product. [RPT1]

The dependence on scrap and recycling has the potential to postpone production and exchange the eco-friendly option for a new product, particularly when the supply of scrap is low. This dependency on input from waste creates a problem for expanding environmentally friendly-based production.

5.4.3 Strategies to overcome eco-innovation challenges

The discussion around strategies to deal with the challenges brought by eco-innovation in the South African C&T industry describes adopting a mix of adaptability, collaboration, and value-based engagement, which explains why eco-innovation companies operate at the interface of business and environmental sustainability.

Table 5.8: Strategies to Overcome Eco-Innovation Challenges

Codes	Subthemes	Theme
• Training and upskilling	Ongoing skills Improvement of Workers	Strategies to Overcome Eco-Innovation Challenges
• Building brand loyalty • Authenticity in recycled product marketing	Building a Community-Oriented Brand	
• Wait for the availability of scraps for production	Controlling Manufacturing Lead Times	
• Balancing financial and environmental sustainability goals	Maintaining a Balance between Environmental and Economic Sustainability	
• Proactive support and collaborative problem-solving	Providing Support to Supply Chain Partners	

5.4.3.1 Ongoing skills improvement of workers

Another important strategy for addressing eco-innovation challenges is the inclusion of focus on regular education as well as training for the employees. [RPT3] explained that:

There's a lot of training and retraining and ongoing development of people involved. [RPT3]

This constant support helps to ensure that the workforce keeps re-skilling and can also meet the needs for eco-innovation. Companies that engage in eco-innovative processes

must continuously train staff to stay updated with green technology trends that give them a competitive advantage.

5.4.3.2 Building a community-oriented brand

A notable theme during the interviews was building a community where supporters of similar causes believe in the brand's sustainable principles. As [RPT9] observes,

> *We're starting to produce a community of patrons who have bought into the brand, regardless of what we produce. [RPT9]*

This cementing of the brand around sustainability ensures that customers develop loyalty, which goes beyond purchasing products and creates a strong society committed to sustainable practices. Companies must entrench their brand and devise new ways to appeal to new customers who demand eco-friendly products.

5.4.3.3 Controlling manufacturing lead times

There are often inherent delays owing to innovative activities, which tend to be time-consuming and, sometimes, unconventional. A [RPT1] stated that some eco-innovative products were irregularly available because of certain processes and demands in their production, which tend to extend production and supply periods:

> *You have to wait for that … sometimes they're not enough, so we have to wait again for a time period until that happens and then assemble again. [RPT1]*

Accepting these facts and setting up the processes anticipating time delays owing to eco-innovation as a standard branding practice helps suppliers mollify customers' expectations and better manage the logistics and workflow. This, coupled with the limited availability of waste for other end products, may exacerbate manufacturing delays and sometimes require designers to pivot and introduce alternative products.

5.4.3.4 Maintaining a balance between environmental and economic sustainability

The other difficulty lies in integrating the economic dimension with the environmental dimension. This means that a business must find a balance between practising eco-innovative activities without compromising its profitability, as [RPT7] stated:

> *We try to see where we can achieve financial and environmental sustainability. [RPT7]*

Adopting such practices enhances the sustainability of the businesses. It promotes eco-innovative practices as multi-dimensional aspects of economic, environmental, and social design, making enduring impacts possible. The success of eco-innovation must also address businesses' quest for profitability. Therefore, the balance of the two is always at play.

5.4.3.5 Providing support to supply chain partners

The participants regarded providing support through increasing the focus on transparency in the sourcing of products as critical.

Transparency also effectively dealt with sustainability-related misconceptions about sustainable products. When brands embrace honesty about using recycled materials, they can completely change consumers' perceptions of eco-innovative products.

> *We've been selling the concept that those are clues to the customer that our product really is recycled from a plastic bottle. [RPT11]*

In this sense, such a marketing tactic informs the salespersons about the possibilities of implementing the products, eases doubts about the prospects, and enhances trust in the company’s sustainable activities.

Another approach for controlling opposition or logistical difficulties during the implementation phase of eco-innovation via outreach is collaborating with other networks in the supply chain.

> *We have always sort of offered our help. [RPT10]*

Such assistance helps partners with aspects such as the transport of waste materials. That supportive approach not only helps to build up a trusting relationship with suppliers but also helps to enhance the overall integration of sustainable measures within the target supply chains.

5.4.4 Monitoring and reporting

Companies have strategically employed various strategies to record, monitor and report any progress or impacts their sustainable initiatives may have generated over time (see Table 5.9 below).

Table 5.9: Monitoring and Reporting

Codes	Subthemes	Theme
Stakeholder reporting	Stakeholder engagement	Monitoring and Reporting
Broad environmental benchmarking and traceability	Environmental tracking	
Order-based monitoring	Practical Monitoring approaches	
Monitoring and Documenting Implementation through Case Studies	Implementation documentation	
Computerised reporting	Technological reporting solutions	

These reporting processes enhance accountability, fulfil stakeholders' requirements, and assist organisations in improving their sustainability practices overall. A significant consequence of such processes is reporting on organisations' sustainability, which tends to occur in reports that build upon other existing reports, such as annual reports. Such dual-purpose reports provide for internal monitoring and appeal to the needs of the global investors fraternity. For instance, one of the participants said:

> *We all do sustainability reporting, multi-layered reporting, you know, in our annual reports and everything. All of, you know, typically the members, the investor community internationally, which is very, very interested in what happens in South African clothing retail and in some of South African manufacturing. [RPT8]*

This understanding highlights that the scope of sustainability reporting is open to domestic scrutiny, and its impact resonates with the stakeholders and investors who are focused on the textile and manufacturing industries in South Africa. Traceability is the third step in the monitoring process, enabling corporations to compare and quantify how much resources were used and how much wastage was generated. This data collection aspect is also essential for impact measurement and mitigation of harmful effects. One participant said:

> *We have traceability on these two products and benchmarked through these engineers how waste to landfill, water consumption per metre, woven, knitted, as well as water, chemicals, electricity per unit, etc. [RPT11]*

These comprehensive views are provided by detailed tracking, which enhances the ability of companies to pinpoint where improvements can be made, for instance, in reducing water or excessive energy use or waste management. On the other hand, while many companies may have established some form of reporting structure, some still need to establish such systematic practices. To some, tracking continues to be order-based instead of embedded within the overall system. As one participant noted:

> *I wouldn't know with the reporting part and the recording of it. I think it's order to order because we don't really know exactly what we're doing until it's an order. [RPT1]*

That statement shows that sustainability tracking in some companies is still only conducted upon orders, implying that a more systematic approach would be more appropriate. In other instances, monitoring and advocacy of reporting are conducted to facilitate case studies investigating how green practices are adopted in the industry. Such studies can facilitate internal learning and knowledge transfer to external audiences. Another participant said:

> *We do the assessment, we get the report to the company, and then afterwards we would … have some sort of case study because it's about actual implementation, so we need to monitor the implementation as well as we go along. [RPT2]*

The tracking measures the effectiveness of sustainable practices and provides a documented legacy of best practices that will assist other companies and inform broader industry benchmarks. Lastly, certain companies employ such technologies in their reporting systems, using digital means to record the materials used and waste produced. This automated procedure allows for real time management of resource consumption and expenses. One participant observed:

> *We have everything computer scanned. So, we know exactly how much a product needs, and then we get sort of a report on the waste that's generated from each cat. Our reporting is more about keeping track of where the textiles are going and the cost. [RPT11]*

This insight demonstrates how digitalisation enhances the accuracy and efficiency of monitoring, providing companies with immediate insights into their sustainability metrics. In summary, Figure 5.2 provides an overview of the path to Sustainable Innovation, including the benefits, challenges, and strategies for Eco-Innovation in South Africa's C&T Industry.

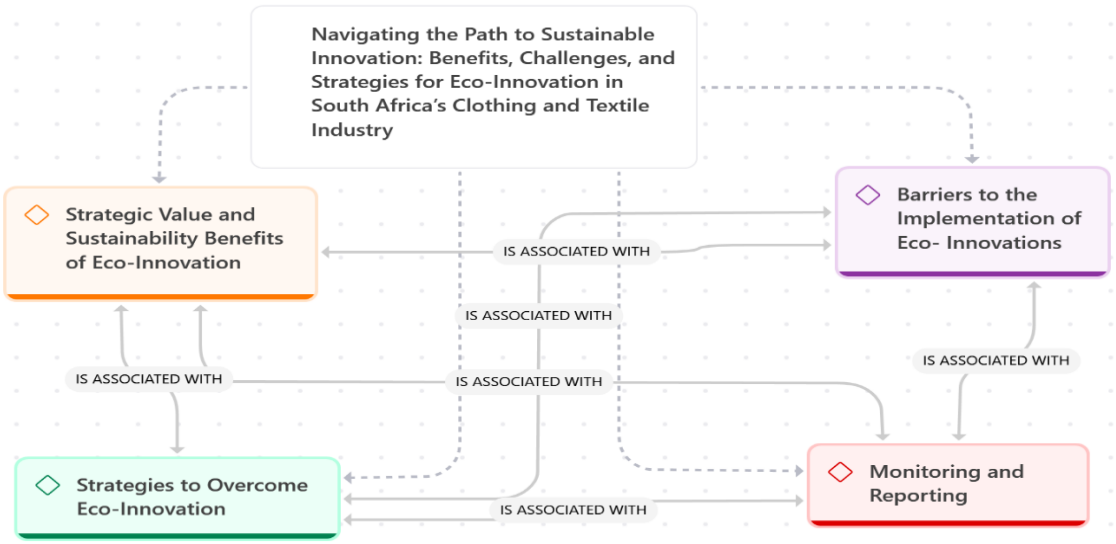

Figure 5.2: Benefits, Challenges, Monitoring, Reporting and Strategies for Eco-innovations

5.5 Marketing campaigns and approaches for eco-innovation in the South African C&T industry

Research SQ-3: Why and how are C&T companies marketing their eco-innovative apparel?

To answer research SRQ 3, this section explores how South African C&T companies market sustainably manufactured C&T by examining the reasons behind their approach and the methods used. Through the analysis of interview responses, insights emerged into the industry's use of social media, in store advertising, dedicated customer outreach, and internal sustainability campaigns. This section offers a holistic perspective on how the marketing campaigns within the C&T sector in South Africa promote eco-innovation, which is becoming increasingly relevant due to the rise in demand for sustainable fashion.

Table 5.10: Marketing Campaigns and Approaches for Eco-Innovative Apparel

Codes	Subthemes	Themes
• Campaigns for Sustainability Awareness • Multi-channel marketing • Website marketing	Marketing Campaigns and Consumer Influence on Sustainable Apparel	Marketing Campaigns and Approaches for Eco-Innovative Apparel
• Alternative energy sources • Global best practices • Understanding the True Impact of Recycling • Continuous innovation	Approaches for Advancing Eco-innovative Practices	

5.5.1 Marketing campaigns and consumer influence on sustainable apparel

As part of their strategy, companies use various forms of marketing, ranging from using social media, placing adverts in stores, sponsoring content, etc., to showcase their concern for the environment and cultivate the loyalty of green consumers.

Applying multi-channel marketing to companies is critical for interconnecting with the target audience in both online and offline environments. As one informant said:

> *They do a lot of work to show people our products. They do Instagram and other kinds of marketing in different media, so online, they do quite a lot of that type of thing [RPT5].*

The fact that social media marketing focuses on Instagram indicates the advancement of the industry in appreciating the need for visual marketing. In this way, it is marketing the attributes of the organisation's sustainable products. Besides social websites, companies also market their products using other customer communication platforms to inform their customers about environmentally friendly practices, campaigns, and new environmental product ranges. RPT5 said:

> *We've got a customer database, and a lot of information is sent out to our customer base to market ourselves on in store ads, posters, video links, and things of that nature [RPT5].*

This approach integrates both online and offline activities, thus sending out a coherent message regarding sustainability at all consumer interfaces. These types of companies use direct advertising complemented by storytelling in their marketing, which is more about the transparency of the marketing process than the actual ‘selling’ of the brand or product. One company assigned staff to develop content and run intra-organisational campaigns to highlight the sustainable nature of its production processes. As a participant described:

> *We had an entire content team that created a campaign internally for external use to share in our production processes from the sustainability element. [RPT9]*

With such stories, these companies are trying to establish lasting relationships with customers as they brand themselves as socially responsible businesses that share the customers' conscience about waste and cleaner production processes. While some companies manage through comprehensive marketing campaigns, others need more

resources. One participant acknowledged the need for further development in their digital marketing efforts, stating:

> *We've got notes to that effect on our website, but we don't have a big engine of marketing, so there's some potential there that's untapped [RPT11].*

Acknowledging the term 'untapped potential' implies that although there is knowledge of the need to promote eco-innovative practices, smaller firms may be too under-resourced to fully benefit from the available digital channels, thus highlighting the need for more marketing efforts.

5.5.2 Approaches for advancing eco-innovative practices

The participants' insights pointed out a more holistic eco-innovation whereby companies are not just integrating sustainable technologies and materials into their operations but are also facilitating a continuous process of learning and assimilating practices from the global picture of environmental sustainability.

Numerous factors, including industry trends, personal dedication, and awareness of the intricacies of sustainable production, spur the desire to innovate. A critical approach in promoting sustainability is the replacement of fossil fuels with renewable resources such as solar and wind energy. As one of the participants pointed out:

> *I think interventions like solar, wind, and those kinds of things are very important. [RPT3].*

This shift towards renewable energy sources shows an understanding of the destructive impact of conventional manufacturing methods and a readiness to scale cleaner energy use and cleaner production processes.

Moreover, attendance at trade fairs and partnerships with technological companies are also valuable, as they help companies understand the latest sustainability developments and practices and allow them to benchmark themselves against other global players. As the next participant said, these events enable the sector to see what works in other countries.

> *Interface at trade shows and trade fairs and with technology partners and others in terms of what is happening globally in terms of best practice from an environmental point of view [RPT3].*

However, as stated above, the road to sustainability for technological advancement is simple, but companies need help with proving that their actions make a mark. One of the participants raised the issue of sustainable materials and asked whether they could be sustainably sourced. Just because a material is made from recycled materials, does that make any substantial impact? They pointed out:

> *One has to really understand, sometimes you think, 'Oh, it's recycled', but have you really saved anything? And so, there's a lot of learning still, to be honest, to be done" [RPT5].*

Therefore, it is helpful to consider the material's life cycle and its practicalities; there are also some arguments about whether recycling might or might not be the solution for everything.

Consequently, eco-aware schemes may need to be approached more holistically and might need proper justification rather than self-evident perception. While some leaders seem to be focusing on their eco-innovative businesses, for other leaders in the industry, eco-innovation is not just a matter of business management.

However, it might be regarded as a more personal mission in which industry and self-promoting goals must converge. One of the participants explained how he had taken on the responsibility of revolutionising the fashion business in the era of the Fourth Industrial Revolution in the company where he worked. He spoke out, saying:

> *I also realised that I need to be the change that I want to be, I want to see. I need to be part of the change. So, it's something that I'm doing continuously as the business can afford it. I'm constantly trying to innovate because fashion itself, with the fourth industrial revolution, we're going through some very fast-moving process. [RPT6]*

One encouraging aspect emanating from this viewpoint is the emphasis that many green initiatives are expected to be rolled out in phases, according to the means available. This participant said that the market was changing.

Therefore, customers also have to keep changing, which suggests that eco-innovation in fashion is much broader than a few new ideas, designs, or techniques but is more of a process of re-evaluating and rewriting the style guide, among other things that need to occur. Figure 5.3 summarises the marketing Campaigns and Approaches to Eco-Innovative Apparel in South Africa.

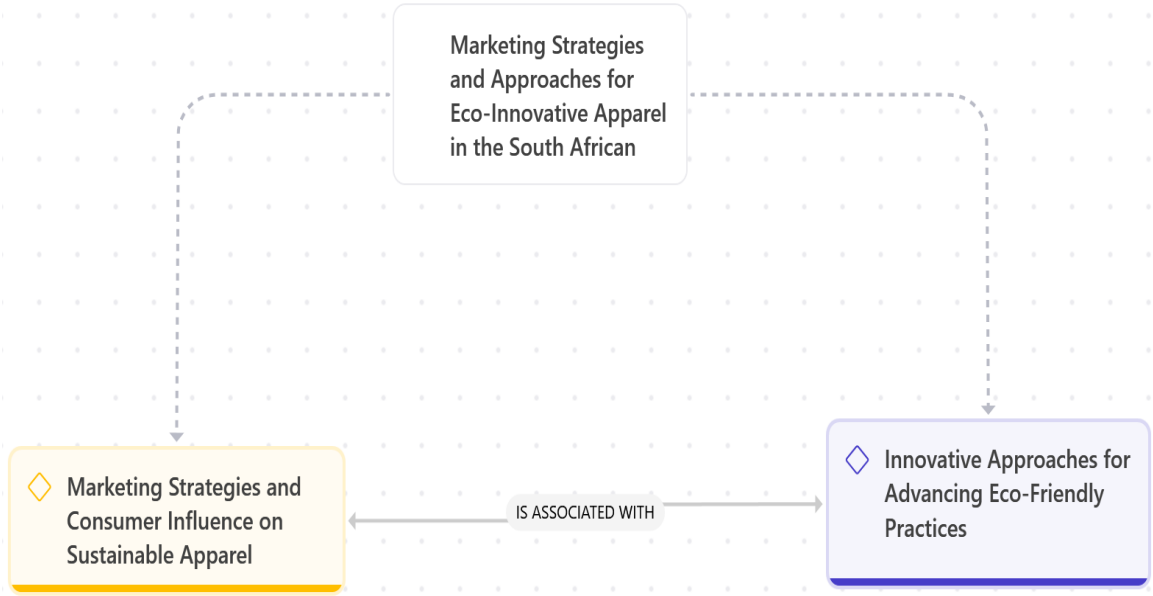

Figure 5.3: Marketing Campaigns and Approaches to Eco-Innovative Apparel in South Africa

5.6 Governmental Support and Policy Initiatives for Fostering Eco-innovation in the South African C&T Industry

Research SQ-4: What can the South African government do to foster eco-innovation in the industry?

This research question sought to answer how the South African government could best support and promote the study of eco-innovation in the C&T industry. The participants' insights showed that the study aimed to determine the kind of government action and policy attention that sought to facilitate sustainable change in the industry. The insights in response to the questions asked showed how, in their view, the government's role was to consider the potential of eco-innovation while considering a variety of options –such as adopting new financial measures, policy measures and regulations (Table 5.11).

Table 5.11: Governmental Support and Policy Initiatives for Fostering Eco-Innovation in the South African C&T Industry

Codes	Subthemes	Theme
• Awareness of Government Interventions (Limited to Non-Local) • Government Initiatives for Localisation and Employment Growth	Awareness of government support initiatives	Governmental Support and Policy Initiatives for Fostering Eco-Innovation in the South African C&T industry

• Government's role in promoting sustainability and job creation		
• Protection • Government policy • Textile waste management regulation	Policy Initiatives to foster Eco-Innovation	
• Tax incentives • Manufacturing incentives • Resource Conservation incentives	Financial support through incentives	

5.6.1 Awareness of government support initiatives

Insights drawn from the participants point to a contradiction between theory and practice, as there is a perceived absence of government efforts to advance sustainability initiatives from a local perspective. The participants appreciated that the government was influenced to spearhead the Green Revolution. However, most of them needed to learn about available initiatives and were interested in what was happening in other countries. Certain participants pointed out their need to be informed about the South African government's efforts to tamper with South Africa's development in the ecological field. One of the participants was frank enough to say:

"I'm not. You don't need to tell me." [RPT6]

Meaning that they needed to learn more about local programmes that were attempting to promote ecological development. Another participant endorsed the opinion, saying:

"No, only in Europe." [RPT1]

This implies that similar measures are not available or visible in South Africa or are not made known widely enough or that there was a question over the availability of information regarding government measures' nature and effectiveness.

This lack of knowledge warrants implementing programmes to correct this information gap. There is an urgent need for the government to communicate better regarding this sector to ensure that stakeholders know what the government is doing about it.

Some participants are aware that the government's support has the potential to be a successful method for promoting sustainability:

I definitely think government plays a role because if we see the strategic imperatives around job creation, the strategic imperatives around keeping the environment and so forth. [RPT4]

This response shows that there is an expectation that the government should be the primary player in promoting sustainability, usually through initiatives that combine with strategic priorities like environmental protection and job creation. It is common knowledge that there are specific government plans or programmes, such as the Master Plan for localisation, which reflect the intention of the government to encourage local industries and create jobs. In the words of one participant:

The Master Plan also aims to, especially when it comes to localisation, they're pushing for that so that it also increases employment (RPT2).

Understanding the Master Plan further demonstrates an understanding of the government's endeavour to enhance the local economy and sustain employment by providing local content. However, it is apparent from the participants' responses that there is a need to close the knowledge gap by providing details about the government's current interventions, as there seems to be limited uptake of government solutions, forcing companies to resort to self-reliant solutions.

5.6.2 Policy initiatives to foster eco-innovation

Through their insights, participants highlighted the importance of integrating sustainability into economic policy, protecting local industries from global competition, implementing regulations addressing specific environmental challenges such as textile waste management, and upskilling the industry's labour force through a massive government initiative to drive teacher training in South Africa's agricultural industry.

The researcher suggests it is essential to incorporate sustainability incentives directly into economic policies through tax and duty adjustments. One participant emphasised that:

That whole vibe about sustainability needs to be taken into account in our economic policy [RPT6],

This shows an aspiration that technical and ecological innovations should be recognised and given attention at the policy-creating level. The researcher pointed out that reduced tariffs for importing such innovative machines and vehicles would assist firms with

improved integration and uptake of more sustainable manufacturing methods. For example, they suggested that:

> *If you can import machinery that uses this type of energy... we will let you pay less duty if you bring in an electric vehicle that doesn't use fossil fuel; you pay less duty because fossil fuel is considered to be damaged in the environment" [RPT6].*

Such policies would, therefore, reduce financial constraints in adopting eco-innovative technologies by increasing the availability of such equipment to businesses.

Participants also expressed concerns about the fierce competition in international markets, especially in countries with low-cost production. One of the respondents observed as follows:

> *If you want to make it greener, but you're competing against the Chinese, who's really, at a price perspective, very difficult to beat. You're going to incur more costs, and you need to have some sort of protection for the local industry with a green initiative. [RPT7]*

Demonstrating that sustainability practices can be associated with higher cost structures, which might erode the competitiveness of local industries. The participants emphasised the importance of protective measures, such as tariffs or subsidies, to mitigate these factors and:

> *Have some sort of protection for the local industry with a green initiative. [RPT7]*

Moreover, some of the participants suggested that there is a need for tougher policies regarding textile waste management so that waste disposal does not work against environmental objectives. One of the participants proposed the following:

> *I think there should perhaps be maybe a little bit more regulation around certainly where people are taking textile waste [RPT10].*

This insight pointed out the need for more waste management and disposal policies and that more strict regulations and supervision were needed to minimise the damage caused by textile waste. Better policy on regulation of this sector would contribute to more efficient waste management practices in the industry while promoting other eco-innovations.

5.6.3 Financial support through incentives

Even though many participants still needed to possess specific knowledge regarding the existing and ongoing eco-innovative initiatives from the government, their insights indicate a definite readiness among participants to engage in financing models that could facilitate and improve their uptake.

The respondents expressed a hopeful outlook towards incentives such as tax relief or other kinds of engagement to help alleviate the costs of moving towards sustainability. One of the respondents pointed out:

> *Definitely, if government intervention can assist, from taxes or otherwise [RPT9]*

Such insight shows a willingness to accept different kinds of financial aid. It suggests that assistance in the form of tax concessions or grants-in-aid extended by the government could help improve eco-innovation adoption.

The participants also acknowledged a lack of incentives to reduce the use of resources, including water and electricity, which are costly in production. One participant suggested that the government:

> *… should be looking at incentivising businesses to reduce the demand on resources, like water and electricity, by helping companies through incentives to implement alternative measures. [RPT5]*

This response highlights the financial strain that resource consumption places on companies and the potential role of incentives in encouraging alternative, less resource-intensive practices. Although understanding such motivators may be relatively scanty, the respondents thought there was potential within the broader construct of such investments. Thus, one of them stated:

> *I think with incentives there, there's opportunity, I think there might be incentives. (RPT10).*

This statement is based on the anticipation that there will be sustainability incentives. It highlights an attitude in the industry that such investments could enable C&T manufacturers to reconcile their willingness to embrace sustainability with the economic constraints that require this to be more than just a vision—Figure 5.1 below provides an

overview of governmental support and policy initiatives for fostering eco-innovation in the South African C&T industry.

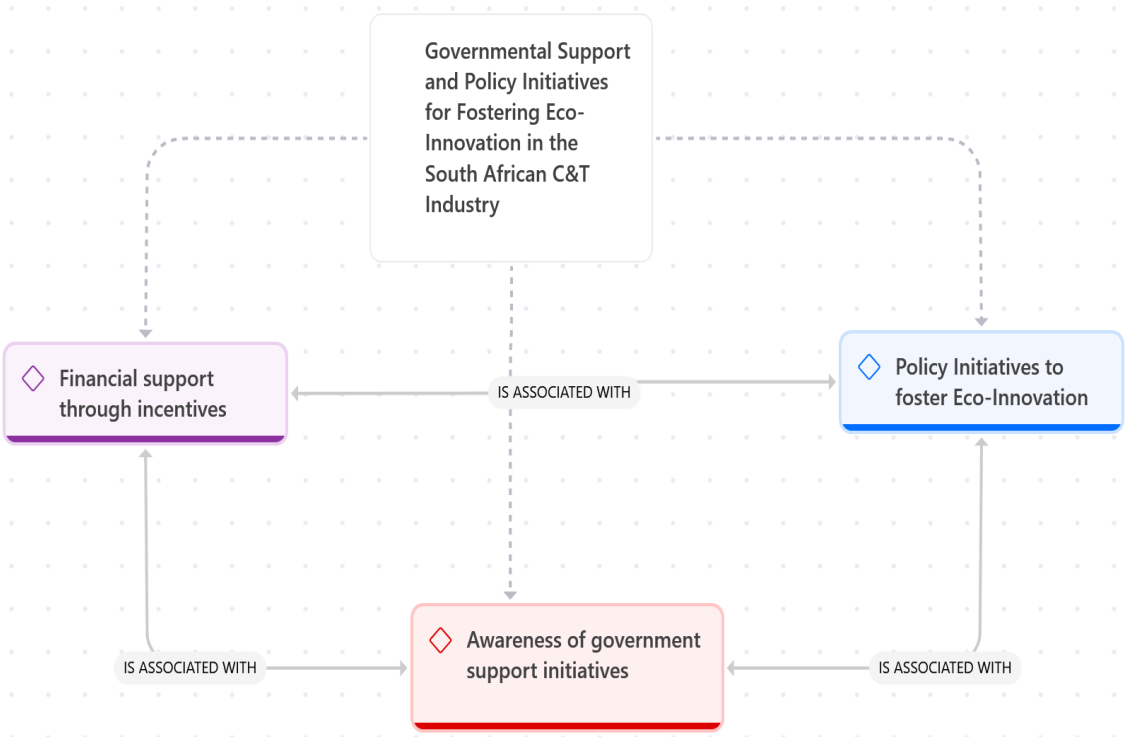

Figure 5.4: Governmental Support and Policy Initiatives for Fostering Eco-Innovation in the South African C&T Industry

5.7 Conclusion

Chapter 5 provided insights into the current eco-innovative manufacturing processes that South African based C&T companies are using. This was initially contextualised within the timeline and milestones of eco-innovations, which started almost 15 years ago, with some participants mentioning it as long ago as 2017. The findings revealed several driving factors behind eco-innovative practices, including ethical responsibility, market pressures, and internal business values, which pushed companies towards cleaner manufacturing processes. Several types of eco-innovations were mentioned during the data collection process. These included waste reduction and pollution control through repurposing, water savings for resource optimisation, designing clothing items for reuse, and transparency in striving to use post-consumer waste in production design.

Additionally, it sought to compare today's eco-innovative processes with the old-school manufacturing methods adopted in these practices, thus providing a comprehensive view of eco-innovation integration. The C&T industry is experiencing a significant change focused on sustainable production methods and compliance with eco-friendly strategies. This transition is striking as it concerns the confrontation between customary resource

consumption and production methods and their newer, eco-innovative counterparts. The findings revealed multiple advantages, such as improved production through eco-innovation, C&T's competitiveness in the marketplace, increased financial benefits, storytelling about the brand, and eco-clustering. These challenges must be overcome to ensure adequate monitoring and reporting to keep the government and stakeholders' fingers on the pulse.

The findings also revealed that marketing campaigns and consumer influence on sustainable C&T can be achieved with campaigns for sustainability awareness, multi-channel marketing, website marketing and innovative approaches for advancing eco-innovative practices. The findings also revealed that governmental support and policy initiatives, such as awareness of government support initiatives, policy initiatives to foster eco-innovation, and financial support through incentives, can help to foster eco-innovation in the South African C&T industry.

CHAPTER 6: DISCUSSION

Chapter 6 of this research report will present an in-depth structured discussion of the findings emanating from Chapter 5. The findings revealed in the chapter seek to answer the primary research question on the role of eco-innovative manufacturing and marketing in the South African C&T industry. This chapter will examine the major themes presented with each SRQ using a clear and organised methodology. It will compare the research findings with those of the literature review in Chapter 2 and critically analyse the viewpoints of other academic scholars. It will also highlight similar findings and those that may differ from scholarly concepts while identifying any new insights that findings have presented.

Each research question had clear themes and subthemes that were unpacked and further supported by research participants' quotes. The methodological approach for this paper looks at each theme in Chapter 5. It draws analytical conclusions on each SRQ based on supporting or differing scholarly views, with particular focus on the major themes that are relevant to this research report, i.e., the timeline and milestones of the eco-innovation in South African C&T companies, the driving factors behind eco-innovative practices, the types of eco-innovation that South African companies have employed; the strategic value and sustainability benefits of eco-innovation; some of the barriers and challenges to the uptake of eco-innovation; monitoring and reporting of green initiatives and lastly, governmental support and interventions.

6.1 SRQ – 1: What are the current eco-innovative manufacturing processes that South African based C&T companies are using?

6.1.1 Theme 1: Timeline and milestones of eco-innovation

As mentioned in Chapter 5, this research question aimed to track and trace the timeline and milestones of eco-innovation in South Africa and compare how the new, cleaner manufacturing process differs from the old working methods. The first theme, emanating from sub-research question 1, looked at the timeline and milestones of the manufacturing processes that were historically reliant on the use of fossil fuels. Haseeb et al. (2020) explained how, historically, the primary cause of fossil fuel combustion in textiles was the increased use of fossil fuels in boilers to provide steam that may be used to dry clothes. The textile industry's energy use was also improved by introducing electrical motors, lighting, and air compressors. However, the C&T industry is still largely characterized as energy-intensive, as a significant portion of the energy used in the textile sector remains inefficient and primarily relies on fossil fuels (Mia et al., 2019).

The empirical research found that recycling initiatives were introduced in some South African based C&T companies in 2010 when company leaders sought to introduce broader systemic change in manufacturing operations. For this research report, recycling at the manufacturer level speaks specifically to how manufacturers are repurposing offcuts from finished garments and are managing fabric waste in ways that yield economic benefits to the company while being environmentally sustainable.

The findings describe recycling initiatives by South African C&T companies as having a zero-waste goal, which is what typically describes or informs a CE system. Chen et al., (2021) reiterated that at the concept's core, the CE involves reducing the intake of raw materials and generating waste, thereby aiming to retain the value of input resources within the system for an extended period. It also emphasises reintegrating products back into the system whenever possible (Ferasso et al., 2020).

Scholars have defined the CE by drawing on the similarities of how many C&T companies are repurposing their raw material inputs into other end products. The zero-waste goal has a two-pronged advantage. However, circularity alone does not ensure positive social, economic, and environmental outcomes. The CE is characterized by significant versatility, a broad scope, and various applications, which can lead to definitional ambiguities and disparities(Meidl, 2021). This complexity is evident in its varying implementation among South African C&T companies.

Circularity that results in sustainable waste reduction compels manufacturers to find creative methods to reintegrate clothing offcuts into the value chain and sell them as new end products, thus realising a new revenue stream. The burgeoning idea of waste management in the industry has also led to the development of new small waste management companies that collect, sort, and redeliver what was once deemed as waste. The CE within the South African context can be said to drive environmental sustainability while simultaneously forging social sustainability through job creation downstream of the manufacturing value chain. Scholars posit a clear evolution and progressive timeline for introducing eco-innovative processes, such as cleaner energy alternatives, improved machinery and zero waste management through recycling, which has gained traction over the years. However, it can be said that these shifts towards more eco-innovative processes can be attributed to technological advancements that have seen the improved energy mix that C&T manufacturers employ as they seek to be on par with their competitors and other global players.

The manufacturing processes continue to improve, even though the steady rise of fast fashion, driven by mass overconsumption, may curtail the gains made by eco-innovation as manufacturers strive to meet large consumer, on-trend fashion demand. The similarities identified from the empirical findings and literature are expected, as C&T companies in South Africa operate in a globalised industry where the gradual progression of eco-innovative manufacturing practices and environmental sustainability continues to be a significant global conversation. C&T firms are, therefore, expected to align with cleaner manufacturing processes, regardless of the pace of eco-innovation adoption.

6.1.2 Theme 2: Driving factors behind eco-innovative practices

The empirical research findings highlight that eco-innovation in the South African C&T industry is primarily driven by company leaders who are aware of the environmental concerns brought about by their industry and are looking for ethical and social responsibility initiatives that seek to redress these concerns. Consumers increasingly scrutinise C&T companies for their environmental and social impact, thus compelling company leaders to consider alternative ‘greener’ options and solutions. Over the past decade, awareness of sustainability among leading businesses has grown significantly, resulting in a more extensive implementation of sustainability goals (Thorisdottir & Johannsdottir, 2020). This can be seen through the recent growth of ESG policies and frameworks by companies that seek to be responsible corporate citizens.

The research findings indicate that the introduction of eco-innovation in South African C&T companies stems from an ethical and social responsibility aspect, as C&T companies look to reduce the environmental effects of the material and fabrics used in their garments. This approach to manufacturing can be considered a component of a company’s CSR agenda. On a more granular level, corporate ethical and social responsibility is viewed as a management strategy that recognizes the significance of both corporate growth and profitability (Nguyen et al., 2021). However, CSR demands that companies strive for non-profit social objectives, particularly those associated with sustainability, such as protecting the natural environment and promoting social justice and equity (Nguyen et al., 2021). The literature and the research findings corroborate that eco-innovative practices as a business strategy seek to respond to the demand for change in the ways of doing business that balance the dynamics between people and profit.

C&T companies that participated in the research view present CSR as part of their corporate image. However, Tien et al., (2020) argued that the primary motivations of

many emerging market companies often centre their CSR strategy around enhancing their public image and boosting business profits rather than genuinely contributing to social well-being and environmental protection. This approach to CSR often manifests as superficial initiatives that serve more as marketing strategies than as authentic commitments to sustainability (Thorisdottir & Johannsdottir, 2020). Herein lies the question of the true intention of South African C&T company CSR initiatives, of being transparent and committed to the objective of a CSR strategy (external environmental and social benefit) or to solely improve brand perception among consumers, thus driving up sales and profit.

The findings also indicate that eco-innovation uptake is driven by market demand from end users and international markets. The research found that for some C&T companies, integrating sound environmental practices through eco-innovation effectively meets regulative requirements and improves their ability to export into more highly regulated foreign markets. Ahmad et al. (2020) described how businesses implement creative business strategies and improved production techniques to meet stakeholders' growing ESG demands for environmentally friendly and sustainable C&T products. Maier et al. (2019) stated that eco-innovation is necessary for an organisation to succeed in the business environment and survive in a highly competitive local and global market. The similarities in the findings and the literature are expected as companies strive for growing market share, and the global pressures from market demands compel C&T manufacturers to increase eco-innovative practices to ensure international compliance and corporate sustainability and maintain their competitive advantage. In the South African context, this theme may be of more importance to global industry players than local ones; however, it may be relevant to all C&T companies who ultimately aspire to export their apparel.

6.1.3 Theme 3: Specific types of eco-innovation in manufacturing

The third theme looks at the specific types of eco-innovation that South African C&T firms are adopting. The empirical research highlights broad subthemes that speak to innovation that reduces waste. Zero waste in the production process is a recurring theme in this research report and presents itself in the findings of several other research sub-questions. Zero waste points to greater resourcefulness and optimal use of input raw materials during manufacturing.

Water saving and pollution control were also recorded as a clear area of concern. C&T companies were making strides in using machines that use less water and produce less

effluent and pollution. The findings speak to companies introducing water saving technologies and reducing water treatment costs. Adane et al., (2021) indicates the adverse environmental effects of wastewater and effluent on the environmental ecosystem. However, what is important to note is that the drivers for eco-innovation are not solely based on the environmental impact. C&T companies realise other financial benefits when they use water saving eco-innovation. Some of the types of eco-innovation that companies use, such as effluent treatment processes, comply with strict government regulations, which speak to the authoritative type of decision that influences the adoption rate of innovation, as shown in the DIT.

The research findings indicate different sustainable manufacturing processes highlighting the importance of eco-innovative practices from the preliminary manufacturing phases, such as sourcing sustainable material, i.e., organically certified fabrics and purposeful clothing design for reuse and transparency. The findings point to the strategy of eco-sourcing and eco-design as a holistic project management approach, which encompasses the entire product manufacturing process, from the conceptual design stage to the final finished product.

Rogers's (2003) DIT in the literature speaks to the perceived attributes of any innovation, which may influence its adoption rate. Therefore, if South African C&T companies view eco-innovation as uncomplex and compatible with existing manufacturing processes, they realise the RA through improved profit margins or positive brand perception.

The literature and the empirical findings present similar outcomes in that eco-innovation that sees water savings, waste reduction options as seen in figure 6.1, repurposing of material, and overall support for sustainable manufacturing have afforded C&T companies an increased RA. It may be argued that these realised advantages not only yield environmental advantages by minimising companies' environmental footprints but also signal to customers that these companies are employing reasonable ESG policies that have the potential to improve their brand perception.

The empirical findings do not build upon existing literature; however, they necessitate the application of the DIT to provide a more nuanced analysis. This analysis should consider contextual factors influencing the adoption of innovations, including cultural, economic, and social dynamics, which can differ significantly across countries (Ladds et al., 2023) and varying manufacturing industries.

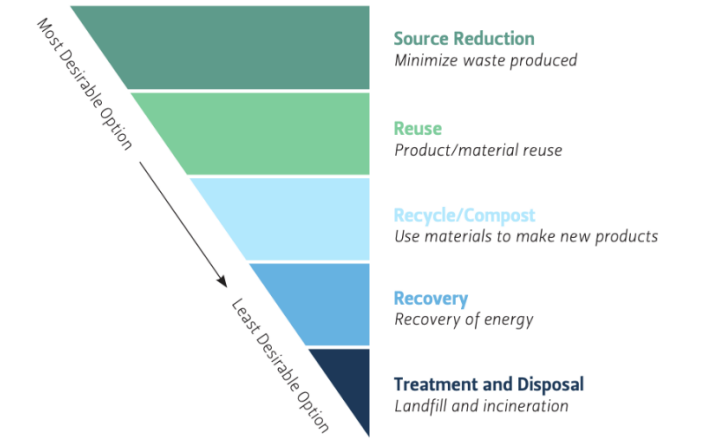

Figure 6.1: Waste management hierarchy

Source (Meidl, 2021)

6.1.4 Theme 4: Comparison of current and previous manufacturing process

The findings indicate significant shifts within the South African C&T industry as companies focus on sustainable manufacturing methods and compliance with green strategies. Companies have made a clear and intentional transition from resource-intensive processes to sustainable alternative manufacturing processes. The main objective of these alternatives is to minimise waste, encourage repurposing initiatives, and foster sustainable design practices while avoiding recycling barriers.

The timeline and milestones of eco-innovation mentioned earlier in this research report reinforce the finding that companies are transitioning away from the historic intensive coal and fossil fuel burning approach, which characterised the first and second industrial revolutions, to using less energy-employing technology. The findings indicate that the industry is gradually moving towards sustainable alternatives. As scholars say about eco-innovation, this transition to less resource-intensive processes are an expected finding. Hazarika and Zhang (2019) asserted that eco-innovations are designed to bring about new technologies rather than merely altering or improving existing ones. This approach emphasises the importance of innovation beyond simply reducing quantities or minimising negative impacts. By focusing on introducing ground-breaking technologies, eco-innovations seek to create transformative changes that can lead to more sustainable practices across various sectors.

In addition, Maier et al. (2020) highlighted the increasing necessity for companies to transition to sustainability-oriented modifications to remain competitive in today's market. Scholars emphasise that businesses must adjust their value chains and product and

service offerings. This may involve rethinking business models to integrate sustainable practices more effectively. As competition intensifies and consumer preferences shift towards more sustainable options, organisations must embrace these changes to meet regulatory requirements, enhance their market position and fulfil the growing demand for environmentally responsible solutions.

Secondary research question 1 aimed to identify the current eco-innovative manufacturing processes employed by C&T companies in South Africa. The empirical findings revealed key themes that traced the country's timeline and significant milestones of eco-innovation. These findings aligned with existing scholarly literature, which describes the operations of the C&T industry within a highly globalised environment. It highlights how changes in technological manufacturing processes and trends can impact the local South African context, irrespective of the speed at which these innovations are adopted.

Zalk (2021) discussed how South African businesses have lost efficiency due to their inability to reinvest in their manufacturing efforts, which has caused them to fall further behind the industry's technological frontier. The rate of eco-innovative manufacturing practices is nuanced and arguably reliant on the contextual appreciation of country-to-country regulations. Its policies play a key role, as alluded to by the DIT.

However, South African companies are implementing alternative methods, such as material repurposing and sustainable design practices from the early stages of manufacturing and choosing fabrics. These are all small yet imperative transitional steps South African C&T companies use to transition away from the old energy-intensive and wasteful manufacturing processes. Company attitudes are shifting as they seek more responsible ways to ensure that products from by-products are not landing in landfills and ensure maximum utilisation of raw input costs. Company leaders have typically spearheaded these eco-innovative manufacturing processes, so the findings do not include a one-size-fits-all approach. C&T firms are all using eco-innovative processes compatible with their respective companies and yield the most financial benefits, sometimes benefiting customer brand perception.

The findings show how C&T companies are finding alternative manufacturing methods, using improved machinery and creative design as ways of eco-innovation. The ultimate objective of the currently employed eco-innovative manufacturing processes is to reduce waste from the onset (design phase), maximise the utilisation of resources such as water and electricity and transition away from energy-intensive manufacturing methods. C&T

companies continue to strive to be more environmentally sustainable in their manufacturing operations through their CSR programmes or the formulation of dedicated sustainability departments. Therefore, eco-innovation can be described as not being linear but an iterative process constantly evolving and transitioning to adapt and address the changing environmental sustainability landscape.

6.2 SRQ 2: What benefits, if any, have C&T companies realised through eco-innovation?

This research question aimed to identify the tangible and strategic benefits South African C&T firms gain from eco-innovative manufacturing practices. The insights collected from this research report revealed four distinct themes that illustrate how companies leverage the value of their eco-innovation efforts. The empirical findings of this sub-question highlight several strategic advantages: the challenges faced, the monitoring and reporting tools used, and the strategies C&T firms implement to address these challenges. In addressing the second sub-question, clear indicators demonstrate how these benefits contribute to C&T company's overall environmental goals.

6.2.1 Theme 1: Strategic value and sustainability benefits of eco-innovation in the C&T industry

The research findings show that C&T companies yield clear economic benefits from adopting eco-innovative manufacturing practices, such as improved market share and customer value. The ability to provide customers with quality environmentally made alternatives increases the product range offering and attracts new environmentally conscious buyers. Through the additional product offering, C&T companies that use eco-innovative manufacturing can increase their market share and improve the customer value experience.

The research revealed that integrating environmental sustainability with product storytelling has become a key strategic approach. Companies in the C&T sector have embedded sustainability messaging at the heart of their brands, fostering connections with customers who are already conscious of environmental issues. By employing narratives around eco-innovative manufacturing practices, these companies effectively highlight their sustainability efforts, leading to stronger engagement with customers who resonate with environmental concerns. Participants in the study emphasised that incorporating eco-innovation storytelling is crucial for establishing a strong brand image perceived as authentic and ethical, thereby enhancing trust between consumers and clothing brands.

In this context, one strategic advantage of eco-innovation is waste minimisation and increased profitability. Participants noted that waste minimisation involves reusing materials and improving design practices. Efficient waste management, including handling manufacturing waste like effluent and fabric offcuts, is viewed as a way to enhance profits, allowing companies to make the most of their raw materials.

The research participants recognised that the environmental benefits of eco-innovation can align with economic advantages, such as optimising resource use—such as water and electricity—which lowers operational costs while demonstrating their commitment to sustainability to their customers. It can be argued that C&T companies use storytelling as a marketing strategy.

Eco-innovation is strategically incorporated into messaging and brand building to attract new customers and maintain and deepen brand loyalty with existing customers. Resource optimisation and waste minimisation are clear outcomes of some C&T companies' eco-innovative approaches. Companies that implement more creative and purposeful sustainability initiatives, supported by dedicated sustainability teams and departments, are likely to derive greater strategic value from their efforts.

Hazarika and Zhang (2019) define eco-innovation as organisational innovation that provides environmental benefits—specifically, adopting management systems and methods to address environmental issues in product development and production. Consequently, as demonstrated in practice and emphasised in the literature, it is evident that South African C&T companies, regardless of their style and scale, are actively engaging in eco-innovative manufacturing and reaping the associated value benefits.

Companies are intentionally driving eco-innovation through their company visions and staffing structures, as the literature on DIT indicates that the organisational culture plays a crucial role in shaping perceptions regarding the adoption of innovations (Rogers & Scott, 2021). It can be asserted that C&T companies leverage storytelling as a distinct marketing strategy. They are strategically integrating eco-innovation into their messaging and brand development, aiming to attract new customers and strengthen and enhance loyalty among existing ones. Additionally, resource optimisation and waste reduction are evident results of the eco-innovative practices adopted by some C&T companies. In summary, additional research must show the real monetary value of eco-innovation's true economic and strategic benefit over a longer period to justify its return on investment and potentially build a case that can encourage more companies to adopt eco-innovation.

6.2.2 Theme 2: Barriers to implementation of eco-innovation

The findings in the research point to the challenges and barriers that C&T companies have to contend with when transitioning to eco-innovative manufacturing processes. These barriers were notably financial burdens, infrastructure limitations and resource dependencies. Some argue that the initial cost requirement had to be extensively motivated, as some eco-innovative technologies were very complex and expensive. Those companies that moved towards eco-innovative manufacturing practices understood that investing in green technologies and establishing an environmentally friendly supply chain were trade-offs to the required upfront monetary investment.

Harsanto et al. (2023) suggested that barriers to implementing eco-innovation in the textile industry, such as costs, insufficient knowledge, lack of government support, and macroeconomic issues, are recurring themes. This is consistent with the empirical findings, as participants noted how expensive the implementation of eco-innovation can be. C&T companies had to incur additional costs and still ensure that they were profitable, which resulted in the rising cost of manufacturing eco-friendly apparel; this cost was then passed on to the customer to ensure the profit margins on manufactured C&Ts stayed in place.

Another finding in the research was the concern of transferring green ideas into viable solutions that would attract customers. Several research participants spoke of maintaining the quality of garments when using cleaner manufacturing processes. Quality that is synonymous with the clothing brands cannot be compromised. Quality assurance remained a key priority, adding to the complexities of transitioning to eco-innovative solutions.

The DIT describes how if an innovation is seen as significantly superior, it is more likely to be adopted (Min et al., 2019). Factors influencing this perception of RA may include tangible benefits, such as enhanced performance or reduced costs. Therefore, eco-innovative manufacturing processes must be known to deliver exceptional quality that consumers will still want to buy.

DIT also posits that the perceived complexity of an innovation negatively impacts its likelihood of adoption by individuals or organisations. This complexity can encompass technical details, the necessary training, or the significant changes required to maintain existing workflows (E. Rogers & Scott, 2021). In the research findings, infrastructure and technology barriers were also seen as challenging when adopting eco-innovation.

Without efficient infrastructure and government incentives or subsidies to purchase eco-innovative machinery, C&T companies continue to weigh the opportunity costs that could realise systemic, environmentally sustainable manufacturing processes.

6.2.3 Theme 3: Strategies to overcome eco-innovation challenges

Even with the challenges experienced by C&T companies transitioning to eco-innovative manufacturing practices, these companies have found strategic ways to overcome and navigate these challenges. Respondents refer to the “training and retraining” of their staff. Ongoing skills improvement and upskilling are crucial in a fast-paced, innovative environment as C&T companies seek to stay on par with global industry players and maintain their competitive advantage.

Some respondents mentioned how there are often inherent delays owing to innovative activities, as some of the products are unconventional and more care and time are required to deliver final quality sustainably manufactured apparel. These eco-innovative processes are, at times, complex and take longer periods to execute. Companies tend to anticipate processing delays and extended workflows that come with the initial introduction of eco-innovation. However, the literature alludes to how eco-innovation is intended to improve efficiencies and user experiences.

Roger (2003) highlights in DIT the significance of understanding how users' previous experiences with similar technologies can affect their perceived ease of use. It could be argued that the challenges related to lead time delays may occur early in adopting eco-innovation, and these challenges could improve with prolonged use and ongoing staff training. Therefore, these are reasonable and expected differences from the literature that speak to the efficiencies brought on by eco-innovation. As Rogers (1995) defined, compatibility reflects how innovation is perceived as harmonious with users' existing frameworks. Previous research has indicated a positive correlation between compatibility and the likelihood of companies adopting new technology. This may hold as C&T companies highlight the challenge of integrating their eco-innovative processes with supply chains. The research findings indicate that companies thus need to continuously provide extended support to their partners at different levels of the value chain, i.e., transportation of waste material and other material suppliers and service providers.

6.2.4 Theme 4: Monitoring and reporting

Monitoring and reporting emerged as crucial elements in the research findings. The study revealed that companies have strategically utilised various reporting tools and methods

to assess the effects of eco-innovative manufacturing practices and their additional strategic advantages. The significance of monitoring and reporting lies in enabling (C&T) companies to track their sustainability initiatives effectively. This process enhances accountability and ensures reporting mechanisms satisfy stakeholder expectations and demonstrate tangible progress in sustainability efforts.

The empirical findings showed that many C&T companies do not produce independent sustainability reports but integrate sustainability content into broader organisational documents, such as annual reports. These combined reports serve dual purposes. They facilitate internal monitoring and provide global stakeholders insights into the company's environmental sustainability initiatives and their effects on operations and profitability. In a highly globalised industry, these monitoring reports are vital tools that appeal to potential investors focused on ESG criteria for impact investing. These reports help stakeholders make informed investment decisions by presenting relevant data.

Research participants highlighted that monitoring and reporting are essential for tracking resource optimisation and waste reduction goals stemming from eco-innovative manufacturing processes. This capability enables C&T companies to identify the challenges and successes associated with their transition to eco-innovation, thus potentially advocating for further sustainability reforms in manufacturing practices. The integration of monitoring and reporting into business strategies is increasingly recognised as best practice in the realm of environmental sustainability. Companies focus on compliance with regulations and seek to enhance their competitive advantage through sustainable practices. Organizations can offer stakeholders reliable and transparent insights into their sustainability performance by utilizing thorough reporting frameworks like the Global Reporting Initiative (GRI) or the Sustainability Accounting Standards Board (SASB) standards. Ultimately, robust monitoring and reporting systems can serve as foundational components in advancing eco-innovation in the C&T industry, guiding companies towards more responsible and innovative practices that meet the expectations of a growing base of environmentally conscious consumers and investors.

6.3 SRQ 3: Why and how are C&T companies marketing eco-innovative apparel?

To effectively address the third sub-research question, the empirical findings delved into various marketing strategies and campaigns currently employed by C&T companies in South Africa. Through analysing 13 interview responses, valuable insights emerged regarding how these companies promote their products. Specifically, it was found that many C&T companies are harnessing the power of social media platforms to engage

with their audiences while also implementing in store campaigns designed to attract customers directly.

6.3.1 Theme 1: Marketing strategies and approaches for eco-innovative apparel in the South African C&T.

Dedicated customer outreach efforts, such as monthly newsletters, were identified as a key strategy for informing consumers about sustainable practices and new product offerings. Other internal sustainability campaigns further highlighted the commitment of these companies to eco-friendly initiatives. Within this context, the findings indicate a clear trend towards a holistic marketing approach, where companies promote their sustainably manufactured apparel and emphasise their overall dedication to sustainability, which is becoming increasingly relevant with the rise of demand for sustainable alternative apparel options.

Interestingly, some companies that participated in the research mentioned that they do not have specialised marketing departments. This absence can significantly impact the scale and effectiveness of their marketing campaigns, the variety of channels they utilise and their overall reach to target audiences. The limitations in marketing resources and strategies were primarily linked to the company's size, suggesting that smaller firms may struggle more than larger ones to implement comprehensive marketing initiatives. These findings underscore the diverse approaches to marketing sustainability in the South African C&T sector and highlight the challenges companies face in effectively communicating their eco-innovative efforts to consumers. The theme was further broken down into two subthemes that addressed marketing strategies that used multi-channels and innovative approaches to advancing eco-innovative manufacturing.

6.3.1.1 Subtheme 1: Marketing strategies and consumer influence on sustainable apparel

The research findings indicate that several C&T companies are strategically incorporating a variety of marketing approaches as part of their commitment to sustainability. These approaches range from leveraging social media platforms to engaging consumers through in store advertisements highlighting sustainability campaigns. By doing so, these companies aim to showcase their genuine concern for environmental issues while simultaneously cultivating loyalty among customers who resonate with the values of environmental sustainability.

Companies increasingly utilise diverse communication channels to maximise their marketing impact in this context. They place particular emphasis on both online and offline multi-channel marketing strategies. For instance, platforms like Instagram are crucial to reaching a broad audience. At the same time, in store initiatives focused on reusing and recycling provide tangible ways for customers to engage with brands' sustainability efforts.

These marketing campaigns promote sustainable practices and reinforce the principles of a CE. Customers are encouraged to bring in old or outdated clothing, which can be repurposed into new garments, thus extending their lifecycle and reducing waste. In addition, the CE concept is becoming integral to eco-innovation strategies. Companies are exploring ways to redesign products and processes to reduce waste, recycle materials, and prolong product life cycles. This shift aligns with sustainability goals, opens new market opportunities, and enhances brand reputation. This engagement promotes a feeling of community and collective accountability among consumers, potentially enhancing the adoption rate in line with the DIT's emphasis on the significance of social connections in the process of adopting innovations.

Furthermore, in store campaigns are essential for educating customers about new environmentally sustainable product offerings. By informing customers about these ranges, C&T companies highlight their innovative approaches to sustainability and create opportunities for consumers to make more informed choices that align with their values. Overall, this multifaceted marketing strategy enhances brand loyalty and contributes to a larger movement towards sustainable consumption in the industry.

In addition to social media and in store initiatives, companies promote their products through customer communication channels like databases and monthly newsletters. C&T companies actively share messages and information regarding their sustainability initiatives. They employ storytelling as a marketing strategy, thus highlighting their eco-friendly manufacturing practices and enhancing the company's brand image. This approach helps customers to perceive the company as purposeful and committed to implementing cleaner manufacturing processes.

Researchers assert that current marketing practices do not effectively address the sustainability challenges in the C&T industry. The ongoing inquiry (Kemper & Ballantine, 2019) raises critical questions about whether marketing, in its existing form, can genuinely be considered sustainable. They argue that this form of marketing is fundamentally based on the impractical idea of perpetual consumption, which

fundamentally ignores the ecological constraints of our environment. The concern is that replacing conventional products with eco-friendly, low carbon alternatives does not tackle the underlying problem. This approach fails to address the significant environmental repercussions associated with mass production processes, which are often detrimental to ecosystems and contribute to resource depletion.

By relying on a model that promotes continuous overconsumption, marketing perpetuates the cycle of overproduction and waste rather than encouraging a more mindful approach to consumption. Therefore, it becomes crucial for companies within the C&T industry to rethink their marketing strategies. They must move beyond merely offering greener products and instead focus on fostering sustainable consumption patterns that mitigate environmental impact. This shift requires a comprehensive re-evaluation of marketing practices to align them more closely with sustainable principles, ultimately leading to a more responsible and environmentally conscious approach in the industry.

While companies view marketing as a means to promote eco-innovative sustainability, scholars often criticise it as a catalyst for overconsumption and overproduction. (Sheth & Parvatiyar, 2021) contended that it is unlikely to become the primary force behind markets and business practices that achieve sustainability objectives despite the increasing focus on sustainable marketing. Consequently, marketing in its current state must shift from simply responding to consumer and market demands to adopting a more responsible approach that actively promotes sustainable products and services (Jung et al., 2020).

When you juxtapose the empirical findings with existing literature, there are conflicting perspectives on marketing as a mechanism for promoting environmental sustainability. Companies employ marketing strategies and campaigns to connect with customers and present themselves as champions of environmental sustainability and eco-innovative manufacturing practices, enhancing their brand image.

Understandably, marketing scholars might view this as a successful outcome, given that the campaigns have achieved their sales or public relations goals. However, environmental sustainability scholars, who approach the issue differently may argue that marketing merely intensifies the discussion around resource depletion rather than fostering a comprehensive approach to conservation.

The variations in the research findings and existing literature are anticipated because businesses aim to generate profit and employ various strategies, such as CSR initiatives and online and offline marketing campaigns, to achieve economic gains. This may sometimes come at the expense of long-term environmental sustainability, which can be derived from eco-innovative manufacturing practices.

6.3.1.2 Subtheme 2: Innovative approaches for advancing eco-innovative practices

The research findings presented in Chapter 5 point to how companies are approaching holistic eco-innovation, whereby companies are not just integrating sustainable technologies and materials but are also undertaking a continuous process of learning and assimilating practices from the global picture of environmental sustainability. The findings highlight how companies are spurred on by factors such as industry trends, company vision and mission, and the growing awareness of eco-innovative intricacies.

C&T companies are increasingly adopting various innovative strategies to promote eco-friendly practices. This shift reflects a growing awareness of the harmful effects that traditional manufacturing methods can have on the environment. As these companies recognise the importance of sustainability, they are committed to scaling up cleaner manufacturing practices that reduce their ecological footprint and contribute to a healthier planet.

To further their understanding and implementation of these eco-innovative practices, many companies actively participate in trade fairs and form strategic partnerships with technology firms that employ green technology. These trade fairs provide valuable opportunities for networking and learning, thus allowing South African C&T firms to stay informed about the latest advancements in environmental sustainability. Collaborating with technological companies enables them to access innovative tools and techniques that enhance their eco-innovative manufacturing processes, making them more efficient and globally competitive.

Some technological advancements driving eco-innovation are not simplistic and often face challenges, requiring companies to be creative in finding alternative sustainable solutions. C&T companies realise that eco-innovation is not a singular approach that can only be realised through machinery. It encompasses approaches that speak to acquiring sustainable material. South African C&T companies refer to the Better Cotton Initiative (BCI), a worldwide effort to revolutionise cotton production by establishing Better Cotton as a sustainable mainstream product.

In addition to promoting the economic well-being of farmers and their communities, which leads to improved social conditions and quality of life, BCI also works to ensure the responsible management of water, land, and resources for the benefit of local communities and the environment (McClay, 2020). The commitment to eco-innovation within the C&T sector is not just about compliance or improving brand image; it is a proactive approach to ensuring the industry's long-term viability while protecting the environment for future generations. Companies understand that they must keep innovating beyond a few ideas, designs or techniques. By embracing these new evolving practices and technologies, C&T companies are paving the way for a more sustainable and responsible manufacturing landscape as they continuously rewrite and rethink eco-innovation.

The findings and the research draws on the same similarities and understanding of the importance of innovation. Maier et al. (2019) explain how, in a highly competitive market, innovation is a prerequisite for the organisation's success in the business and preservation environment. South African C&T companies are constantly looking for innovative ways to develop eco-innovative practices in their manufacturing processes. A solution is deemed eco-innovative if it is more environmentally friendly than "the relevant alternative." This alternative can refer to the technology currently utilised by an organisation or the standard technology commonly adopted within a specific industry. Such alternatives play a crucial role in determining the environmental impact of various practices, as they are often the benchmarks against which new solutions are measured. When assessing eco-innovation, it is important to consider the effectiveness of these technologies in mitigating emissions or lowering the overall CF. For instance, an organisation may implement a new manufacturing process that significantly reduces waste and energy consumption compared to traditional methods. Similarly, within an industry, a shift towards greener technologies, such as renewable energy sources or advanced recycling techniques, can represent a substantial improvement over existing practices.

By focusing on these comparative measures, businesses can identify innovation opportunities that enhance their operational efficiency and contribute to broader environmental goals (Arilla-Llorente et al., 2024). In the South African context, attendance at trade fairs, participation in sustainably sourced materials initiatives such as BCI, and realising the need to evolve and adapt to global trends continuously lays a good foundation for increasing the adoption of eco-innovative practices. Some of the limitations herein lie with the ability of C&T companies to transfer and integrate these

eco-innovations into existing assembly lines and supply chains. The compatibility of global trends may be seen as either a limitation in the findings or an opportunity to drive what the (CSIR, 2022) terms disruptive/radical eco-innovations as genuine promoters of environmental sustainability within the South African context.

6.4 SRQ 4: What can the South African government do to foster eco-innovation in the C&T industry?

Sub-research question 4 investigated how the South African government can most effectively support and promote eco-innovative manufacturing within the C&T industry. To achieve this, the study employed semi-structured interviews, allowing in-depth discussions with knowledgeable participants about the industry. The objective was to gather diverse perspectives on government initiatives that could significantly enhance eco-innovative practices within the sector.

6.4.1 Theme 1: Governmental support and policy initiatives for fostering eco-innovation in the South African C&T industry

During the interviews, participants shared their insights on the critical role of government in fostering an environment conducive to eco-innovation. They suggested that the government strengthen regulations promoting sustainable practices, ensuring manufacturers adhere to higher environmental standards. Additionally, participants highlighted the importance of providing financial incentives, such as grants or tax breaks, which could motivate companies to invest in eco-innovative technologies and processes. The overarching theme of government support was further dissected into three key subthemes. The first subtheme focused on the awareness of existing government support initiatives.

Participants discussed the need for better communication regarding available programmes, as many were unaware of the resources that could aid their transition to more sustainable practices.

The second subtheme explored the policy initiatives that could effectively foster eco-innovation. Participants emphasised the need for policies promoting sustainability and encouraging collaboration between government, industry stakeholders, and research institutions. The participants indicated how this collaborative approach could lead to the development of innovative solutions tailored to the specific regulatory challenges faced by the C&T industry.

Finally, the third subtheme addressed the need for robust financial incentives to facilitate eco-innovation. Participants argued that financial support is crucial, especially for small and medium-sized enterprises (SMEs) lacking the initial capital to invest in eco-innovative technologies. By implementing targeted financial programmes, the government could significantly lower the barriers to entry for these C&T companies, enabling them to adopt more eco-innovative practices and contribute to a greener manufacturing landscape.

6.4.1.1 Subtheme 1: Awareness of government support initiatives

The empirical findings point to the stark absence of company awareness of government initiatives to improve eco-innovation in South Africa. Participants lack knowledge of concrete initiatives to address the industry's environmental sustainability concerns. Participants pointed to the lack of exposure to government-affiliated initiatives, which could indicate the government’s poor promotion of existing support initiatives or the limited relevance or viability.

Participants expressed their expectation for government support, as they were viewed as the key primary driver for promoting eco-innovative initiatives. They highlighted the strategic significance the government can play in combining environmental protection policies and job creation in the industry and the country. Some research participants knew of the Retail Clothing, Textile, Footwear, and Leather Sectors (R-CTFL) Master Plan, was finalised in 2019 to strengthen the industry (Department of Trade Industry and Competition, 2022). However, there remained some uncertainty regarding its rollout and implementation plan.

The industry strongly recognises the crucial role of the government in raising awareness about eco-innovation initiatives that contribute to environmental sustainability goals. It is widely recognised that effective communication and promotion of these initiatives can significantly impact the adopting of sustainable practices across various sectors. However, as several scholars pointed out, there are notable challenges stemming from the government's difficulty in aligning existing policies with broader national economic strategies and activities, as this disconnect may create conflicts within the industry (Morris et al., 2021). One of the primary issues identified is the lack of coherence between eco-innovation policies and general economic policies at the national and departmental levels of government. Government initiatives not aligning with overarching economic objectives can confuse and hinder stakeholder collaboration (Morris et al., 2021). This misalignment becomes particularly problematic when coordinating efforts

among industry players, including manufacturers, labour unions, retailers, and governmental entities. Each group may have differing priorities and objectives, which makes it challenging to implement cohesive rules and regulations.

Moreover, the complexity of the industry landscape further complicates coordination efforts. With numerous stakeholders involved, it becomes essential for the government to facilitate clear communication and collaboration to ensure that eco-innovation initiatives are effectively integrated into industry practices. (Zalk, 2021). Without a unified approach, the potential for conflicting interests and objectives increases, which can ultimately undermine the environmental sustainability goals the government seeks to promote. The DIT hypothesis is that the social interconnectedness level improves the innovation adoption rate (Roger, 2003), reinforcing the need for tighter regulations to foster improved stakeholder coordination where best practices and challenges can be shared and solved jointly. The research findings and the literature align regarding the lack of coordination efforts from industry players, which could explain the poor level of eco-innovation awareness. Even with the presence of industry associations such as the National Clothing Retail Federation, different C&T manufacturers have varying eco-innovative manufacturing requirements, making the uniform application and adaptation of environmental sustainability policies complex. This supports the DIT hypothesis, which holds that complicated innovations have poor adoption rates (Rogers, 2003), even when implemented by government agencies with lax enforcement and policing policies, which may be the case in South Africa.

6.4.1.2 Subtheme 2: Policy initiatives to foster eco-innovation

The findings highlight the increasing significance of policy initiatives that incorporate eco-innovation into economic strategies, safeguard local industries from competition posed by low-cost imports, and establish regulations that tackle fundamental environmental sustainability issues like textile waste management, resource optimisation, and sustainable sourcing of fabrics. Participants pointed to tax incentives, import tariffs, and subsidy adjustments as essential policy tools to enhance eco-innovation within the C&T sector. Several participants favoured introducing reduced tariffs for companies that import machinery and equipment that assimilate cleaner production processes.

As alluded to by (Zalk, 2021), many South African C&T companies are currently driven by the optional decision to drive eco-innovation through their company values. They are, therefore, not incentivised to incur the financial and upskilling costs of transitioning their

manufacturing assembly lines and training their existing staff towards more radical eco-innovative alternative options.

The findings also highlighted the difficulties that C&T companies face in competing with inexpensive imports from international markets, particularly those utilising low-cost production models, such as those in China. This significant advantage held by countries with low manufacturing costs has been perceived as undermining the competitiveness of local industries, thereby emphasising the necessity for government protective measures. However, existing literature indicates that the historical reliance on protectionist policies of the South African C&T sector during apartheid, combined with a lack of innovation, has hindered the industry's ability to keep pace with global competitors. This stagnation has contributed to a continuous decline in the sector's contribution to the national GDP, which fell from 6% in 2005 to 3% in 2016 and 0.7% in 2021 (Hatzenburg & Mazema, 2023). This situation raises important questions about the impact of protectionism and the duration for which the C&T industry may require such protective measures before it can compete in an open market.

6.4.1.3 Subtheme 3: Financial support through incentives

The research findings show that several companies within the C&T industry are open and willing to engage in financing models that can facilitate eco-innovation. The research respondents had a more positive outlook towards the possibility of financial relief incentives. This denotes the initial financial requirements when embarking on the transition to eco-innovative manufacturing processes, thus possibly reducing the short-term financial RA of adopting eco-innovation. Zalk (2021) notes that many C&T companies in South Africa are primarily driven by their corporate values to advance eco-innovation. However, the absence of incentives might hinder these companies from pursuing and creating disruptive eco-innovations, as they often only meet the basic requirements to comply with local environmental regulations.

The empirical findings reveal a strong willingness and forward-thinking vision among company leaders in the C&T sector to transition toward eco-innovative manufacturing processes. This shift is driven by recognising the long-term benefits of adopting sustainable practices. Specifically, companies that implement resource optimisation strategies and establish effective waste management protocols can realise immediate financial advantages, which serve as compelling incentives for change. Furthermore, when start-up incentives from government programmes bolster these eco-innovation initiatives, they can significantly broaden their appeal, particularly to SMEs. Many SMEs

face financial constraints that hinder their ability to invest in sustainable technologies and practices. By providing targeted financial support, the government can help small businesses overcome such challenges, making eco-innovation a more viable option.

In summary, the findings from the semi-structured interviews underscored the participants' belief that a proactive and supportive government role is essential for promoting eco-innovation in the South African C&T industry. Through strengthened regulations, increased awareness of support initiatives, collaborative policies, and targeted financial incentives, the government can pave the way for a more environmentally sustainable and innovative manufacturing C&T sector.

There are still limited findings and knowledge on the need for dedicated research and design (R&D) initiatives that can help improve economic policy and industry coordination. Industry and country-specific tailored solutions derived from dedicated think tanks and R&D teams may potentially address policy complexity issues and solve industry challenges with more relevant and readily applicable eco-innovative solutions. The conversation on the effect of tariffs and subsidies in the South African market requires further exploration. Some scholars, such as (Dong & Kouvelis, 2020), argue that introducing tariffs to protect an industry may result in retaliatory tariffs in affected countries, resulting in escalated counter-tariffs and trade wars, which may affect supply chains, local supply outputs, and profitability. Therefore, tariffs cannot be considered in singular industry isolation due to their potential ripple effect on other micro-economic models.

While there is a clear recognition and appreciation of the government's vital role in driving awareness of eco-innovation initiatives, significant gaps remain in policy alignment and stakeholder coordination. Addressing these challenges will require a concerted effort from the government to harmonise its eco-innovation policies with broader economic strategies and to foster collaboration among all industry players. By doing so, the government can help create a more conducive environment for sustainable practices and ensure that the various interests within the industry work together towards common environmental goals while addressing a balance between protectionism and free-hand economic models that can still ensure the industry remains globally competitive.

6.5 Conclusion

In Chapter 6, the research report provided a thorough critical analysis of the empirical findings outlined in Chapter 5. This analysis was structured through a systematic approach that involved clear funnelling and grouping of codes and subthemes. As a

result, the discussion chapter successfully identified key overarching themes that address the four sub-research questions. Each sub-research question contributes to a deeper collective understanding of the significance of eco-innovation within the manufacturing and marketing sectors of the South African C&T industry. The chapter outlined specific methodological steps employed to synthesise and analyse the research findings alongside insights from other scholars. This approach explored and enhanced the DIT in the South African C&T context. By integrating empirical data with existing literature, the chapter aimed to illuminate the dynamics of eco-innovation in the industry, emphasising its implications for manufacturing processes and marketing strategies. Through this rigorous analysis, the chapter illuminated how eco-innovation is a critical driver for change within the C&T sector, reflecting broader trends in sustainability and corporate responsibility. The discussion highlighted the challenges companies face in implementing eco-innovative practices and showcased the opportunities that arise from aligning with SDG.

Chapter 6 positioned the findings within a broader academic framework, facilitating a richer understanding of eco-innovation's role in shaping the future of the South African C&T industry. By engaging with the DIT, the chapter underscored the importance of external influences and internal motivations in driving the adoption of sustainable practices, thereby contributing valuable insights to scholars and practitioners in the field.

SRQ – 1: What are the current eco-innovative manufacturing processes that South African based C&T companies are using?

SRQ1 aimed to delve deeply into the transition towards eco-innovation, seeking to understand the various drivers that influence this evolution within the C&T industry. The research identified several key themes highlighting the significant timeline of eco-innovation and the underlying drivers that propel companies to adopt such practices. One of the most crucial takeaways from this inquiry was the recognition of the primary factors motivating C&T companies in South Africa to implement eco-innovative manufacturing processes. These drivers were rooted in CSR, market-driven demand, and a growing sense of environmental accountability. The findings emphasised that CSR is a regulatory requirement and a strategic choice for companies aiming to enhance their reputation and stakeholder relationships. Market-driven demand reflects consumers' increasing preference for sustainable and ethically produced goods, pushing companies to adapt to these changing consumer expectations. Additionally, a commitment to environmental responsibility has become essential as companies acknowledge their role

in mitigating the environmental crisis exacerbated by their industry's historically high pollution levels.

The main takeaway from SRQ1 was the realisation that these drivers are predominantly external. Companies perceive the need to address these factors to remain relevant and competitive. They recognise that responding to customer or investor demands is vital for maintaining market share and enhancing their brand image. By adopting eco-innovative practices, companies may improve public perception as ethical and authentic entities. Furthermore, aligning with international regulations and standards is critical for companies operating globally, ensuring compliance and possibly attracting ESG-abiding investors.

South African C&T companies are increasingly embracing eco-innovative practices, from resource-intensive processes to sustainable alternatives that minimise waste and optimise the use of resources. This transition occurs regardless of whether the motivating factors stem from external pressures or internal aspirations. The evolution towards eco-innovation is becoming an essential aspect of business strategy, as companies recognise that their growth and competitive edge hinge on their ability to adopt environmentally sustainable practices. The journey towards eco-innovation is not merely a trend but a necessary evolution for C&T companies striving for longevity and success in a world where sustainability is paramount.

SRQ 2: What benefits, if any, have C&T companies realised through eco-innovation?

SRQ 2 focused on the tangible and strategic advantages that C&T companies gain from integrating eco-innovative manufacturing processes. The findings provided a comprehensive overview of the benefits, challenges, mitigation strategies, and monitoring tools that these companies employ to assess their sustainability initiatives and measure their impacts.

The research revealed that C&T companies experience a variety of both financial and non-financial strategic benefits through the adoption of eco-innovative manufacturing practices. Among these benefits are enhanced market share, improved brand perception—often communicated through compelling storytelling—and waste minimisation that contributes to increased profitability. The findings highlighted significant economic outcomes from resource optimisation, leading to improved operational efficiencies characterised by reduced water and electricity consumption. C&T companies

actively leverage eco-innovation as a dual strategy for environmental sustainability, yielding both economic and sustainability advantages.

Despite these realised benefits, C&T companies also faced challenges associated with eco-innovation. Many of these challenges were identified as structural, arising from country-specific regulations and insufficient technological support from the government. Financial constraints emerged as a significant barrier to the rapid adoption of eco-innovative manufacturing processes, particularly for smaller C&T companies that lacked the financial resources necessary to upgrade to cleaner manufacturing technologies. Consequently, these infrastructural and financial challenges led some companies to stave off implementing eco-innovative practices in favour of more immediate profit-driven initiatives.

In contrast, larger C&T firms with more substantial budgets and investor backing appeared to navigate these challenges more effectively. These companies were able to invest in training and upskilling their workforce, ensuring that they could meet the demands of transitioning to eco-innovation. Another notable takeaway was how C&T companies expanded their sustainability efforts to include partners and suppliers within their value chains, inadvertently fostering the emergence of a secondary waste management industry. It became evident that companies with dedicated sustainability departments were better equipped with structured mitigation strategies to address and overcome eco-innovation barriers, successfully balancing environmental and economic operational dynamics.

A clear non-financial benefit of eco-innovation was enhancing strategic reporting and monitoring capabilities. Even when companies did not produce standalone sustainability reports, they often integrated sustainability metrics into broader corporate reports. These reporting tools enabled companies to track and evaluate the impacts of their eco-innovative practices while also identifying areas for further improvement. Monitoring and reporting provided investors with data that positioned C&T companies as environmentally friendly, enhancing their reputation and appeal in an increasingly sustainability-focused market. Overall, the findings underscored the multifaceted value of eco-innovation, highlighting its potential for driving economic growth and its role in promoting sustainable practices within the industry.

SRQ 3: Why and how are C&T companies marketing their eco-innovative apparel?

SRQ 3 explored the marketing question of this research report. It sought to understand how C&T companies are marketing their sustainably manufactured apparel and why they must inform customers of alternative sustainable apparel. This research question explored different marketing campaigns, and the added value marketing strategies bring to the C&T industry.

One major theme identified marketing strategies in their entirety, and two subthemes further broke down consumer-driven marketing strategies and strategies that advance eco-innovative practices. The consumer-driven strategies were predominately mass media-based and had online and offline aspects. Multi-channel, digital media and social media via platforms such as Instagram were identified as the mainstream marketing channels. C&T companies also use offline marketing strategies such as in store campaigns. The main findings showed how companies use marketing strategies to showcase their alternative apparel while demonstrating their sustainability initiatives to customers, who viewed these C&T companies as ethical and authentic. It was clear, however, that regardless of the marketing strategy used, marketing was driving mass consumerism, raising the issue of the actual effect and impact of the benefits seen from eco-innovations if there is still mass consumption. This was contradictory to the concept of sustainable marketing.

SRQ 4: What can the South African government do to foster eco-innovation in the C&T industry?

SRQ 4 explored how the South African government can effectively encourage and support eco-innovation within the C&T sector. Participants in the research identified several key areas for potential initiatives that could enhance eco-innovation in the industry. These included increasing awareness of existing support programmes, implementing policy-driven initiatives, and providing financial assistance through government incentives.

The findings revealed notable contradictions, particularly regarding government Master Plan initiatives. There was a general lack of awareness regarding how these plans integrate into current national policies and how various stakeholders could coordinate and benefit from them. A significant takeaway is that the introduction of the Master Plan demonstrates the South African government's commitment to influencing environmental sustainability across industries at a national level. The government recognises the critical role of eco-innovation in promoting environmental sustainability, yet challenges remain in the effective execution and integration of the Master Plan and related initiatives.

Some stakeholders advocated for protective measures to shield the industry from low-cost imports and competition. Given that financial constraints were noted as a major barrier to adopting eco-innovation, research findings were anticipated to highlight financial incentives as a preferred form of government support. Participants favoured grants, tax breaks, and other financial assistance to ease the transition to eco-innovation. It is crucial, however, that the impact of government involvement is evaluated to ensure that initiatives do not overly protect the industry, potentially hindering the growth of a competitive C&T sector.

In summary, Chapter 6 examined and analysed the primary themes and subthemes identified in the empirical findings, highlighting key insights, arguments, and expected and unexpected similarities and contradictions in the research and existing literature. The DIT was employed to interpret the research, confirming its hypotheses in some cases while revealing deviations due to specific contextual factors in South Africa. This chapter sets the stage for Chapter 7, which will synthesise the main outcomes and propose new areas for future research that build upon the DIT.

CHAPTER 7: CONCLUSION

In the final chapter of this research report, the outcomes and conclusions of this exploratory research report will be addressed. This chapter will examine the key outcomes of the critical analysis conducted in Chapter 6. This chapter seeks to answer the main research question on the role of eco-innovative manufacturing and marketing within the South African C&T industry. The C&T industry is recognised as one of the most polluting sectors, with its significant environmental impact stemming from excessive energy, water, and chemical consumption (Niinimäki et al., 2020). Most textile and clothing production occurs in global South countries such as India, China, and Bangladesh, which heavily depend on fossil fuels for electricity. This further amplifies the CF associated with each garment produced (Leal Filho et al., 2022). This, therefore, results in the call for innovative solutions that will address the ongoing sustainability challenges that the C&T industry grapples with and align with SDG 12, which speaks to responsible production and consumption patterns.

This research report sought to highlight the important role eco-innovation can play in addressing the environmental sustainability challenges that occur in the primary activities of the C&T value chain (manufacturing and marketing). The growing global discourse on sustainability makes this research report important to the business world, as it plays an imperative role in contributing to providing and driving alternative eco-friendly solutions in different industries. Businesses can influence industry trends and best practices that protect and conserve environmental resource limitations. Eco-innovation, as described earlier, is a business strategy focused on enhancing companies' competitive advantage, considering the increasing demand for environmental responsibility (Demirel & Kesidou, 2020). In this context, eco-innovation encompasses incremental and radical advancements in products, processes, and methods that minimise environmental impact (Harsanto et al., 2023). The research outcomes showed that South African C&T companies use eco-innovative processes in varied ways, as they recognise the importance of incorporating environmental sustainability practices in their manufacturing processes and sustainability messaging in their marketing operations.

This research report also sought to understand how companies’ market eco-innovative apparel. This was to understand if the market-driven demand for sustainable alternatives is caused by marketing strategies that showcase eco-innovative use and eco-innovative practices. The research outcomes also indicate that C&T companies recognise and leverage the added value sustainable marketing may have. According to Jung et al.

(2020), an organisation's sustainable marketing efforts create a favourable brand image and enhance customer attitudes, providing the organisation with competitive advantages derived from brand equity.

Eco-innovation is a multifaceted approach that brings about several positive effects, benefiting C&T companies in ways that extend beyond the core concept of environmental sustainability. For South African C&T companies, embracing eco-innovation has led to significant strategic economic and environmental advantages. These companies are not only attracting environmentally and socially conscious investors, known as ESG investors. However, they also implement practices that minimise waste and optimise resource usage, particularly water and electricity consumption. By focusing on sustainable practices, these companies are enhancing their brand image, which is increasingly important in a market where consumers are more aware of and sensitive to environmental issues. This improved brand perception can increase market share, as consumers are more likely to support brands that align with their sustainability and social responsibility values.

Moreover, the role of eco-innovation in both manufacturing and marketing is crucial. Despite various challenges, South African C&T companies have found that eco-innovation offers sustainable alternative revenue-generating channels. This is achieved by developing a broader range of products made from garment offcuts, which reduces waste and creates unique offerings that appeal to eco-conscious consumers. Additionally, introducing eco-innovative designs and integrating advanced eco-friendly technologies and machinery enables these companies to enhance their operational efficiency and product quality.

By adopting such innovative practices, South African C&T firms are positioning themselves to compete on equal footing with global players in the industry. This competitive edge is critical in a marketplace that increasingly values sustainability, as it allows these companies to appeal to a broader audience while contributing positively to environmental goals. Ultimately, eco-innovation is a strategic imperative for South African C&T companies, fostering long-term growth and sustainability in an ever-evolving industry.

7.1 Principal theoretical conclusion

This research report adopted an exploratory methodology to delve into the significance of eco-innovation within the C&T industry, particularly focusing on the South African context. The study yielded several important findings highlighting the evident presence

and implementation of eco-innovative manufacturing processes. It also examined how these sustainable practices are being effectively marketed to consumers.

By investigating these aspects, the report sheds light on the growing trend of eco-innovation in the C&T sector, underscoring its potential to enhance environmental sustainability while meeting consumer demands. The insights gained from this research may serve as a valuable resource for industry stakeholders aiming to adopt greener practices and improve their marketing strategies in alignment with sustainability goals.

7.1.1 Transitioning to eco-innovation and its benefits

The primary outcome of the research underscored that the key motivators for C&T companies in South Africa to embrace eco-innovation are rooted in both economic benefits and environmental imperatives. Many firms are transitioning from traditional, resource-intensive manufacturing processes to more sustainable alternatives as the industry evolves. This shift is not merely a trend; it reflects a strategic response to the clear advantages that sustainable practices offer, such as cost savings, improved efficiency, and enhanced competitive positioning in the market.

Companies increasingly recognise their ethical, social, and environmental responsibilities in today's business landscape. This awareness is driven by several factors, including regulatory pressures, stakeholder expectations, and a growing consumer base that is more environmentally conscious than ever. As consumers become more informed about the environmental impact of their purchases, they are actively seeking brands that demonstrate a commitment to sustainability. Consequently, C&T companies understand that maintaining and improving their brand image requires a proactive approach to environmental stewardship.

To effectively meet the evolving market demand, C&T companies must adopt alternative manufacturing processes prioritising sustainability. This involves minimising waste and resource consumption through strategies that align with the principles of the CE. The CE approach emphasises rethinking product life cycles and encouraging recycling, upcycling, and using renewable resources. By implementing these practices, companies can reduce their environmental footprint and create high-quality, sustainably manufactured apparel that resonates with consumers’ values.

Furthermore, adopting eco-innovation in the C&T sector is not just about compliance or responding to consumer pressure; it represents a fundamental shift in how businesses operate. Companies increasingly integrate sustainability into their core strategies,

recognising that long-term viability and success are intertwined with environmental responsibility. This holistic approach enables them to capture new market opportunities, foster innovation, and build stronger relationships with consumers who value ethical practices.

As companies adapt to the demands of environmentally conscious consumers, they are adopting cleaner manufacturing processes that minimise waste and contribute to a more sustainable future. This evolution reflects a broader recognition of businesses' role in addressing environmental challenges while enhancing their brand reputation and ensuring competitiveness in an increasingly eco-aware market.

7.1.2 Challenges and mitigation strategies

The research conclusions indicate that the advantages of eco-innovation significantly outweigh the challenges and obstacles C&T companies face. In the South African context, these companies encounter various difficulties, particularly financial constraints, along with barriers related to infrastructure and technology. Smaller firms, in particular, struggle with limited financial resources, which hampers their ability to transition to eco-innovative practices fully. For other companies, the challenge lies in effectively integrating sustainability into their existing operational frameworks.

Despite these challenges, many C&T companies have remained committed to pursuing eco-innovation to meet their internal needs, such as enhancing stakeholder accountability and maintaining a competitive edge in a profit-driven market. These firms recognise that adopting sustainable practices can offer customers greater value while fulfilling their corporate social responsibilities.

To address the obstacles they face, C&T companies have implemented a variety of strategies. One key approach has been to improve staff training, ensuring employees have the skills and knowledge necessary to adapt to new operational requirements accompanying eco-innovation. This investment in human capital facilitates the transition to sustainable practices and fosters a culture of sustainability within the organisation.

Larger companies have taken this further by extending support to their supply chain partners. This collaborative effort has led to the development of complementary industries focused on textile waste management, creating a more sustainable ecosystem within the industry. By working together, these companies can share resources, knowledge, and best practices, which not only helps them overcome individual challenges but also strengthens the overall sustainability of the C&T industry. While C&T

companies in South Africa face significant barriers to eco-innovation, their commitment to sustainability and their strategies to navigate these challenges demonstrate their resilience and adaptability. By prioritising training and fostering collaboration within their supply chains, these companies address their immediate operational needs and contribute to a more sustainable future for the industry.

7.1.3 The benefits of sustainable marketing

The research findings reveal that South African C&T firms are actively positioning their products as sustainably manufactured and employing various multi-channel marketing strategies to achieve this. The industry leverages online and offline platforms, including social media, monthly newsletters, and in store campaigns, to effectively showcase and promote its commitment to environmental sustainability. This approach not only highlights their eco-friendly practices but also enhances their brand image in the eyes of consumers. Through these sustainability marketing efforts, customers tend to perceive C&T companies as ethical and authentic, which fosters a stronger sense of loyalty among their consumer bases. By aligning their branding with sustainability, these firms tap into the growing market of eco-conscious consumers who prioritise environmental responsibility in their purchasing decisions.

In addition to cultivating loyalty, C&T companies strategically employ marketing initiatives to attract new eco-aware customers, which can inadvertently drive up sales. However, this approach also carries potential risks. As Kemper and Ballantine (2019) noted, marketing strategies that emphasise sustainable consumption may inadvertently reinforce a cycle of perpetual consumption. This concept fundamentally overlooks the ecological constraints and limits of our environment, raising concerns about the long-term sustainability of such practices. While the intention behind promoting sustainable products is commendable, C&T companies need to consider the broader implications of their marketing strategies. They must balance encouraging responsible consumption and avoiding the pitfalls of promoting consumption patterns that could undermine the eco-innovation initiatives they aim to support.

7.1.4 Initiatives to support eco-innovation

The outcomes of the research report highlighted a widespread call for government support initiatives to facilitate and enhance eco-innovation within the C&T industry. Given the financial challenges identified as significant barriers to adopting eco-innovative practices, C&T companies emphasised the need for government financial incentives.

These incentives could include tax breaks, adjustments to import duties on goods from low-cost production countries, and grants designed to assist companies in transitioning to sustainable manufacturing processes. The government acknowledges the critical importance of environmental sustainability and aims to promote this through the Retail Clothing Textile Footwear Leather (R-CTFL) Master Plan 2030. This ambitious initiative seeks to create a competitive, sustainable, and dynamic value chain within the R-CTFL sector, aiming to generate 330,000 jobs by 2030 (Hatzenburg & Mazema, 2023). The plan aims to boost local retail sales to R250 billion and increase local retail procurement from 45% to 65%, amounting to an additional R66 billion in the economy (Hatzenburg & Mazema, 2023).

Despite these significant objectives, the research revealed that respondents found the Master Plan lacking specific financial incentives for C&T companies. Many viewed the plan as overly complex and challenging to integrate into national policies, resulting in limited stakeholder coordination. This perceived complexity poses an additional hurdle for companies aligning their operations with the government's sustainability goals.

7.2 Research contribution

By critically analysing and refining established theories such as DIT, the research outcomes may provide more precise insights into the role of eco-innovation in the C&T industry and improve applicability in real-world situations. The processes of theory refinement not only advance academic understanding but may also enrich the discourse within the C&T field, leading to more robust and relevant theoretical developments (Crane et al., 2016).

This research report took an inductive theoretical approach to the diffusion of innovation theory. It sought to build on the DIT through the gaps initially identified in theory, specifically referring to its application in the South African context. The outcomes sought to potentially refine some of the variables of innovation adoption, as outlined in DIT. As Crane et al. (2016) note, there has been a significant increase in the refinement of theoretical frameworks within management academia. Much of this work has emerged from contexts outside the original Anglo-American settings where these theories were first developed, highlighting the importance of diverse societal perspectives in advancing theoretical understanding.

One of the gaps was that the DIT often portrays innovation users as passive recipients rather than active participants in the adoption process (Z. Lim et al., 2021). In the South African context, where there are regulatory gaps regarding eco-innovation, C&T

companies have taken a more active participatory role in adopting new eco-innovation. The outcomes of this research report show how C&T companies have the chance to lead by enhancing, developing, and applying strategies that minimise their negative environmental impact while maximising positive results. Product design has gained significance as businesses aim for sustainable long-term success, focusing on improving existing production, usage, and disposal systems and facilitating transitions to entirely new eco-innovative-driven systems (Salo et al., 2020).

South African C&T companies are not merely passive recipients of eco-innovation; they are actively driving its implementation through strategic marketing initiatives and comprehensive CSR campaigns. This proactive approach reflects a growing awareness among industry leaders and stakeholders of the importance of sustainability in the C&T industry. The research outcomes indicated that key figures within these companies are advocating for the integration and transition to eco-innovation, particularly in the absence of robust regulatory frameworks and supportive initiatives from the South African government. This indicates a grassroots movement toward sustainability, where the impetus for change comes from within the industry rather than from external mandates.

Several scholars have criticised the DIT for failing to fully account for the various contextual elements that significantly impact the adoption of innovations. These elements include cultural, economic, and social dynamics, varying wildly from one country to another (Ladds et al., 2023). In South Africa, these contextual factors are particularly relevant due to the country's diverse cultural landscape and complex socio-economic conditions. The local traditions and practices can profoundly affect the diffusion process, influencing how businesses perceive and adopt eco-innovations (Kumar & Gupta, 2023).

For instance, South Africa's readiness for innovation is closely tied to its existing regulatory frameworks, which can either facilitate or hinder the adoption of new practices. The economic climate and the availability of resources for sustainable initiatives also influence the level of support for eco-innovation. C&T companies in South Africa are navigating these challenges as they consider the types of eco-innovations to adopt. These innovations may include sustainable sourcing of fabrics, eco-design practices that minimise environmental impact, and effective waste management strategies to reduce production processes' ecological footprint.

Furthermore, companies' ambition and commitment to integrate eco-innovation into existing manufacturing processes can vary significantly. Some may adopt a piecemeal

approach, implementing eco-innovations in specific areas, while others may strive for a comprehensive overhaul of their operations to embrace sustainability fully. This variation reflects the individual company's strategic goals and its capacity to innovate within the constraints posed by the broader South African regulatory environment.

Therefore, the active role of South African C&T companies in promoting eco-innovation highlights a critical shift towards sustainability in the industry. As leaders and stakeholders drive this transition, the interplay between local contexts and the principles of DIT becomes increasingly important in understanding how these companies navigate their eco-innovation journeys. The ongoing dialogue around innovation readiness and regulatory support will be essential for fostering a more sustainable future for the South African C&T sector.

7.3 Recommendations

Based on the outcomes of this research, several key recommendations have emerged, focusing on broad industry initiatives that encompass marketing strategies, collaboration between businesses and government, and clear support measures from the government.

7.3.1 Eco-innovation success cases

The success and importance of eco-innovation in the C&T industry can be effectively highlighted through industry fairs and expos. These events can serve as platforms to showcase the benefits of eco-innovative solutions, raising awareness among various stakeholders. A coordinated initiative that brings together industry players to share best practices, the latest eco-innovative technologies, and success stories of cleaner production methods could significantly enhance the visibility and adoption of sustainable practices in the C&T sector. By collaborating and learning from one another, companies can drive the eco-innovation agenda forward, thus benefiting the industry and the environment.

7.3.2 Reimagined marketing strategies

Firstly, C&T companies need to carefully assess the implications of their marketing strategies, particularly those that drive consumerism. These companies must strike a balance between promoting responsible consumption and steering clear of marketing practices that may inadvertently encourage unsustainable consumption patterns. By doing so, they can avoid undermining the eco-innovation initiatives they strive to implement.

To effectively navigate this challenge, C&T companies should craft marketing strategies that emphasise sustainability while prioritising profitability. This approach requires a thoughtful integration of environmental considerations into marketing campaigns, ensuring that promoting eco-friendly products does not come at the expense of responsible consumption. The goal should be to create messaging that resonates with environmentally conscious consumers, thereby highlighting the benefits of sustainable practices without promoting excessive consumption.

Moreover, C&T companies should seek to adopt a dual focus on profit and environmental stewardship while ensuring that one does not jeopardise the other. This means developing marketing messages that educate consumers about the importance of sustainability and responsible purchasing decisions while demonstrating the tangible benefits of eco-innovation for both the environment and the consumer. By fostering a culture of responsible consumption, companies can build stronger relationships with their customers and enhance brand loyalty.

7.3.3 Government and business collaboration

As consumer demand for eco-friendly products continues to rise, with the implementation of more stringent regulations, it becomes increasingly important for business leaders and policymakers to work together to foster sustainability innovation within the textile industry (Harsanto et al., 2023). This collaboration is essential to meet the expectations of environmentally conscious consumers and navigate the complexities of evolving global and local regulatory frameworks. By joining forces, businesses can leverage the insights and resources of policymakers to create more effective strategies that promote sustainable practices.

This partnership can lead to the development of innovative solutions that minimise environmental impact, enhance product offerings, and ultimately ensure long-term competitiveness in a rapidly changing market. Addressing sustainability challenges collaboratively will also help pave the way for a more resilient and responsible textile industry that aligns with global sustainability goals.

In addition to refining marketing strategies, collaborative efforts between businesses and government are essential. C&T companies should engage with government entities to advocate for supportive measures to facilitate the eco-innovation transition. This collaboration can help ensure that policies are aligned with the needs of the industry and effectively address the barriers to sustainable practices.

7.3.4 Government support initiatives

While the government's intentions to promote eco-innovation through the R-CTFL Master Plan 2030 are commendable, the absence of direct financial incentives for C&T companies may hinder the effectiveness of these efforts. To support the industry's transition towards sustainable practices, the government must consider implementing clearer, more accessible financial incentives to foster better stakeholder coordination. This approach could help create a more conducive environment for eco-innovation, benefiting both the industry and the broader environmental sustainability goals.

Clear government support initiatives are crucial for fostering an environment conducive to eco-innovation. By providing tangible support, the government can help alleviate some financial burdens companies face and encourage more widespread adoption of eco-innovative practices. The effectiveness of these recommendations depends on effective collaboration among all stakeholders in the C&T industry and their commitment to prioritising long-term environmental sustainability in their operational strategies. Additionally, robust government oversight to monitor and enforce regulations could encourage the C&T sector to adopt more ambitious eco-innovative practices, which could be further encouraged by championing eco-innovation success case studies.

7.4 Limitations of the research

7.4.1 Clothing vs textile

One notable limitation identified in the research was the difficulty of effectively combining the C&T industries under a single category for analysis. These two sectors, while interconnected, differ significantly in their manufacturing processes, operational methodologies, and waste management strategies, thus making a unified approach challenging.

The textile industry, for example, is characterised by its complex production processes, which often involve multiple stages, including spinning, weaving, dyeing, and finishing. The industry generates substantial waste throughout these stages, particularly chemical effluents produced during dyeing and finishing. This type of waste can be particularly harmful to the environment, as it often contains toxic substances that require careful treatment before disposal. In contrast, the clothing industry, which is primarily focused on the assembly of garments, typically produces less waste overall. The waste generated here mainly consists of material offcuts and unsold inventory, which, while still an

environmental concern, is fundamentally different in nature and impact from the chemical waste produced in the textile sector.

This divergence in waste types and quantities emerged as a significant challenge during the study, complicating efforts to draw meaningful comparisons between the two industries. Researchers found that the differences in waste management strategies—ranging from recycling and reusing materials in the clothing industry to managing hazardous chemical waste in the textile sector—further complicated the analysis. To mitigate these challenges, the research adopted a broader categorisation that emphasised the shared characteristics and similarities between the two subsectors. By focusing on common themes such as sustainability practices and eco-innovation strategies, the research provided valuable insights while recognising the unique environmental impacts of each industry.

7.4.2 Geographic scope

Another limitation of the research report was its geographic focus, which was confined exclusively to South Africa; concentrating the study on this emerging market involved only South African C&T companies. As a result, the outcomes and analyses are primarily relevant to the South African context and may not be directly applicable to other regions or markets.

However, these outcomes could serve as a valuable reference for future comparative studies examining eco-innovation's role in other emerging markets. Such studies could enhance understanding of how different socio-economic and cultural factors influence the adoption of eco-innovation across various geographic settings, allowing for broader insights and potentially informing policy and practice in similar contexts worldwide.

7.4.3 Data collection and bias

This research report employed an interpretivism research approach, utilising semi-structured interviews as the primary method for data collection. While this qualitative methodology allowed for in-depth exploration of participants' perspectives and experiences regarding eco-innovation, it also introduced certain limitations. One significant drawback was the challenge of making generalisations based on research outcomes. The interpretivist framework emphasises understanding phenomena from the subjective viewpoints of participants, which inherently limits its ability to apply findings broadly across different contexts or populations.

Furthermore, the subjectivity of the researchers played a crucial role in interpreting the data. A noticeable inclination towards a pro-eco-innovation perspective may have influenced the analysis and conclusions drawn from the interviews. While potentially enriching the narrative around the benefits of eco-innovation, this bias may also have skewed the findings by emphasising certain themes or outcomes over others. As a result, the findings may not fully capture dissenting views or the complexities involved in implementing eco-innovative practices across varying contexts within the C&T industries. By acknowledging these limitations, researchers can better contextualise their findings and contribute to a more nuanced discussion on the role of eco-innovation in promoting sustainability within the C&T sectors.

7.5 Suggestions for future research

Future research should explicitly differentiate between the textile and clothing industries, as they each have distinct manufacturing processes and approaches to waste management. It is essential to conduct separate studies for each industry to yield more relevant outcomes and recommendations tailored to their specific manufacturing processes.

Future studies could also explore how sustainable marketing activities impact consumer markets by comparing C&T companies that practice sustainable marketing in other emerging markets. Such comparative research may offer deeper insights into marketing implications by considering these factors.

Future research could benefit from incorporating a mixed-methods approach that combines quantitative data with qualitative insights. This would enhance the robustness of the findings and allow for more comprehensive generalisations about eco-innovation. Additionally, ensuring a diverse range of perspectives in participant selection could help mitigate bias and provide a more balanced understanding of the challenges and opportunities related to eco-innovation in the South African C&T industry.

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APPENDICES

APPENDIX A: INFORMED CONSENT LETTER FOR INTERVIEWS

Gordon Institute of Business Science
University of Pretoria

Informed consent letter for interview

I am conducting research on eco-innovation (eco-friendly) manufacturing in the clothing and textile industry in South Africa

Our interview is expected to last 60 minutes and will help us understand the role of eco-innovative manufacturing in brand marketing, within the South African clothing and textile industry

Your participation is voluntary, and you can withdraw at any time without penalty. By signing this letter, you are indicating that you have given permission for:

- the interview to be recorded;
- the recording to be transcribed
- verbatim quotations from the interview to be used in the report, provided they are not identified with your name or that of your organisation;
- the data to be used as part of a report that will be publicly available once the examination process has been completed; and - all data to be reported and stored without identifiers.

If you have any concerns, please contact my supervisor or me. Our details are provided below:

Researcher name:
Email: 23023602@mygibs.co.za
Phone:

Research supervisor name:
Email:
Phone:

Signature of participant: _____ Date: _____

Signature of researcher: _____ Date: _____

APPENDIX B: INTERVIEW QUESTIONNAIRE

Research Interview questions

1. To your knowledge, when was eco-friendly / green innovation introduced into the manufacturing process.
2. What were the driving reasons for its introduction?
3. Please tell me more on the type of eco-innovative processes that has been introduced, and how does it differ from your previous manufacturing process?
4. Based on your experience, how are you harnessing the value derived from green (eco-friendly) innovation in the C&T industry?
5. In your experience, what are some of the monitoring and reporting tools the being used to record the environmental impact of their manufacturing processes, if any?
6. What are some of the practical ways that you have been marketing their eco-friendly product offering?
7. And what have been the benefits of it (internally and externally)?
8. How do you think the introduction of green technology / practices has impacted your sales and branding strategies?
9. What are some of the marketing strategies that you use to market eco-friendly apparel?
10. To your knowledge, what have been some of the challenges that you have experienced with regards to the adoption of green eco-friendly innovation?

11. How did you mitigate/overcome these?

12. Are you aware of any government interventions that assist with the uptake and use of green innovation in the C&T industry,

13. Are you making use of these interventions?

14. What more do you think clothing manufactures /you can do to increase the levels of eco-friendly green innovation in the South African C&T industry?

15. What more do you think the South African government can do to increase the levels of eco innovation in the South African C&T industry?

16. Do you know of any future plans in the South African C&T industry to grow and or encourage green innovation?

APPENDIX C: LIST OF CODES

Codes	Codes	Codes	Codes	Codes
1. Around 2017	2. Challenges in Accessing Funding for Technological Upgrades	3. Monitoring and Documenting Implementation through Case Studies	4. Anticipated circular economy benefits in diverse product lines	5. Environmental impact across the supplier network
6. Reverse engineering	7. Waiting for the Availability of Scraps for Production	8. Localisation and job creation	9. Emerging fabric waste management and recycling initiatives	10. Transition to in-house recycling management
11. Textile Recycling Practices	12. Order-Based Monitoring	13. Manufacturing Incentives	14. Financial reporting	15. Process improvement
16. Repurpose	17. Minimal Reporting	18. Environmental and Community Responsibility	19. Environmental impact on resource consumption	20. Waste consolidation
21. Waste minimisation	22. Goodwill-Driven Practices	23. Alignment with corporate strategy	24. 3 years ago	25. Involvement in emerging local technologies
26. Ethical reasons	27. Awareness of Government Interventions (Limited to Non-Local)	28. Resource optimisation	29. Sustainability	30. Drive towards localisation
31. Environmental and waste concerns	32. Facilitating EU export	33. Exchange global best practices	34. Compliance with BEE	35. Barriers to Implementing Green Initiatives: Cost, Supply Chain, and Market Readiness
36. Intellectual property protection	37. 2006	38. Training and upskilling	39. Manufacturing localisation	40. Use of Post-Consumer Waste in Product Design
41. Cultural value	42. Potential savings	43. Water infrastructure challenges	44. Design and reuse initiatives	45. Government Leadership in Promoting Sustainability

				and Job Creation
46. Economic Efficiency	47. Resource optimisation	48. Alternative electricity sources	49. Engagement in sustainable cotton initiatives	50. 2010
51. Dependency on Waste Availability for Production	52. Focus on Chemical and Textile Waste Management Solutions	53. Early stages of eco-material assessment	54. Initiatives on hemp	55. Market demands and customer expectations
56. Commitment to Positive Change	57. 7 years ago	58. Manufacturing localisation	59. Need for Industry Protection in Green Initiatives	60. Sustainability Practices
61. Customer benefit	62. Electricity consumption	63. 7 years ago	64. Evolution of Integration	65. Financial Burden of Eco-Friendly Implementation
66. Infrastructure Adaptation for Sustainable Technology	67. Transition from Electricity-Intensive to Pneumatic Cutting Processes	68. Reduced energy consumption and emission	69. Global awareness and responsibility	70. Building Brand Loyalty
71. Resource Accessibility and Feasibility	72. Environmental Consciousness	73. Coal Use on Fabric Production and Steam Generation	74. Comprehensive Sustainability Accountability	75. Internal Campaigns for Sustainability Awareness
76. Multi-channel marketing	77. Minimalism	78. Financial and environmental benefit	79. Commitment to sustainable manufacturing practices	80. Leadership Engagement and Advocacy
81. Customer-Centric Communication	82. Industrial Shifts	83. Environmental Monitoring	84. Use of eco-friendly machines and material	85. Awareness of Government Interventions (Limited to Non-Local)
86. In Store Advertising (Posters and Video Displays)	87. Financial Constraints	88. Regulatory compliance	89. Brand Storytelling for Value Creation	90. Financial support

91. Source eco-friendly material	92. Government legislation	93. Balancing Financial and Environmental Sustainability Goals	94. Comprehensive staff training	95. Commitment to Eco-friendly Manufacturing Practices
96. Understanding the True Impact of Recycling	97. Continuous Innovation	98. Seeking Energy Efficiency for Cost Reduction	99. Waste Management Education	100. Waste reduction and repurposing
101. Incentives for Resource Conservation in Business Operations	102. Awareness of Government Interventions (Limited to Non-Local)	103. Pursuing Cleaner and Cost-Effective Energy Solutions	104. Dedicated waste management department	105. Enhanced Waste Management and Recycling
106. Certified Organic Fabric Sourcing	107. Traceability	108. Usage and Cost reporting	109. Enhanced Waste Management and Recycling	
110. Challenges in Partner Accountability and Process Adaptation	111. Translating Concepts into Marketable Products	112. Textile waste management regulation	113. Sustainable material sourcing	
114. Proactive Support and Collaborative Problem-Solving	115. Authenticity in recycled product marketing	116. Broad Environmental Benchmarking and Traceability		
117. Computerised reporting	118. Consumer Desire vs. Sustainability	119. Commitment to Sustainability and Business Excellence		

APPENDIX D: CONSISTENCY MATRIX

Research Question	Literature Review	Data Collection Tool/Interview Questions	Data Analysis
SQ - 1: What are the current eco-innovative manufacturing processes that South African based C&T companies are using?	(Silvestre, 2015)	[1] When did the company introduce eco-innovation into its manufacturing process? [2] what were the reasons for its introduction? [3] What type of eco-innovation has the company introduced? [4] how does it differ from the previous manufacturing process?	What are the current green eco -innovative trends in the C&T sector? How widely used are some of these innovations?
SQ2: What benefits, if any, have C&T companies realised through eco-innovation?	(Ahmad et al., 2020). (Arilla-Llorente et al., 2024)	[5] Based on your experience, how are you harnessing the value derived from green (eco-friendly) innovation in the C&T industry? [6] In your experience, what are some of the monitoring and reporting tools being used to record the environmental impact of manufacturing processes, if any? [10] To your knowledge, what have been some of the challenges that you have experienced about the adoption of green, eco-friendly innovation, [11] How are companies mitigating/overcoming these challenges?	Asses if companies are realising the same benefits (financial or otherwise). Are there any reoccurring patterns in the drivers of a company adopting eco-innovation?
SQ3: Why and how are C&T companies marketing their eco-innovative apparel?	Kemper & Ballantine (2019);	[7] What are some of the ways you could market sustainable apparel/textiles? [8] In your opinion, are consumers influenced by whether or not apparel is sustainably manufactured?	Identify themes relating to marketing and communication channels per DTI adopted by eco-innovative C&T companies.

		[9] How do you think the introduction of sustainability has impacted companies' sales and branding strategies? [12] What more can clothing manufacturers/you do to increase the levels of eco-friendly green innovation in the South African C&T industry?	
SQ4: What can the South African government do to foster eco-innovation in the industry?	Whitfield & Mkhabela, (2023); Mbatha (2021)	[13] In your opinion, what role should the government play in increasing the uptake of green innovation in the industry? [14] How should the government approach interventions in addressing environmental sustainability in the C&T industry? [15] What would you or your organisation do to grow and encourage green innovation uptake in the C&T industry shortly?	Understand if underlying constraints and opportunities drive eco-innovation in the South African context.