Adoption of Environmental Management Accounting in the Textile Manufacturing Industry of South Africa

by

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Adoption of Environmental Management Accounting in the Textile Manufacturing Industry of South Africa

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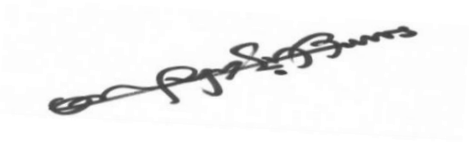

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DEDICATION

This study is dedicated to God, my refuge and strength, a very present help in every difficulty.

To Mother Earth, for offering all the natural resources necessary for human survival, despite our ceaseless interference with nature.

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ABSTRACT

The global profile of environmental concerns has intensified the demand to develop greener practices. This study investigated the green practices employed by textile manufacturing organisations (TMOs) in South Africa, and the benefits thereof for such organisations. This study, likewise, examined the indicators of the successful adoption of green practices among TMOs in SA. The qualitative accounts presented in this study were compiled using existing literature, in-depth interviews, and web-based document analysis. The generated data were thematically analysed, and the study findings indicate that TMOs in SA employ activity-based costing and material flow cost accounting, primarily for cost allocation and waste minimisation. The findings of this study also indicate that coercive pressure, in the form of environmental compliance monitoring, is lacking in the textile manufacturing industry (TMI) of SA. This study suggests that TMOs may require several practices to meet their environmental objectives. Therefore, future work can focus on the use of water management accounting (WMA) in TMOs.

Keywords: activity-based costing, environmental costs, management accounting, life-cycle costing, material flow cost accounting, product environmental footprint, textile manufacturing industry

OKUCASHUNIWE

Uhlaka lomhlaba wonke lokukhathazeka kwemvelo lukhulise isidingo sokuthuthukisa izinqubo eziluhlaza. Lolu cwaningo luphenye izindlela eziluhlaza ezisetshenziswa yizinhlangano ezikhiqiza izindwangu (TMOs) eNingizimu Afrika, kanye nezinzuzo zazo kulezo zinhlangano. Lolu cwaningo, ngokufanayo, luhlole izinkomba zokwamukelwa ngempumelelo kwezinqubo eziluhlaza phakathi kwama-TMO eNingizimu Afrika. Ulwazi lwezezimali olwethulwe kulolu cwaningo luhlanganiswe kusetshenziswa izincwadi ezikhona, izingxoxo ezijulile, nokuhlaziywa kwemibhalo esekelwe kusizindalwazi. Imininingwane ekhiqiziwe yahlaziywa ngokwendikimba, futhi okutholwe ocwaningweni kubonisa ukuthi ama-TMO eNingizimu Afrika asebenzisa izimali zezindleko ezisekelwe emsebenzini kanye nethuluzi elisetshenziswa yizinkampani ezikhiqizayo ukuthuthukisa ukusebenza kahle kwezinto zabo ukuze zonge, ikakhulukazi ekwabiweni kwezindleko kanye nokunciphisa imfucuza. Okutholwe kulolu cwaningo kuphinde kukhombise ukuthi ingcindezi ephoqayo, ngendlela yokuqapha ukuthotshelwa kwemvelo, ayikho embonini yokukhiqiza izindwangu (TMI) yaseNingizimu Afrika. Lolu cwaningo luphakamisa ukuthi ama-TMO angadinga izinqubo ezimbalwa ukuze ahlangabezane nezinhloso zawo zemvelo. Ngakho-ke, umsebenzi wesikhathi esizayo ungagxila ekusetshenzisweni kwesilinganiso sokuphathwa kwamanzi (WMA) kuma-TMO.

Amagama asemqoka: izindleko ezisuselwe emsebenzini (activity-based costing), izindleko zemvelo (environmental costs), Ukuphathwa kwezimali (management accounting), ukugcinwa kwamarekhodi ezindleko zempahla ebonakalayo kuyo yonke impilo yempahla (life-cycle costing), ithuluzi elisetshenziswa yizinkampani ezikhiqizayo ukuthuthukisa ukusebenza kahle kwezinto zabo ukuze zonge (material flow cost accounting), indlela entsha yokulinganisa ukusebenza kokusimama (product environmental footprint), imboni yokukhiqiza izindwangu (textile manufacturing industry)

OPSOMMING

Die wêreldwye profiel van omgewingsbesorgdhede het die aanvraag vergroot om groener praktyke te ontwikkel. Hierdie studie het die groen praktyke ondersoek wat deur tekstielfabrikasie-organisasies in Suid-Afrika aangewend word, asook die voordele daarvan vir sulke organisasies. Hierdie studie het ook die aanwysers van die suksesvolle aanname van groen praktyke onder tekstielfabrikasie-organisasies in Suid-Afrika ondersoek. Die kwalitatiewe beskrywings in hierdie studie is saamgestel deur die gebruik van bestaande literatuur, in-diepte onderhoude en webgebaseerde dokumentontleding. Die gegenereerde data is tematies ontleed, en die bevindings van die studie dui aan dat tekstielfabrikasie-organisasies in Suid-Afrika aktiwiteitsgebaseerde kosteberekening (*activity-based costing*) en materiële vloei-kosteberekening (*material flow cost analysis*) aanwend, hoofsaaklik vir kostetoewysing en die minimalisasie van afval. Die bevindings van hierdie studie dui ook aan dat daar ’n gebrek is aan dwangdruk, in die vorm van die kontrole van omgewingsgehoorgewing, in die tekstielfabrikasiebedryf van Suid-Afrika. Hierdie studie se voorstel is dat tekstielfabrikasie-organisasies verskeie praktyke kan benodig om aan hulle omgewingsdoelwitte te voldoen. Dus kan toekomstige navorsing fokus op waterbestuursrekenkunde (*water management accounting*) in tekstielfabrikasie-organisasies.

Sleutelwoorde: aktiwiteitsgebaseerde kosteberekening, omgewingskoste, bestuursrekenkunde, lewensiklus-kosteberekening, materiële vloei-kosteberekening, omgewingsletsel van produkte, tekstielfabrikasiebedryf

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LIST OF ABBREVIATIONS

ABC	-	Activity-based costing
ACCA	-	Association of Chartered Certified Accountants
AI	-	Artificial intelligence
BIS	-	Black Industrialist Scheme
BCG	-	Boston Consulting Group
BP	-	British Petroleum
BRICS	-	Brazil, Russia, India, China, and South Africa
CASs	-	Conventional accounting systems
CCTC	-	Cape Clothing and Textile Cluster
CIMA	-	Chartered Institute of Management Accountants
COD	-	Chemical oxygen demand
CEO	-	Chief Executive Officer
CFO	-	Chief Financial Officer
CTCP	-	Clothing and Textile Competitiveness Programme
CTFL	-	Clothing, textiles, footwear, and leather
DIT	-	Diffusion of Innovation Theory
EMA	-	Environmental management accounting
EMAPs	-	Environmental management accounting practices
EABC	-	Environmental activity-based costing
ERPSs	-	Enterprise resource planning systems
EEA	-	European Environmental Agency
FAMA	-	Facility and Merchandise Authorization
FD	-	Finance Director
GDP	-	Gross domestic product
GHGs	-	Greenhouse gases
HFO	-	Heavy fuel oil
IFAC	-	International Federation of Accountants
IDC	-	Industrial Development Corporation
ISO	-	International Organisation for Standardisation
IT	-	Information technology
JSE	-	Johannesburg Stock Exchange
JIT	-	Just-in-Time

KCTC	-	KwaZulu-Natal Clothing and Textile Cluster
LCA	-	Life-cycle assessment
LCC	-	Life-cycle costing
LED	-	Light-emitting diode
MFCA	-	Material flow cost accounting
MEMA	-	Monetary environmental management accounting
NDA	-	Non-disclosure agreement
PEF	-	Product environmental footprint
PEMA	-	Physical environmental management accounting
SADC	-	Southern African Development Community
SASTAC	-	Southern African Sustainable Textile and Apparel Cluster
SDGs	-	Sustainable Development Goals
SMEs	-	Small and medium enterprises
SAICA	-	South African Institute of Chartered Accountants
TAM	-	Technology Acceptance Model
Texfed	-	Textile Federation
TMI of SA	-	Textile Manufacturing Industry of South Africa
TMOs in SA	-	Textile Manufacturing Organisations in South Africa
TQM	-	Total quality management
TRA	-	Theory of Reasonable Action
UNISA	-	University of South Africa
UN	-	United Nations
UNESCO	-	United Nations Educational, Scientific and Cultural Organisation
UNDSD	-	United Nations Division for Sustainable Development
USEPA	-	United States Environmental Protection Agency
USA	-	United States of America
WMA	-	Water management accounting
WTO	-	World Trade Organization

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This study investigates the adoption of environmental management accounting (EMA) by textile manufacturing organisations in South Africa (TMOs in SA). This study will also identify the environmental management accounting practices (EMAPs) that TMOs in SA employ to minimise waste and negative environmental impact. Johnson (2004:1-2) contends that organisations' poor environmental behaviour and greenwashing have amplified the global profile of environmental problems. Major industrial accidents such as the Bhopal chemical leak in India in December 1984 is deemed one of the world's worst chemical disaster (Yeo *et al*., 2017:361). The Exxon Valdez oil spill in Alaska in March 1989 and the British Petroleum (BP) deep-water horizon oil rig explosion in the Gulf of Mexico in April 2010, both considered to be the most environmentally destructive oil spills in the history of North America, have further raised the global profile of environmental issues (Gill, Picou and Ritchie, 2012:3; Kastler *et al*., 2019:2). Likewise, the MV Solomon Trader fuel oil spill in the Solomon Islands in February 2019 stresses the importance of the impact of environmental pollution (Newcastle Herald, 2019:1). The oil spill is gradually destroying the United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage marine reserve on the island, impeding the economic activities and source of living of the islanders (Osifelo and Martin, 2019:1).

The escalating environmental damage and lack of suitable actions tailored towards curbing poor environmental behaviour have intensified the global awareness and media coverage of major issues such as the decline in natural resources, damage to natural habitats, the greenhouse effect and global warming. These issues have informed the probing into several organisations' activities and business practices that impact the environment negatively, with several demands for change (Fakoya, 2016:1019). Across the globe, countries progressively face environmental challenges. For example, China has enjoyed high industrial growth in Asia in recent years, accompanied by environmental depredation. This has called for numerous changes to achieve economic growth with no subsequent environmental problems (Qian, Burritt and Chen, 2015:407). In southern Africa, for instance, the major environmental issues emanate from industrial pollution, land degradation and waste disposal. These present problems for the public and private sectors to pursue long-term solutions to sustainable business practices (Darkoh, 2009:93).

In South Africa, the adoption of sustainable practices and integrated reporting has provided

insight into how listed organisations interact with the external environment (Iredele and Moloi, 2020:1). The use of EMA is not mandatory for South African organisations (Smit and Kotzee, 2016:152); however listed organisations have mandatory reporting obligations concerning their environmental activities (de Villiers and Maroun, 2018:5). Small and medium enterprises (SMEs) serve as the backbone of many developing economies. In South Africa, for instance, SMEs are major contributors to the economy and serve as a source of employment for young people (Mabesele, 2020:3). SMEs promote economic growth and development, but they are also the bane of environmental problems in several developing economies (Sahu *et al.*, 2021:16). This study presents various contributions to previous research. First, the EMAPs employed by TMOs in SA are identified. Second, a framework for adopting EMA is also considered for the TMI of SA. Lastly, the current state of the TMI of SA is presented. This will provide valuable information that may assist in improving policy design and implementation by the government and other industry players.

1.1.1 Goal of chapter

This chapter introduces this study and presents a background to the research problem. Then, to unpack the study's motivations, scope and limitations, this chapter outlines the concepts underpinning the research problem and the appropriate methodology for this study.

1.1.2 Layout of chapter

Following the introduction, this subsection provides a layout of this chapter. First, in Sections 1.1 and 1.2, the chapter's introduction and background to the study are presented. Section 1.3 follows with a discussion of the problem statement, and Section 1.4 presents the research question. The research objectives are outlined in Section 1.5. Next, section 1.6 presents the thesis statement, and Section 1.7 outlines the definition of terms utilised in this study. Next, in Section 1.8, the research methodology is presented. Next, the delineation and limitations are considered in Section 1.9. Next, section 1.10 examines the ethical considerations, and Section 1.11 considers the significance of this study. Lastly, Section 1.12 outlines a structured layout of the chapters, and Section 1.13 concludes the chapter with a summary.

1.2 BACKGROUND TO THE STUDY

South Africa's reliance on fossil fuel as its main energy source, and its dependence on an extensive carbon-intensive energy system, especially by the industrial sector, has increased

greenhouse emissions with devastating environmental impacts (Nene and Nagy, 2021:234). A recent study shows that about 81% of South Africa's energy is sourced from coal (Nene and Nagy, 2021:234). Consequently, South Africa's greenhouse emission level remains very high at 9.3 tons per individual in comparison to neighbouring countries such as Mozambique and Zambia, with greenhouse emissions of 0.1 and 0.07 tons per individual, respectively (Pillay, 2017:1). Owing to global recognition of environmental problems, South Africa has begun to appreciate the significance of engaging and employing environmentally friendly practices (Doorasamy and Garbharran, 2015:14). This is due to the increased awareness that the use of fossil fuel presents a threat to people's health, sources of reliable and safe water, and availability of arable lands.

Organisations are frequently confronted with the potential costs of employing environmentally friendly practices. These organisations may also incur costs for business activities that generate negative environmental impacts. These costs may include waste minimisation costs such as waste treatment or process design (BPP Learning Media, 2021:591). Organisations may also incur costs from negative environmental behaviour, such as regulatory fines or lawsuits (Smit and Kotzee, 2016:152). Organisations, consequently, may employ systems or practices to minimise environmental costs. According to Burritt, Hahn and Schaltegger (2002:40), Conventional Accounting Systems (CASs) provide information concerning the economic performance of organisations to support and improve current and future decisions. In contrast, Qian, Hörisch and Schaltegger (2018:1609) argue that CASs ignore the balance between profitability and environmental responsibility. In support of this statement, Le and Nguyen (2019:11) contend that managers have no visibility of and incentive to manage environmental costs because CASs disregard the impact of environmental issues.

Burritt, Hahn and Schaltegger (2002:41) plead that EMA provides valuable information organisations require to manage environmental costs and minimise negative environmental impact. EMA is required in operations and strategic planning because it assists organisations in improving efficiency and productivity in resource usage (Schaltegger, Viere and Zvezdov, 2012:74). EMA can be described as a management accounting tool that assists organisations in generating physical and monetary information (Burritt, Hahn and Schaltegger, 2002:41-43). Therefore, adopting EMA may provide valuable information on environmental costs, allowing organisations to manage resource consumption and the impact of harmful waste. According to Kozlowski, Bardecki and Searcy (2014:13), TMOs generate wastes that have a negative impact on the environment. Therefore, TMI negatively impacts the environment

through waste from finished products and resources used in production, such as raw materials, energy, and wastewater (Yaseen and Scholz, 2019:1193). Watson, Jonas and Tärneberg (2017:3) argue that Europe's environmental impact from energy, materials and chemicals employed in textile production was 4-6% in 2017. Likewise, Jonas *et al.* (2017:10) claim that the fashion industry in 2015 utilised 79 billion cubic metres of water, producing about two million tons of greenhouse emissions and 92 million tons of waste products. Jonas *et al.* (2017:10) caution that by 2030 these figures are estimated to grow by at least 50%.

In South Africa, the textile and clothing industry features a substantial number of small organisations that have informal operations (Le Roes-Hill *et al*., 2017:2). The revenue derived from factory-made textiles in South Africa was about R25 billion in 2017, and R14 billion accounted for revenue from finished textile goods (Markets and Research, 2018:2). The TMI of SA consists of 20 top organisations with about 150 employees as at the close of 2017. Accordingly, five organisations control about 40% of the industry's total income (Markets and Research, 2018:2). The TMI of SA has been mainly impacted by illegitimate and low-priced imports of raw materials and finished textiles from Asia (Le Roes-Hill *et al*., 2017:2). The level of imports has increased because of the trade agreements between South Africa, China, and several other African economies. This has led to a reduction in homemade textile products, resulting in the contraction of the textile industry and a decline in employment (Claassens, 2017:4). The environmental issues arising from the activities of TMO in SA have, nonetheless, increased (Mazibuko *et al*., 2019:720). Therefore, EMA adoption may be valuable for TMOs in SA for identifying and managing environmental costs.

Ambe (2007:65) claims that, in some instances, features of EMA can be found in South African organisations. Likewise, Smit and Kotzee (2016:159) suggest that a reasonable level of some attributes of EMA awareness exists in the South African chemical industry. The low level of EMA adoption, however, persists in South Africa because organisations are unwilling to embrace new environmental initiatives unless regulators impose them (Doorasamy and Garbharran, 2015:15; Nyide, 2017:38). The low level of adoption may also be due to the significant investment required for funding environmental initiatives. Furthermore, Shah *et al*. (2018:450) contend that EMA benefits are typically long-term, as such organisations may not immediately realise the benefits of EMA adoption. This study aims to explore EMA adoption by TMOs in SA and establish what EMAPs they use to manage environmental costs and harmful environmental waste. This will be delivered by reviewing existing literature on EMA adoption. In addition, the benefits of EMA will also be examined. Institutional and contingency

theories will support this study as a theoretical underpinning. Finally, the findings of this study may provide useful information on the indicators of the successful adoption of EMA in the TMI of SA.

1.3 PROBLEM STATEMENT

CASs provide managers with information to support and improve current and future decision-making. In addition, CASs emphasise profit maximisation as the primary indicator of business performance, with profit determined by apportioning costs to general overheads (Burritt, Hahn and Schaltegger, 2002:40; De Villiers and Maroun, 2018:2). Notwithstanding these strengths, it may be contended that CASs disregard the balance between the conflicting objectives of profitability and environmental responsibility (Qian, Hörisch and Schaltegger, 2018:1609). Literature review reveals a rising awareness of CASs weakness in highlighting the environmental impact and controlling environmental costs (Fakoya, 2015:155; Mokhtar, 2015:12; Burritt *et al.*, 2019:480). CASs fail to provide a critical focus on the existence and size of environmental costs to support environmental decision-making (Christ and Burritt, 2013:1190). Accordingly, environmental costs incurred by organisations are ignored because they are considered general overheads (Lien *et al.*, 2017:26).

Globally, textile organisations cause devastating and harmful environmental impacts from dry waste, wastewater and gas emissions generated from their operations (Toprak and Anis, 2017:429; Ghaemmaghami, Zamani and Shafiei, 2018:187). They may lack awareness and understanding of the impact of their operations on the environment due to the absence of relevant information. The TMI of SA has particular environmental contours that prompt a deepened investigation into EMAPs that TMOs in SA employ to manage environmental costs (Smal, 2016:190; Le Roes-Hill *et al.*, 2017:2; Khumalo, 2019:3). This generates a knowledge gap in terms of evidenced-based costing around environmental concerns and the attendant action that should be taken regarding environmental actions, impacts, and cost measurement thereof.

EMA provides significant visibility on the existence, nature, and size of environmental costs, consequently making them part of financial cycles and strategic actions (Christ, Burritt and Varsei, 2016:460). In addition, EMA may facilitate setting results-based indicators that minimise negative environmental impact and manage the environmental dimensions of any value chain. EMA, therefore, highlights costs related to the environment and provides organisations with tools to manage negative environmental impact (van der Poll, 2015:11).

Literature review spanning two decades emphasises the growing awareness of EMA in South Africa (Ambe, 2007:59; Doorasamy, 2016:269; van der Poll, 2021:88), yet there is insufficient evidence to support the efficacy of EMA in small organisations which is the case of the TMOs in SA. EMA research on small manufacturing organisations in South Africa is limited to micro-brewery (Fakoya, 2016:1022-1023) and Gauteng Province (Nyahuna and Doorasamy, 2021:106). Consequently, research is required to investigate EMA adoption in TMI of SA and the EMAPs that TMOs in SA use to manage environmental costs.

1.4 RESEARCH QUESTIONS

The research questions below were formulated to aid the research problem stated above.

RQ1: What practices do the selected textile manufacturing organisations in South Africa use to manage environmental costs?

RQ2: What benefits does environmental management accounting adoption bring to the selected textile manufacturing organisations in South Africa?

RQ3: What indicators stimulate the successful adoption of environmental management accounting amongst the selected textile manufacturing organisations in South Africa?

The answers to these research questions will provide relevant information on EMA adoption in the TMI of SA.

1.5 RESEARCH OBJECTIVES

The following research objectives were designed based on the research questions.

RO1: Identify the practices that a selection of textile manufacturing organisations in South Africa use for managing environmental costs.

RO2: Explore the benefits of environmental management accounting adoption for the selected textile manufacturing organisations in South Africa.

RO3: Ascertain the indicators of successful adoption of environmental management accounting amongst the selected textile manufacturing organisations in South Africa.

1.6 SIGNIFICANCE OF THE STUDY

Several organisations and individuals may find this study useful. This study investigated EMA adoption in the TMI of SA, and the categories of environmental waste produced by TMOs in

SA were identified as carbon emission, wastewater, and dry waste. Also, at least 50% of the selected TMOs in SA acknowledge that wastewater is the dominant environmental waste generated from their operations. Similarly, Madhav *et al.* (2018:32) agree that textile manufacturing consumes a substantial amount of water and produces a sizeable proportion of harmful waste in waterways. Askham and van der Poll (2017:1) claim that South Africa is experiencing a water disaster because of water shortages and poor quality of accessible water. This establishes a case for TMOs in SA to minimise water usage because of the scarcity of quality water and the harmful environmental impact of wastewater. In Cape Town, for instance, it is mandatory for TMOs to minimise the use of municipal water consumption by 45% (GreenCape, 2019:2). The expectation, consequently, is an increase in accessible water, improvement in water quality as well as a reduction in harmful wastewater generated by TMOs in Cape Town.

EMAPs employed by the sampled TMOs were identified as ABC, MFCA, and PEF, and at least 50% of the selected TMOs in SA employ ABC for managing environmental costs. The identified EMAPs employed by TMOs in SA were matched against the categories of harmful waste generated. The TMOs that used MFCA for managing environmental costs generated a significant level of wastewater as their main waste. Likewise, TMOs employing ABC to manage environmental costs generate significant dry waste. It is plausible that TMOs will deploy the most efficient EMAP to manage environmental costs. Therefore, TMOs in SA may employ EMAPs based on their specific situation and condition. TMOs in SA may also adopt several EMAPs to meet their environmental objectives. Burritt *et al.* (2019:489) agree that organisations may require multiple EMAPs to manage environmental costs efficiently and effectively. Consequently, TMOs in SA may combine MFCA and ABC with other EMAPs based on their particular situation and condition to adequately manage environmental costs.

This study also identified that TMOs in SA employ EMAPs majorly for cost allocation and waste minimisation. This indicates that EMAPs such as ABC and MFCA may be valuable for addressing the conflicting objectives between profitability and environmental responsibility. Likewise, with innovative EMAPs, individuals may be able to identify improvement in their job performance, and TMOs in SA may also be inclined to use new EMAPs that are superior to existing EMAPs. Furthermore, the proposed EMA adoption framework may also support TMOs in SA when choosing suitable EMAPs, facilitating identifying and managing environmental costs and eliminating negative environmental impact.

1.7 THESIS STATEMENT

EMAPs such as material flow cost accounting (MFCA) and activity-based costing (ABC) will highlight and make the size of environmental costs visible, such that TMOs can set targets to focus on minimising negative environmental impact and improving economic performance.

1.8 DEFINITION OF TERMS AND CONCEPTS

Environmental management accounting (EMA): managing environmental and economic performance by developing and implementing environment-related accounting systems and practices. While this may consist of reporting and auditing in some companies, EMA typically involves life-cycle costing (LCC), full-cost accounting, benefits assessment, and strategic planning for environmental management (IFAC, 2005:19).

Life-cycle costing (LCC): considers costs associated with the whole lifecycle of a product, from development and manufacture to its use and subsequent disposal (Steen, 2005:108).

Activity-based costing (ABC): apportions costs based on the activities that cause the cost to rise. These activities are known as cost drivers (Schaltegger and Müller, 1997:4).

Product environmental footprint (PEF): aggregates the environmental impacts of raw materials usage, supply chain activities, greenhouse effect, climate change, natural resource depletion, including animal and plant well-being (Wu and Su, 2021:3).

Material flow cost accounting (MFCA): quantifies the flows of materials in processes or production lines in physical and monetary units (ISO, 2011:3).

Environmental activity-based costing (EABC) distinguishes between environmental-related and environmental-driven costs (BPP Learning Media, 2021:591).

Environmental-related costs: are costs that can be ascribed to a combined environmental cost centre, such as a waste treatment plant (BPP Learning Media, 2021:591).

Environmental-driven costs are concealed under general overheads and cannot be associated specifically with a combined environmental cost centre, although they relate to environmental drivers (BPP Learning Media, 2021:591).

Coercive pressure: occurs from interest and power originating from influential stakeholders, such as regulators, suppliers, customers, employees and environmental activists that act as a voice for the planet and environment (Dimaggio and Powell, 1983:150-151).

Mimetic pressure: emphasises the reactions to effective practices of other organisations. It may equally involve organisations benchmarking their business strategies and practices with other organisations to improve upon them (Dimaggio and Powell, 1983:151-152).

Normative pressure: highlights the need for voluntary compliance emanating from collective expectations, norms, and standards. Normative pressure stems from activities within industry or trade associations, training, education, and professional networks (Dimaggio and Powell, 1983:152-154).

1.9 RESEARCH METHODOLOGY

The research methodology consists of strategies for collecting and analysing data (Tracy, 2019:38). The interpretivists argue that social reality is subjective and contingent on specific circumstances. The emphasis on human interpretation of events leads interpretative research to be identified directly with qualitative research (Biggam, 2018:172-173). This study adopted a qualitative approach to explore EMA adoption in the TMI of SA. A similar approach adopted by Lee and Gunarathne (2019:7) compared EMA implementation in Australia and Sri Lanka, where semi-structured interviews and thematic analysis of qualitative data were employed. The research data for this study was compiled using existing literature, in-depth interviews, and a web-based document analysis. The target population was the TMOs in the three major textile clusters of South Africa. A purposeful sampling method was employed and individuals and sites that fit the parameters of this research were selected intentionally. Qualitative data analysis involves the ability to interpret text and descriptive data to search for patterns and themes (Creswell and Creswell, 2018:313). Consequently, the interview recordings were transcribed into words and the resulting data was analysed using thematic analysis.

1.10 DELINEATION AND LIMITATIONS

This research was conducted within certain boundaries and encountered some constraints. First, the research was conducted within the TMI of SA, which comprises small manufacturing organisations concentrated in three provinces, Gauteng, KwaZulu-Natal, and the Western Cape. This study provided relevant information from the South African context, consequently, efforts to apply the findings of this study outside the TMI of SA may be challenging. Second, the data collection and analysis method may introduce some level of subjectivity, even where specific procedures like open-ended questions and method triangulation are applied for control (Vaismoradi *et al.*, 2016:107). Lastly, information involving environmental compliance and reporting is regarded as highly confidential by TMOs in SA. This limited the level of

disclosure by research participants, nevertheless, the findings of this study were reinforced by employing relevant literature and web-based document analysis to support in-depth interviews. Madhav *et al.* (2018:31-32) suggest that water is an essential resource input for textile wet processing, therefore, EMAP such as WMA may be valuable for managing environmental costs and minimising the negative environmental impact of TMOs in SA. However, a key limitation of this study is the scarce literature on WMA (Olusanmi *et al.*, 2021:8); consequently, there is limited evidence linking the benefits of WMA use with economic and environmental performance.

1.11 ETHICAL CONSIDERATIONS

This study utilised an in-depth interview method for gathering data. Therefore, the researcher came into contact with some of the selected participants during the interviews. This study observed all ethical requirements stipulated by UNISA, and ethical clearance was obtained from the UNISA College of Accounting Sciences Research Ethics Committee before conducting the interviews. The ethical clearance is provided in Appendix D. Also, permission to collect research data was sent to several organisations, of which 10 participants formally agreed to participate in the research interviews. All personal identifiers were removed from research-related information.

Furthermore, only the researcher has access to all research-related information. All electronic-based records stored on his computer and audio recording device are password-protected, and paper-based records are stored at his home. Plagiarism was avoided, and an originality report from a plagiarism detection software is provided in Appendix E.

1.12 LAYOUT OF THE STUDY

This research comprises five chapters, each structurally presented below, with discussions on the contents of the chapters.

Chapter One introduces and provides the background to this study. Additionally, this chapter highlights the big picture and links it to the research problem, questions, and objectives.

Chapter Two provides the context of this study. Likewise, this chapter reviews existing EMA literature and outlines the theoretical lens underpinning this study.

Chapter Three presents the research methodology for this study. Each process stage is described sequentially to provide concise accounts of the research strategies adopted.

Chapter Four presents a detailed analysis of the findings. Discussions on the implications of the findings of this study are also presented.

Chapter Five provides the research summary, recommendations, and conclusion. Finally, areas for further research are suggested based on the findings of this study.

1.13 SUMMARY

This chapter introduced this study and presented a background to the research problem. The global profile of environmental disasters and the urgency to address the negative impact of poor environmental behaviour were outlined. An overview of the research methodology and ethical considerations were discussed. The chapter concluded with a structural layout of the content of each chapter. The next chapter provides the context of this study and presents a comprehensive review of the existing knowledge on EMA.

CHAPTER TWO: ENVIRONMENTAL MANAGEMENT ACCOUNTING: A LITERATURE REVIEW

2.1 INTRODUCTION

Chapter One presented the research background, the problem statement, and the objectives. An outline of the adopted research methodology, the research limitations, and the chapter outlines were also introduced. This chapter overviews the research context, offering background information on the TMI of SA and the development of EMA. Additionally, in this chapter, the researcher reviews the extant literature on what is known about EMA adoption by TMOs. A literature review incorporates the critical analysis and synthesis of the information to facilitate the identification of prospective inconsistencies, conflicts, and gaps in the literature. This provides the evidence necessary to support the findings of this study further and contribute new information to the existing body of knowledge. Finally, the theoretical perspective presents competing theoretical frameworks underpinning this study. This is essential to define the borders of the research and provide insights into the underlying indicators of successful adoption of EMA in the TMI of SA.

2.1.1 Goal of chapter

This chapter seeks to review the literature and theoretical frameworks on EMA. Environmental pollution is reaching disturbing levels globally, drawing increased concerns from organisations, environmentalists, accountants, and the general public. EMA provides information valuable for managing environmental costs and harmful environmental waste. This chapter will discuss and review EMAPs such as ABC, LCC, MCFA and PEF. Adopting EMA may empower managers with the knowledge required to manage environmental costs and minimise negative environmental impact. The review of EMA-related literature may also provide managers with additional information on contemporary EMAPs employed by TMOs.

Additionally, the benefits and challenges of adopting EMA will become clearer to TMOs in SA. Through the lens of two theoretical frameworks, this chapter will ascertain the indicators of successful EMA adoption in the TMI of SA. The next subsection presents the layout of this study.

2.1.2 Layout of chapter

This subsection provides a layout of the chapter. First, Sections 2.1 and 2.2 present the

chapter's introduction and an overview of the research context. Next, Section 2.3 reviews the relevant literature related to EMA. This section also outlines various concepts related to EMA and categories of EMAPs for managing environmental costs. Subsequently, Section 2.4 presents a review of EMA adoption in the TMI. Next, Section 2.5 presents two theoretical perspectives relevant to management accounting, and Section 2.6 considers the theoretical underpinning of the study. Finally, Section 2.7 concludes the chapter with a summary.

2.2 THE TEXTILE MANUFACTURING INDUSTRY OF SOUTH AFRICA

Azmeh and Nadvi (2013:1329) note that the TMI is one of the most geographically dispersed industries in the world. In developing economies, the TMI also plays a crucial role in providing industrial and consumer goods and contributes immensely to the employment of the populace (Tandon and Reddy, 2013:267). The industry's output in terms of manufactured textile products acts as a vehicle for economic growth and development (Toprak and Anis, 2017:432). South Africa is the most developed economy within the southern African region and holds the second-highest gross domestic product (GDP) per capita in Africa (African Development Bank, 2019:3). As a member of the five major emerging national economies, Brazil, Russia, India, China, and South Africa (BRICS), South Africa ensures that its economy and the southern African region benefits from priority areas such as technology, infrastructure development and social and economic growth (Adedoyin *et al.*, 2020:2). Furthermore, South Africa's extensive infrastructure and advanced manufacturing technologies have positioned its major industries to meet domestic demand for manufactured textiles, clothing, and apparel (UNEP, 2015:22). The TMI of SA is, however, burdened with high input costs and the influx of textile imports which has truncated the growth of the industry (Smal, 2016:4).

The TMI of SA has existed for several decades and is a principal employer of labour (Vlok, 2006:227). Historically, the growth and development of the TMI of SA stem from the need to protect the industry from competition arising from international trade. During the apartheid era, the priority of the South African government was to target achieving industrialisation through import substitution, with a specific focus on the domestic market (Naumann, 2001:9). This strategy delivered elevated obsolescence and tardiness, consequently impeding growth and making the industry's output uncompetitive in several market segments due to high input costs and low quality (Vlok, 2006:227; Truett and Truett, 2010:73). At the transition to the democratic government in 1994, South Africa was integrated into the world trading system and joined the World Trade Organization (WTO). As a result, its economy was opened to

international trade, and local companies could import raw materials and finished goods for cheaper than they could source locally (Truett and Truett, 2008:1). The TMI of SA spent several decades in seclusion, which protected the industry from the impact of international trade, however, in recent years the industry has been negatively impacted by rising importation of raw material and finished goods.

The resulting effect is the influx of illegitimate and low-priced imports of raw materials and finished textiles from Asia and neighbouring African countries (Le Roes-Hill *et al.*, 2017:2). According to Claassens (2017:2), the rise in the level of imports is due to the bilateral trade agreements between South Africa and other countries such as China, and those within the Southern African Development Community (SADC). This has led to a reduction in homemade textiles, creating a contraction of the TMI of SA and a decline in employment (Le Roes-Hill *et al.*, 2017:2). The industry has moved from being a major employer in the manufacturing sector to one of the smaller employers of labour, representing only about 3% of manufacturing sector employment (Cotton SA, 2019:8). The TMI of SA exists within the clothing, textiles, footwear, and leather (CTFL) sector. This classification is because of the similar nature of their inputs and operations (Vlok, 2006:229). While a few of the TMOs exist in Gauteng and Eastern Cape provinces, the majority of the TMOs in SA exist in KwaZulu-Natal and Western Cape provinces. This is because of seaport access to ease raw materials importation and finished textiles exportation (Cape Clothing and Textile Cluster, 2017:1). The TMI of SA accounts for 90% of the employment and 80% of value added to the CTFL sector. It employs about 95,000 people and contributes 8% to the manufacturing GDP and 9% to the country's overall GDP (GreenCape, 2019:2).

The TMI of SA, which is the focus of this study, consists of the production, processing, and sales of textiles products by organisations that manufacture fibre, yarn, threads, fabrics, lace, and other textile products (Le Roes-Hill *et al.*, 2017:3). The TMI of SA features a substantial number of small organisations that have informal operations (Le Roes-Hill *et al.*, 2017:2). According to Markets and Research (2018:4), the revenue derived from factory-made textiles was about R25 billion in 2017. However, R14 billion accounted for the sales of finished textile goods. The industry consists of 20 top organisations employing about 150 employees at the close of 2017. Accordingly, the TMI of SA mainly comprises five organisations controlling 40% of the industry's income (Markets and Research, 2018:2). The TMI of SA, though small and not the bedrock of the economy, is a major payer of taxes and rates in cities and townships where they are located. The industry output represents only about 2% of total

manufactured goods, while industry exports represent only about 1% of total manufactured exports (Cotton SA, 2019:8). Initiatives such as the Clothing and Textile Competitiveness Programme (CTCP), jointly established by the South African government and key industry players, have played an important role in stabilising and repositioning the industry (Smal, 2016:4; Le Roes-Hill *et al.*, 2017:2; GreenCape, 2019:4). The Cape Clothing and Textile Cluster (CCTC), KwaZulu-Natal Clothing and Textile Cluster (KCTC), Southern African Sustainable Textile and Apparel Cluster (SASTAC) are other initiatives created to support the growth and competitiveness of the TMI of SA.

The initiatives stated above have created an environment that drives competitiveness and promotes suitable methods for embracing cleaner production techniques (Le Roes-Hill *et al.*, 2017:6; Claassens, 2019:2). The environmental problems created by the TMOs in SA from the usage of resources such as raw materials, energy, water, and the disposal of textile waste has, nonetheless, increased (Mazibuko *et al.*, 2019:720). Due to legislative and regulatory enforcement in South Africa, the level of environmental awareness is growing, however, the adoption tools such as EMA and cleaner production technologies remains low in South Africa (Fakoya and Imuezerua, 2020:2). The adoption of EMA may assist TMOs in SA to generate environmental information suitable for managing environmental costs.

2.3 ENVIRONMENTAL MANAGEMENT ACCOUNTING

According to Burritt *et al.* (2019:480), EMA facilitates identifying, measuring, and allocating environmental costs. They remark that EMA involves using contemporary management accounting tools to improve economic and environmental performance (Burritt *et al.*, 2019:480). Three decades of management accounting literature depict continuing debate on the definition and meaning of EMA and its related concepts (UNDSD, 2001:7). The core of these arguments centre on the need for systems that provide monetary and physical information capable of allocating environmental costs appropriately to aid decision-making (Frost and Wilmshurst, 2000:345). Accordingly, EMA is an improvement on CASs because of its ability to provide accurate information on environmental costs (Schaltegger and Burritt, 2000:77; Burritt, Hahn and Schaltegger, 2002:40). Burritt (2004:29) highlights the importance of accessing EMA systems at an affordable cost and the flexibility of integrating them with existing CASs. Consequently, it implies that the success of EMA adoption in any organisation may be contingent on implementing a system that is relevant to and efficient in managing existing and potential environmental costs.

2.3.1 Development of environmental management accounting: An overview

Environmental disasters have created global interest lately, with a substantial portion of global environmental pollution linked to incessant consumption of raw materials, water, and energy, leading to the depletion of natural resources (Mokhtar, 2015:1). Furthermore, environmental pollution resulting from unrestrained emission of waste into the atmosphere and waterways has equally impacted the environment negatively, amplifying the impact of global warming (Toprak and Anis, 2017:432). The surge in global temperatures, primarily due to increased concentrations of greenhouse gases (GHGs) in the atmosphere, has further worsened the impact of climate change (Namakonzi and Inanga, 2014:6). These problems have increased the interest in environmental issues with various stakeholders at the forefront of providing solutions and systems to curb the negative impact of environmental disasters (Christ and Burritt, 2013:163).

Existing EMA literature decries the weakness of CASs in highlighting and providing visibility on existing and potential costs for environmental-related decision-making (Fakoya, 2015:155; Qian, Burritt and Monroe, 2018:153; Burritt *et al*., 2019:480). Similarly, Ambe (2007:2) cites that, in CASs, the consciousness about environmental costs is misdirected due to the structures and systems employed by organisations. In addition, Qian, Hörisch and Schaltegger (2018:1609) maintain that CASs focus primarily on profitability, disregarding potential issues such as global warming and environmental pollution. Gale (2006:1230) supports this position by emphasising that CASs allocate environmental costs to general overheads. Therefore, cost allocation problems may arise because managers do not have the relevant information concerning these costs. Jasch (2003:669) further says that when environmental costs are not identified and allocated appropriately, the prospects for cost savings are lost.

Jasch (2005:1191) contends that when CASs produce inaccurate information, managers risk-taking inappropriate decisions regarding production costs, product pricing and investment appraisals. The evident shortcomings of CASs have promoted the development of EMA, which is designed to identify, measure, and allocate environmental costs (Ambe, Ambe and Ganda, 2015:275). The rising environmental liabilities to organisations and the resultant impact on corporate image and reputation is the motive behind organisations being pressured to be ethical and environmentally responsible (Smit and Kotzee, 2016:152; ACCA, 2019:1). As a response to this pressure, organisations have shown increased interest in responsible

business practices and are employing contemporary EMAPs for improving environmental performance (Christ and Burritt, 2013:171; Lee, Gunarathne and Herold, 2017:1; Lee and Gunarathne, 2019:4).

According to Bouma and van der Veen (2002:279), accounting for the environment originated in the closing decades of the twentieth century with the perception that environmental management can produce economic benefits for organisations. However, Bouma and van der Veen (2002:279) note that this requires the proficiency of management accountants to produce a cost-and-benefit analysis of employing solutions to environmental pollution. Bartolomeo *et al*. (2000:1) reckon that environmental agencies such as the European Environmental Agency (EEA) and the United States Environmental Protection Agency (USEPA) were pioneers and promoters of the growth of EMA adoption and the application of EMA principles at the start of the twenty-first century. Similarly, developed countries such as Japan, Germany, Australia, and other international organisations such as the United Nations Division for Sustainable Development (UNDSD) and the International Federation of Accountants (IFAC) are also at the forefront of promoting the adoption of EMA. Environmental costs, however, require internal management before external reporting, necessitating modifications to organisations' CASs (BPP Learning Media, 2021:590).

2.3.2 Environmental management accounting definition and concepts

EMA information is vital for internal business activities and environmental-related decision-making before external reporting (BPP Learning Media, 2021:590). Accordingly, Burritt, Hahn and Schaltegger (2002:41) describe EMA concerning internal reporting as identifying, measuring and allocating environmental costs through integrating physical and monetary information to enhance organisational environmental decision-making. Likewise, Qian, Burritt and Chen (2015:407) see EMA as a system that enables identifying, collecting, collating, and analysing physical and monetary environmental information to facilitate organisational decision-making and performance management. These definitions reinforce the use of physical and monetary information for internal decision-making. Jasch and Savage (2008:324), however, argue that EMA has no standard definition. The international guidance document by IFAC proposes two matching definitions (IFAC, 2005:19). The management accounting concept statement defines EMA as:

> “the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices. While this may include reporting and auditing in some

> companies, environmental management accounting typically entails life-cycle costing, full cost accounting, benefits assessment, and strategic planning for environmental management."

In addition to the definition above, the United Nations (UN) expert working group (IFAC, 2005:19) on EMA offers a supporting definition of EMA as:

> "the identification, collection, analysis, and use of two types of information for internal decision making; physical information on the use, flows and destinies of energy, water, and materials (including wastes) and monetary information on environment-related costs, earnings, and savings."

Other contrasting definitions also exist, indicating an extensive application of EMA in various contexts, such as EMA implementation and software support. In this instance, EMA is viewed as a form of managerial technology adopted by organisations to provide environmental cost information. Therefore, EMA adoption can improve environmental performance and enhance economic results (Burritt, 2004:24; Rikhardsson *et al.*, 2005:2). The common theme around these definitions indicates that EMA manages environmental costs by using physical and monetary information to support decision-making. Broadly, these definitions demonstrate the types of information considered under EMA, which incorporates monetary and physical attributes of any potential negative environmental impact (Burritt, Hahn and Schaltegger, 2002:41).

2.3.2.1 Physical environmental management accounting

Estimating environmental costs accurately requires the identification of monetary as well as non-monetary information of activities such as raw materials, other resource inputs and waste that has been generated (IFAC, 2005:20). Physical environmental management accounting (PEMA) involves the identification, tracking and recording the physical flow of raw materials, energy, water and waste to improve environmental performance (Jasch and Savage, 2008:326). TMOs, for instance, consume water, energy, and raw materials to support their operations. However, due to inefficient processes, product design and quality issues, waste materials may end up in landfills and waterways or are expelled into the air, devastatingly impacting the environment and health of humans, plants, and animals.

According to Schaltegger, Hahn and Burritt (2000:15), PEMA measures environmental waste regarding physical units, employing measures such as litres and kilograms to estimate environmental waste. Therefore, TMOs should accurately identify information on the physical flows and destinies of materials, energy and water employed in manufacturing. Accordingly,

to effectively manage the potential environmental impact of waste, organisations need to be able to isolate the proportion of their inputs that constitute waste and those of the final product. Furthermore, the quality of PEMA information can improve through functional collaboration among accounting, production and environmental functions (Gunarathne and Lee, 2015:375; Smit and Kotzee, 2016:154). PEMA information is, therefore, key to valuing environmental-related impact and acts as the underpinning for providing relevant information for the effective management of all potential environmental impacts of waste (IFAC, 2005:21).

2.3.2.2 Monetary environmental management accounting

As indicated in Section 2.3.2.1, PEMA involves tracking the consumption of physical resource inputs such as raw materials, energy, water, and the process of waste generation (IFAC, 2005:20). Monetary environmental management accounting (MEMA), in contrast, occurs when allotting monetary values to PEMA information, such as incurring costs to treat hazardous environmental waste (Burritt, Hahn and Schaltegger, 2002:41; Gunarathne and Alahakoon, 2016:4). Additionally, monetary values may also occur outside PEMA information such as licencing, systems, and process design fees, as well as site decommissioning costs. TMOs, for instance, may incur costs such as wastewater treatment, cleaning up or compliance penalties on toxic waste discharged in excess of regulatory thresholds. These environmental costs may typically be treated as factory overheads in CASs. EMAPs such as ABC enable allocating these costs to the specific products that drive waste. Environmental cost estimation, in this instance, will be related to each product by identifying the specific activities that cause each product cost to change, known as environmental cost drivers.

Ambe, Ambe and Ganda (2015:283) contend that monetary information facilitates a clearer appraisal of products, services, and projects during decision-making on environment-related costs, earnings, and savings. Ambe, Ambe and Ganda (2015:283) stress that EMAP, such as MFCA, accentuates the relevance of PEMA and MEMA information for environmental decision-making and control. Modifying the material used to package a product, for example, may create cost savings opportunities for an organisation; however, it may produce more harmful environmental waste for the government to clean up. The concept highlights and brings to management's attention the environmental costs related to their decisions. Consequently, adopting EMA is becoming ever more important because of the negative impact of environmental pollution and the associated environmental liabilities to organisations (Smit and Kotzee, 2016:152; ACCA, 2019:1).

Lee and Gunarathne (2019:20) agree that organisations recognise the benefits of employing contemporary EMAPs to minimise the impact of environmental problems and are using them to manage their environmental costs. According to Le and Nguyen (2019:18), CASs classify raw material purchase costs as direct production costs. In environmental terms, however, where additional harmful waste is generated due to the quality of raw materials purchased for production, the cost of these harmful wastes may be recognised as environmental costs. However, according to Jasch and Savage (2008:330), defining and classifying environmental costs is challenging for many organisations.

2.3.3 Environmental costs

According to the UNDSD (2001:11), environmental costs comprise all internal and external costs relating to environmental damage and protection. In addition, these costs cover the management of environmental pollution, such as treating, reducing, disposing, and cleaning up waste. Consequently, the identification and allocation of all current and future environmental costs are critical to achieving environmental cost minimisation objectives as well as enhancing the reputation and image of organisations (USEPA, 1995:7). Owing to the issues linked with environmental cost definition and categorisation, organisations tend to interpret them based on the use of environmental cost information. For instance, organisations may recognise and classify environmental costs concerning product design, project appraisal or simple cost allocation.

Rikhardsson *et al.* (2005:29) contend that CASs conceal environmental costs in overhead accounts, consequently, managers consider them insignificant compared to total costs. Rikhardsson *et al.* (2005:29) remark that organisations do not properly monitor, separate, and control environmental costs because they employ CASs. Environmental costs, therefore, are not visible and potential cost savings are not highlighted in management reports. Qian, Burritt and Monroe (2018:153) argue that organisations do not have incentives to manage environmental costs due to the weakness in CASs. Table 2.1 below demonstrates various environmental cost types and their conventional treatment.

Table 2.1: Environmental cost types and conventional treatment

Ref	Cost Types	Cost Allocation
1.	**Conventional:** Energy costs such as heating and lighting of machinery that generate negative environmental impacts	Considered as general overheads

Ref	Cost Types	Cost Allocation
2.	**Contingent:** Decommissioning costs required to eliminate the environmental impact of production sites	Considered as potential future costs
3.	**Relationship:** Costs of producing environmental impact assessments or sustainability reports for shareholders	Considered as information production cost
4.	**Reputational:** Lost sales due to bad publicity following environmental pollution arising from operations	Not considered as opportunity costs of the lost sales

Source: *Adapted from USEPA (1995:14)*

Table 2.1 illustrates the inherent weakness in CASs to separate environmental cost information appropriately. This implies that CASs may fail to recognise potential environmental costs or combine all environmental cost information as general overheads. Ensuring the accurate separation of environmental costs entails systematically analysing physical inputs and outputs of raw materials, finished goods, packaging and waste. This may also involve tracking and allocating all environmental costs to their appropriate categories. For example, textile manufacturing consumes a substantial amount of water and produces a considerable proportion of waste effluents from scouring, dyeing, bleaching, and printing (Madhav *et al.*, 2018:31-32). According to GreenCape (2019:2), it is mandatory for TMOs in Cape Town to minimise their municipal water consumption by 45%. The expectation, therefore, is a reduction in waste effluents by TMOs in Cape Town because of the reduction in resource consumption.

Shahzadi, Khan, Toor and Haq (2018:213) point out that quality improvement initiatives such as Total Quality Management (TQM), Just-in-Time (JIT) and Six Sigma can be employed by manufacturing organisations to minimise waste and eliminate non-value-adding activities. These improvement strategies may be useful for curtailing environmental costs by monitoring production activities. Appropriate information should be available for the identification of environmental costs, such that organisations can dedicate more resources to minimising internal environmental costs before they are externalised. TMOs, for instance, may improve their production process and harmful minimise waste from textile production by investing in environmental initiatives. Table 2.2 shows categories of environmental costs and key information required to identify environmental costs.

Table 2.2: Key pieces of information for identifying environmental cost

Ref	Cost	Description
1.	**Prevention:** Costs incurred to ensure environmental impact is minimised	Cost of designing a product or process that minimises the use of energy or water
2.	**Appraisal:** Cost incurred to evaluate the environmental impact of a product or a process	Cost of analysing wastewater or carbon-based emissions to ensure they are within legal and policy limits of the organisation
3.	**Internal failure:** Cost incurred on the performance of activities before waste created from operations is released into the environment	Cost of treating wastewater that is above legal and policy limits of the organisation
4.	**External failure:** Cost incurred on the performance of activities after waste created from operations is released into the environment	Cost of remediating the impact of pollution or loss arising from environmental damage. This may include compensation costs or the cost of managing reputational damage

Source: *Adapted from BPP Learning Media (2021:416)*

Table 2.2 portrays the significance of employing appropriate internal cost analysis to prevent or reduce the magnitude of external liabilities. Integrating environmental concerns into capital investment decisions and evaluating the likelihood and impact of environmental risks may improve environmental and economic performance. Consequently, organisations may devote additional funds to prevention and appraisal costs to curb internal and external failure costs. The following section reviews EMAPs' valuable for managing environmental costs and minimising negative environmental impact.

2.3.4 Environmental management accounting practices

According to Christ and Burritt (2013:163), increasing environmental challenges and the associated environmental liability has amplified the need to curb waste and manage negative environmental impacts. In addition, the rising demands of influential and powerful stakeholders regarding environmental sustainability may be the driving force behind organisations pursuing change and improvement in environmental performance. According to van der Poll (2015:12), organisations should employ EMAPs such as ABC, MFCA and LCC to manage environmental costs. Likewise, Lee and Gunarathne (2019:4) mention that EMAPs such as ABC, WMA, MFCA, eco-control, energy and carbon management accounting can be applied to specific environmental focus areas.

Burritt, Hahn and Schaltegger (2002:43) employ the framework for EMA to categorise EMAPs

concerning various dimensions and decision-making situations. They recommend using the framework for EMA that managers and decision-makers can employ EMAPs depending on their organisation's specific position and condition (Burritt, Hahn and Schaltegger, 2002:43). This highlights the fact that EMA adoption is case-specific, and organisations may employ several practices for managing environmental costs. The following subsections will examine the applications, benefits, and challenges of employing EMAPs such as ABC, LCC, PEF and MFCA. These subsections will also attempt to identify an appropriate EMAP that TMOs can employ for managing environmental costs and reducing negative environmental impact.

2.3.4.1 Activity-based costing

ABC originates in academic research, and its application is prevalent among contemporary manufacturing and service organisations (BPP Learning Media, 2021:587). ABC is useful for determining product costs and improving decision-making rather than control (Otley, 2016:3). Organisations, nevertheless, currently employ ABC to improve cost management, therefore emphasising its significance in eliminating waste and non-value adding activities (Hilsenrath, Eakin and Fischer, 2015:2). ABC, therefore, is a strategic management accounting practice that allocates cost using the activities that cause the cost to change. These activities are known as cost drivers (BPP Learning Media, 2021:510).

Concerning the environment, ABC facilitates and supports allocating overhead costs to polluting activities using cost drivers to achieve cost control and efficiency. Environmental ABC establishes a distinction between environmental-driven costs and environmental-related costs. Organisations may employ ABC to manage environmental-driven costs by identifying, tracking, and allocating costs hidden within general overheads to the activities that drive them. A typical example is the cost of cleaning up effluents, such as wastewater from textile manufacturing previously classified as factory overheads, traced to the products that drive pollution. In this instance, ABC may improve decision-making by informing management that some products generate harmful waste and may be relatively more expensive and less attractive to produce. Environmental-related costs, in contrast, can be tracked to a combined environmental cost centre, such as incineration or a waste treatment plant (BPP Learning Media, 2021:591).

Organisations may employ ABC to minimise negative environmental impact by utilising cost drivers to track environmental cost information not visible in CASs. However, according to Mahal and Hossain (2015:71), ABC implementation needs substantial investment in

technology systems and other resources to gather and interpret information on environmental cost drivers (Mahal and Hossain, 2015:71). Furthermore, managers may be demotivated where product lines or services previously earning substantial margins become loss-making as a result of employing ABC to trace and re-allocate environmental-driven cost. Consequently, this may discourage the decision to adopt ABC because managers may favour short-term profitability over long-time survival. The next section discusses LCC.

2.3.4.2 Life-cycle costing

LCC identifies, tracks, measures, and records costs of decisions made from the development phase of a product, project or service to its decommissioning phase at the end of its life cycle (Steen, 2005:108). Closely linked to LCC is the life-cycle assessment (LCA) practice, which involves tracing the inventory of resources existing in the value chain of a product, project or service and evaluating the associated effluents and emissions to the environment (Bierer *et al.*, 2015:1289; Ntalamia, 2017:15). Both practices originate from the energy crisis five decades ago, with LCC having a monetary focus and LCA having a focus on physical balances (Steen, 2005:107). The literature review suggests that the integration of LCC and LCA facilitates and supports environmental LCC adoption, balancing organisations' economic and environmental performance (Moreau and Weidema, 2015:1363; Strazza *et al*., 2015:76). Environmental LCC, therefore, considers physical and monetary balances in accounting for the environmental impacts of a product or project over its life cycle.

Biernacki (2018:10) concedes that environmental LCC accounts for environmental impacts using monetary and physical attributes, and it is a valuable tool for measuring organisations' environmental activities. Organisations, therefore, may use environmental LCC to assess the environmental impacts of textile manufacturing operations, from cotton fibre extraction and processing yarn, dyeing and bleaching, through to the distribution and use of clothing and apparel, and disposal or recycling (Laitala, Klepp and Henry, 2018:2). Organisations may also employ environmental LCC to highlight post-production costs at the start of a project or in the design stage of a product. This may facilitate improved investment appraisal, costing and pricing decisions required to generate acceptable margins.

Bierer *et al*. (2015:1296) recommend additional insight into environmental LCC and propose an extended MFCA as a tie between LCC and LCA. They suggest that MFCA and LCC are similar in structure and quantity modelling; they contend, however, that MFCA needs to be extended to contain all relevant flows over the life cycle of a product or service (Bierer *et al*.,

2015:1296). Organisations, therefore, may use LCC for appraising the environmental impact of a product, project, or service over its lifetime. However, its impact on the future is deficient due to the discounted future monetary flows. Environmental costs, therefore, will only reflect real monetary flows pertaining to the production process (Fakoya, 2014:53). The next section discusses product environmental footprint (PEF).

2.3.4.3 Product environmental footprint

PEF utilises broad criteria for measuring and assessing the environmental performance of a product, service or organisation based on a life-cycle approach (Manfredi *et al*., 2012:1). Owing to the global recognition of environmental concerns and in an attempt to enhance the comparability of the life-cycle approach, the European Commission introduced the PEF. The PEF measures the environmental impact of a product through its life cycle (Schrijvers, Loubet and Weidema, 2021:1). PEF aggregates the environmental impacts of raw materials usage, supply chain activities, greenhouse effect, climate change, natural resource depletion, as well as animal and plant wellbeing (Wu and Su, 2021:3). The individual components of PEF may be considered subsets of LCA because they hold a life-cycle viewpoint. PEF, in contrast, to LCA, employs additional product category requirements and standards that guarantee that its results are more accurate and comparable (Gonçalves and Silva, 2021:2). Luo *et al.* (2021:3) contend that PEF incorporates individual measures such as water, carbon and chemical footprint methods to assess the environmental impact of a product or service over its life cycle.

A review of PEF indicates that water footprint seems the most relevant to this study because TMOs require substantial quantities of water for textile production (Madhav *et al.*, 2018:32). According to Christ (2014:381), there is a growing awareness around corporate-level water management, because of water shortages and increasing levels of contaminated water. Christ and Burritt (2017:381) view WMA as an emerging EMAP comparable to the water footprint method. Olusanmi *et al*. (2021:8) contend that WMA remains unexplored despite the global attention and interest created around the Sustainable Development Goals (SDGs). Olusanmi *et al*. (2021:7-8) report using a bibliometric analysis that only three journal publications exist on WMA research from 2000 to 2018. Olusanmi *et al*. (2021:5) note further that all the existing journal publications on WMA originate from two authors. The research results are, however, inadequate because only publications from the Scopus database were considered. Christ and Burritt (2017:147) reveal, in addition, the presence of scarce literature

on WMA by using Google and Google Scholar search engines. Christ and Burritt (2017:147) argue that WMA is a new practice, and most journal articles focus on the physical aspects of WMA. Nevertheless, literature on the monetary aspects of WMA is projected to increase (Christ, 2014:381; Burritt and Christ, 2017:72).

Due to the existence of limited literature on WMA, this study will, therefore, not review the application of WMA in TMOs. Literature review, nonetheless, suggests that MFCA is valuable for improving wastewater information and the equivalent cost-saving decisions (Huang *et al*., 2019;22; Fakoya and Imuezerua, 2020:24; Tran and Herzig, 2022:47). MFCA use physical and monetary measures to determine the flows of raw materials, water, and energy. Therefore, MFCA may be valuable for minimising the negative impact of environmental waste from textile manufacturing. The next section discusses MFCA.

2.3.4.4 Material flow cost accounting

Schaltegger and Zvezdov (2015:1335) point out that MFCA employs physical and monetary measures for quantifying the flows of resources in production or service delivery. Schaltegger and Zvezdov (2015:1335) contend that MFCA is a widely researched subject area. According to Wagner (2015:1255), MFCA is a modification of flow cost accounting with its origin within an environmental project at a textile manufacturer in Germany. In recognising its promising application in manufacturing, Christ and Burritt (2015:1380) remark that the Japanese state introduced a modified version currently known as MFCA. The development and widespread use of MFCA in advanced countries such as Germany and Japan may be due to the existing technologically efficient manufacturing.

The literature review indicates an increase in the growth and application of MFCA in developing countries (Burritt *et al*., 2019;483; Tran and Herzig, 2020:7), including South Africa (Mbedzi, van der Poll and van der Poll, 2018:14; Fakoya and Imuezerua, 2020:4). Similarly, Christ and Burrit (2016:2) argue that MFCA adoption is increasing because of the introduction of ISO 14051, an international standard on MFCA, issued by the International Organisation for Standardisation (ISO). The ISO defines MFCA as a “tool for quantifying the flows and stocks of materials in processes or production lines in both physical and monetary units” (ISO, 2011:3). MFCA seeks to minimise the cost of raw material inputs, the output of finished goods, waste, and packaging to improve environmental performance (Huang *et al*., 2019:4).

Schmidt (2015:1310) and Tajelawi (2016:50) argue that the MFCA application, in addition to

providing accurate and reliable analysis of inputs and outputs of waste, also quantifies and evaluates the potential for cost savings. In textile manufacturing operations, for instance, it may be argued that the weight of outputs will be less than inputs, and any unexplained gap is likely to imply environmental pollution. Consequently, the emphasis will be on eliminating all gaps from the input and output analysis to curb any negative environmental impact.

Kokubu and Kitada (2015:1279) argue that MFCA is a well-developed and promising EMAP, with the adoption rate increasing globally. The increase in MFCA adoption may be due to its potential application and adaptation to various industry types and organisation sizes, with empirical evidence demonstrating its success in developed and emerging economies (ISO, 2011:1). Christ and Burritt (2015:1378) argue, however, that despite over a decade of MFCA research in select case studies and evidence of successful implementation and application, organisations are, nonetheless, unimpressed about its merits and results. Furthermore, Kokubu and Kitada (2015:1279) mention that as MFCA concepts and methods are introduced, management may face disputes between MFCA and existing structures. These disputes may hinder MFCA adoption in manufacturing and service organisations.

Four EMAPs, ABC, LCC, PEF and MFCA, were identified and discussed to identify a suitable practice for minimising environmental waste. According to the researcher, the extent of research on ABC and LCC application in curbing environmental waste remains scarce in smaller organisations. Sahu *et al.* (2021:2) support this position by affirming that this may be due to the complex nature of ABC and LCC and their potential application, mainly in large organisations with a wide range of complex products and services. Le, Nguyen and Phan (2019:22) suggest that due to financial constraints, small organisations may encounter challenges when employing EMAPs. In contrast, Huang *et al.* (2019:7) recommend that small organisations employ EMAP, such as MFCA, due to its simplicity and low implementation cost. Similarly, Christ and Burritt (2017:603) suggest that MFCA implementation can commence as a simple process and can be applied to small and informal organisations, which is the nature of the TMI of SA.

According to Burritt *et al.* (2019:489), organisations may require more than one EMAP to manage environmental costs properly. MFCA may be combined with other EMAPs to manage environmental costs. Christ and Burritt (2015:1378) remark that MFCA is conceptual, and its use is growing and continues to receive major attention within management accounting literature. This suggests that TMOs in SA may benefit from empirical research on MFCA adoption. The next section presents this study's central discussion, focusing on EMA

adoption in the TMI.

2.4 ENVIRONMENTAL MANAGEMENT ACCOUNTING ADOPTION IN THE TEXTILE MANUFACTURING INDUSTRY

The TMI comprises organisations manufacturing and processing fibres, yarns, threads, wool, fabrics, linen, carpets, rugs, and other textile products. According to Schaltegger, Viere and Zvezdov (2012:58), the principal markets for textiles exist in western Europe, Japan, and the United States of America (USA), where consumers possess a high degree of environmental consciousness. Schaltegger, Viere and Zvezdov (2012:58) remark that the textile manufacturing hub is in Southeast Asia, where major environmental and social challenges persist. According to The Business Research Company (2021:1), in 2020, the Asia-Pacific region accounted for 51% of the global textile market, and the African region accounted for a small percentage of the rest. The outbreak of the coronavirus pandemic at the start of 2020 created restrictions that disrupted the global textile supply chain and consumption, resulting in the shutting of major textile manufacturing operations globally.

The Business Research Company (2021:1) estimates, nevertheless, a global TMI growth of at least 10% from $594.1 billion in 2020 to $654.7 billion in 2021, and it is expected to reach an annual growth of 6% by 2025. This indicates a probable rise in demand for textile raw materials and finished products, mainly due to the switch from retail to e-commerce platforms. The e-commerce platform offers textile manufacturers access to new market segments and alternative distribution channels globally. The ensuing increase in textile manufacturing and supply chain activities is expected to exacerbate the negative environmental impact of textile waste in the future. Xu, Cheng, Liao and Hu (2019:1459) contend that the increase in textile waste from production and consumption remains a global issue, prompting the demand for contemporary approaches to conserve natural resources and reduce the negative impact of environmental waste. The need to provide solutions to environmental issues has triggered the expansion of environmental initiatives by organisations and policymakers seeking to curb environmental pollution and waste costs.

Textile manufacturing consumes natural resources such as cotton fibres, water, and energy. In addition, the manufacturing process generates effluents and emissions with negative environmental impact, culminating in potential environmental costs which may be hidden within general overheads (Le and Nguyen, 2019:8). Schaltegger, Viere and Zvezdov (2012:56) consent that EMA application supports the production of relevant information for

identifying and managing environmental costs in textile manufacturing. In a case study of an Indonesian textile manufacturer, they claim that the environmental costs incurred comprise a significant portion of total textile manufacturing costs, speculating a probable rise in the future (Schaltegger, Viere and Zvezdov, 2012:60). According to Schaltegger, Viere and Zvezdov (2012:60), the increase in total textile manufacturing costs in Indonesia is attributable to the surge in demand for fresh-water supply and the cost of raw materials required for textile production. Schaltegger, Viere and Zvezdov (2012:72) also plead the justification of EMA application in the Indonesian case study and debate that EMA supports management with the information required to identify environmental cost-saving opportunities.

Ghaemmaghami, Zamani and Shafiei (2018:185) concede that EMA application in an Iranian TMO improves production efficiency and minimises resource consumption and waste generation. Furthermore, they endorse the need for innovative systems to identify, measure, and allocate environmental costs (Ghaemmaghami, Zamani and Shafiei, 2018:186). However, they equally stress that no significant association exists between the benefits of EMA application and the consideration of environmental costs, indicating that a decrease in the environmental costs has no significant impact on environmental benefits (Ghaemmaghami, Zamani and Shafiei, 2018:198). However, EMA adoption may be useful for TMOs because its application may support managing environmental costs, providing opportunities for resource efficiency, waste minimisation and cost savings.

According to The European Apparel and Textile Confederation (2019:2), the European textile industry represents about 23% of the global textile market. The Italian textile industry is responsible for a significant portion of the market activity. Boffelli *et al.*'s (2019:10) appraisal of a cluster analysis using an environmental management model derived from literature reveals that Italian textile organisations are aware of and proactive about environmental issues. There are, however, apparent inconsistencies in the adoption and application of environmental management tools (Boffelli *et al.*, 2019:10). According to Christ and Burritt (2015:1378), EMA adoption remains problematic globally, and empirical evidence regarding the benefits of EMA and efficacy of its application in organisations remain doubtful.

EMA adoption currently represents a major subject area, with a literature review indicating that EMAP such as MFCA can be implemented in SMEs economically and with relative ease (Jamil *et al*., 2015; Huang *et al*., 2019; Sahu *et al*., 2021). This resonates with the current study as the TMI of SA consists of small organisations with informal operations (Le Roes-Hill *et al*., 2017:2). SMEs are the backbone of many developing economies, stimulating economic

growth and development; they may, nevertheless, be the bane of environmental issues. Consequently, the sustainable performance of SMEs is crucial to achieving growth and competitive advantage in the TMI of SA. Kokubu and Kitada (2015:1279) stress that the application of MFCA is growing globally, offering prospects for improving productivity, curbing environmental costs and negative environmental impact.

Christ and Burritt (2015:1378) argue that MFCA is one of the most basic and well-developed EMAP, however, existing research on MFCA seems more conceptual than empirical. Schaltegger and Zvezdov (2015:1335) contend that existing research on MFCA adoption remains unexplored in certain contexts and decision situations, with information used from the perspective of internal and external decision-makers lacking. This may explain the existence of limited empirical research on MFCA implementation using various decision situations. Lee and Gunarathne (2019:3) insist that research on the adoption and implementation of MFCA remains unexplored in most developing countries, indicating that existing research places more emphasis on developed countries. This establishes a case for research on EMA adoption in developing countries. According to Clarke-Sather and Cobb (2019:1213), textile manufacturing plants in most developing countries employ fossil fuels to produce power, in contrast, most developed countries employ clean energy to generate power.

According to Tran and Herzig (2020:1), Asian developing countries seem to be the context of a significant portion of MFCA literature, with key authors originating from developed countries (Burritt *et al*., 2019:483). In South Africa, most EMA adoption literature is confined to the manufacturing sector (Doorasamy, 2016; Fakoya, 2016; Fakoya and Imuezerua, 2020). Other EMA adoption literature within the South African context appears conceptual, presenting frameworks for identifying environmental costs and reducing negative environmental impact (van der Poll, 2015; Mbedzi, van der Poll and van der Poll, 2018). These studies highlight the inadequacy of CASs in managing environmental costs. This suggests that MFCA adoption may enable the identification, measurement, and allocation of environmental costs in TMOs, therefore, offering prospects for cost savings. According to Le Roes-Hill *et al*. (2017:2), the TMI of SA consist of small organisations that have informal operations, therefore, EMAP such as MFCA can be implemented economically and with relative ease (Katherine Leanne Christ and R. Burritt, 2017:605). Adopting MFCA may be valuable for TMOs in SA, where only listed organisations are required to report obligations concerning their environmental activities.

2.4.1 Environmental management accounting adoption in South Africa

As industrialisation and technological developments spread globally, they are accompanied by increased resource demand, resulting in environmental pollution (Edinburgh Sensors, 2019:1; Ajibade *et al.*, 2021:321). This has become a global challenge, and leading industries are adopting practical approaches to address the negative environmental impact of their distinct operations (SMEP, 2020:1; Anjum *et al.*, 2021:1). Therefore, conversations around the impact of global manufacturing on the environment persist. South Africa attracts significant interest and attention regarding key environmental issues due to its increasing levels of pollution (UNEP, 2015:22). In integrating with the rest of the world, the TMI of SA needs to adopt global best practices to ensure it remains sustainable and competitive.

Globally, the TMI has been identified in previous studies as one of the most polluting industries in the manufacturing sector (Choudhary and Islam, 2017:22; Saravanakumar, Baalachandar and Mohaideen, 2019:986; Yaseen and Scholz, 2019:1193). This may be the case because most of the textile plants across the globe were built several decades ago when little attention was paid to the impact of the industry's operations on the environment. Toprak and Anis (2017:430) argue that the recent growth and development in major manufacturing sectors worldwide, including the TMI, have contributed to the rise in environmental problems. The TMI is often associated with problems relating to environmental pollution from the use of raw materials, chemicals, and dyes. Additionally, industrial waste from textile plants increases GHGs and effluents released during production (Yaseen and Scholz, 2019:1193). These harmful wastes wind up in the air, waterways and landfills because only a small portion of the inputs comprise the final product (Akhtar *et al.*, 2017:125).

In South Africa, the carbon footprint from producing new textiles is approximately 15 kg of carbon dioxide per kilogram of textile, which is a major contributor to GHGs (GreenCape, 2019:3). Neglecting to treat the environmental waste from the textile manufacturing cycle leads to environmental degradation when this waste is released into the environment (Choudhary and Islam, 2017:22). Additionally, worldwide production and consumption due to population growth has increased the demand for natural resources, drawing more attention to environmental issues and its destructive impact on the planet (Christ and Burritt, 2015:1379). This has amplified the appreciation of sustainable practices available to minimise negative environmental impact. Likewise, strategic structures have been developed globally and within the African continent to promote inclusive and sustainable economic growth, such

as the United Nations Agenda 2030 and African Union Agenda 2063. Agenda 2030, for example is a global plan for sustainable development adopted by United Nations Member States in 2015. The framework offers a shared blueprint of seventeen SDGs to tackle global challenges such as affordable and clean energy, responsible consumption and production, life below water, clean water and sanitation, and climate action (African Union Commission, 2015; United Nations, 2016).

South Africa relies primarily on fossil fuels such as coal for about 70% of its total energy and about 90% of its electricity supply (Cock 2019:1; Department of Environmental Affairs 2016:240). The dependence on an extensive carbon-intensive energy system has increased the level of GHGs with devastating environmental impacts (Nene and Nagy, 2021:234). South Africa is one of the most resource-rich countries in the world and is a major supplier of coal, gold, diamond, and many other minerals (Cole and Broadhurst, 2021:234). The mining industry of South Africa accounted for about R286 billion of the country's GDP in 2015, offering gainful prospects for investment and contributing significantly to the growth of the South African economy (Askham and van der Poll, 2017:2).

Environmental pollution from mining activities in South Africa reinforces the requirement for renewable energy sources and tools for managing negative environmental impact (Mbedzi, van der Poll and van der Poll, 2018:1; Cock, 2019:1). The extent of environmental pollution connotes the inclusion of sustainability initiatives as a reporting component for listed mining organisations in South Africa (Federica, Andrea and Pasquale, 2016:191; Iredele and Moloi, 2020:2). It is pertinent to note that EMA adoption is voluntary in South Africa, nevertheless, corporate governance frameworks such as the King III and IV may improve environmental and economic performance amongst listed organisations. Mbedzi, van der Poll and van der Poll (2018:14) comment that when EMA adoption is voluntary, as is the case in South Africa, mining organisations prioritise economic over environmental performance, encouraging poor environmental behaviour.

Ambe (2007:62) points out that EMA adoption in South Africa is low compared to other developed economies where contemporary environmental concepts are perceived as crucial to organisations' existence. There is, however, an increase in EMA literature within the South African context. Doorasamy and Garbharran (2015:16) point out the weakness of CASs in allocating environmental costs appropriately in a pulp and paper manufacturing organisation. The results indicate that the case study examined employs no EMA component, suggesting environmental costs allocation to general overheads. Baldavoo (2019:104) investigates EMA

adoption by the University of KwaZulu-Natal, exposing the lack of visibility and errors in environmental cost information. Similarly, Ambe, Ambe and Ganda (2015:286) point out South African universities' lack of EMA adoption. They argue that accounting for the environment is absent within universities and service organisations, particularly because the benefits only accrue in the future (Ambe, Ambe and Ganda, 2015:286).

According to Smit and Dikgwatlhe (2015:121), the level of EMA awareness is relatively high in the mining industry, although environmental managers and accountants understand the importance of EMA more than production managers. Likewise, Smit and Kotzee (2016:159) contend that the extent of EMA knowledge and awareness in the chemical industry differs between employees within the production function and those saddled with the finance function. Iredele and Ogunleye (2018:12), in a comparative study of EMA adoption in South Africa and Nigeria, note a high level of commitment to EMA in South Africa, arguing that financial barriers mainly hamper EMA adoption. Iredele and Ogunleye (2018:13) argue that financial incentives, such as green tax rebates and pioneer tax incentives for waste recycling facilities, will improve organisations' financial performance and encourage EMA adoption.

Other studies unveil the adoption of MFCA in waste reduction in manufacturing organisations. Fakoya (2015:157) and Tajelawi (2016:116) remark that MFCA facilitates identifying, measuring, and recording waste cost information. This enables environmental decision-making and improves performance. Fakoya and Imuezerua (2020:24) point out the weakness in the system employed in capturing water loss information in a water treatment plant in South Africa. Fakoya and Imuezerua (2020:20-23) show that MFCA can support environmental and economic sustainability in water purification, highlighting cost savings and facilitating improved environmental decision-making. There is, however, scarce research on EMA adoption in the TMI of SA, according to the researcher. Therefore, by exploring EMA adoption in the TMI of SA, this study seeks to identify the EMAPs that TMOs employ to minimise waste. This may also offer valuable insights into developing an EMA adoption framework for the TMI of SA. The next subsection presents EMA adoption by TMOs.

2.4.2 Environmental management accounting adoption by textile manufacturing organisations

Increased recognition regarding the impact of pollution on the environment has prompted the adoption of practices that support cleaner production and waste minimisation. According to van der Poll (2015:12), EMAPs such as ABC, MFCA and LCC are valuable for identifying,

measuring, and allocating environmental costs. Furthermore, Lee and Gunarathne (2019:4) mention that energy accounting, eco-control, water and carbon management accounting are valuable tools for managing environmental costs. Therefore, integrating environmental concerns into strategic organisational decision-making is critical for facilitating sustainable initiatives. However, Cesar da Silva *et al.* (2021:3) contend that TMI in developing countries comprises small manufacturing organisations. These organisations face challenges such as access to funding and inadequate government support, which prevent adopting environmental practices (Luken *et al.*, 2016:1166).

Cardoso de Oliveira Neto *et al.* (2020:13) contend that SMEs are predominantly interested in employing EMAPs to minimise costs. They suggest that SMEs are not exposed to the concept and benefits of sustainable production due to funding constraints (Cardoso de Oliveira Neto *et al.*, 2020:13). Leite, Fernandes and Leite (2016:73) found that Portuguese TMOs use CASs for managing manufacturing costs. In addition, Leite, Fernandes and Leite (2016:73) state that a balancing application with other environmental systems can improve environmental cost planning and decision-making. Srbinoska *et al.* (2020:84) claim North Macedonian TMOs employ EMAPs for environmental cost planning and projection. The Leite, Fernandes and Leite (2016) and Srbinoska *et al.* (2020) study suffer limitations due to the sampling methods employed. Still, they offer comparable insights on using EMAPs within the European continent.

Lenzo *et al*. (2018:1) are of the opinion that LCC and LCA are appropriately designed to support environmental-related decisions regarding products from the extraction of raw materials required for textile production to their final disposal as harmful waste. According to Biernacki (2018:10), LCC is a cost management practice for assessing the environmental impacts of products, systems and processes using monetary and physical indicators. In addition, LCA considers the economic and social environmental burdens of a product, project or service (Bierer *et al*., 2015:1289). Accordingly, LCA is integrated into an ISO 14 000 family to support the reduction of pollution from industrial waste. This may denote its recognition and wide use in the environmental management literature (Balanay and Halog, 2018:58). According to Fidan, Aydoğan and Uzal (2021:1), LCA is useful for assessing environmental impact; however, it falls short in offering information on product quality, and potential cost savings for improved decision-making.

Fidan, Aydoğan and Uzal (2021:12), when using LCA, report that in denim fabric production, wastes from raw material inputs account for the most significant environmental impact

compared to the energy consumed during the spinning process. Likewise, Nakhate *et al.* (2020:1) argue that when using LCA to investigate the environmental footprints of a textile effluent treatment plant in India, electricity usage is the primary source of negative environmental impact. Nakhate *et al.* (2020:13) argue that environmental waste can be minimised by implementing quality control measures and scaling the recycling capacity beyond its current threshold of 50%. Similarly, Fidan, Aydoğan and Uzal (2021:1) contend that LCA is useful for evaluating the environmental impacts of products, systems, and processes using a life-cycle approach. Nakhate *et al.* (2020:13) remark that LCA application consistently presents limitations due to the differing assumptions made in theory and practice. Manfredi *et al.* (2012:1) add that PEF can be employed for evaluating environmental impact in textile upstream, midstream, and downstream industries.

Luo *et al*. (2021:3) argue that carbon, water and chemical footprint methods utilise a life-cycle approach to assess the environmental impact of products and services. According to Qian *et al*. (2020:209), chemicals are essential compounds employed in textile manufacturing, generating hazardous waste with potential negative environmental impact. Li *et al*. (2021:14) disclose that chemical footprint methodology evaluates the level of chemical pollutants during textile manufacturing and its environmental impact. Likewise, Qian *et al*. (2020:211), using the chemical footprint methodology, argue that the weaving process produces toxic wastes far exceeding those of dyeing, scouring, and bleaching during textile manufacturing. Madhav *et al.* (2018:31-32) refer to textile wet processing as important in manufacturing because it utilises significant quantities of water, toxic chemicals, and other materials for dyeing, printing and finishing. Madhav *et al.* (2018:31-32) concede that the pollutants generated by textile wet processing far exceed those of dry processing. Like Qian *et al*. (2020:211), Madhav *et al*. (2018:31-32) contend that the textile sizing process, including weaving, knitting, and tufting, generates the highest quantity of chemical pollutants.

In addition, Qian *et al.* (2020:209) state that the environmental impact of textile manufacturing consists of other waste matter, such as emissions and other dry waste. According to Chu *et al.* (2021:55), GHGs contribute the most to the rise in environmental costs in the Chinese textile industry. Similarly, Haseeb *et al.* (2020:8) found GHGs to be the primary source of declining environmental conditions in Asian countries. These researchers employ the carbon footprint method, and the findings may further strengthen the view that gas emissions, as much as wastewater, are harmful to the environment. However, Chu *et al.* (2021:56) criticise the chemical and carbon footprint methodology, arguing that both methods only employ

single indicators to measure the degree of environmental impact in distinct fields. In addition, Chu *et al.* (2021:56) mention that environmental price methodology integrates environmental impacts at midpoint and endpoint levels into their equivalent external costs. Accordingly, the environmental price methodology reflects other crucial issues, such as resources consumed across the textile production and supply chain that generates waste effluents and emissions (Chu *et al.*, 2021:60).

Luo *et al.* (2021:2) cite various methodologies for evaluating negative environmental impact. They contend that LCA and PEF provide a structure from a life-cycle viewpoint for evaluating the depletion of natural resources and the impact of human activities on the environment (Luo *et al.*, 2021:2-3). In differentiating LCA from PEF, Luo *et al.* (2021:2) warn that both methods cannot be directly compared as they originate from distinct contexts. However, Luo *et al.* (2021:3) note that carbon and water footprint are popular methods within the textile and apparel industry. He *et al.* (2019:447) propose an evaluation model using 14 metrics to establish the effectiveness of PEF. These metrics employ an agricultural picking robot to demonstrate how PEF evaluates environmental impacts on the planet using ten steps. Luo, Wu and Ding (2022:13) also use PEF to determine cotton jeans' carbon and water footprint. They note that GHGs and wastewater are the major causes of negative environmental impact (Luo, Wu and Ding, 2022:13).

Wu and Su (2021:3) contend that PEF is valuable for reducing textile waste over its lifecycle by considering all the activities across its entire supply chain. The context of this study, however, relates only to textile manufacturing, which principally consists of value addition and enhancements to textile products such as dyeing, printing, weaving, and chemical finishing. It is, therefore, plausible that MFCA, which incorporates monetary and physical resource flows to apportion environmental costs, may be valuable for TMOs. Balanay and Halog (2018:59) reckon that the application of MFCA is less prevalent than LCA. They point out, nonetheless, that LCA is more complex to manage and is primarily valuable for assessing potential against actual environmental impact (Balanay and Halog, 2018:59). Wagner (2015:1255) reports that the development of MFCA stemmed from an EMA project in a German TMO towards the end of the previous century. An input and output analysis of the production process uncovered a significant loss of physical quantities of raw material and other inputs, such as knitting oil and water used in the textile workshop. Further investigation revealed that only 50% of the inward water comprises the final textile effluent, with a concealed underground leakage liable for the unexplained gap, implying a possible negative

environmental impact.

MFCA implementation in the German TMO underlines the importance of improving resource usage by considering the whole resource flow process in the organisation as against focusing solely on functional improvements. Furthermore, it implies that collaboration amongst functions responsible and accountable for environmental-related issues, such as accountants, bookkeepers, senior managers and directors, is crucial to the successful implementation of MFCA (Schaltegger, Viere and Zvezdov, 2012:72; Viere, Stock and Genest, 2013:465). Furthermore, Kasemset, Chernsupornchai and Pala-Ud (2015:1347), in examining the waste minimisation process in a small textile factory in Thailand using MFCA, deduce that raw material costs comprise a significant portion of the environmental cost calculation. They maintain that the sewing and cutting processes account for about 80% of the raw material waste costs (Kasemset, Chernsupornchai and Pala-Ud, 2015:1347). However, the study's scope is limited because it does not incorporate waste from textile wet processing. In a similar study, Dechampai *et al.* (2021:16) endorse using MFCA in a Thai lingerie manufacturing organisation. The outcome of a waste minimisation analysis shows that MFCA is valuable for classifying and identifying material and monetary loss. Dechampai *et al.* (2021:16) argue similarly to Kasemset, Chernsupornchai and Pala-Ud (2015:1347) that the cutting process contributes significantly to the increase in environmental cost.

Chattinnawat, Suriya and Jindapanpisan (2018:209) utilise the application of MFCA to detect resource sources and system inefficiencies to improve the pyjama production process. Chattinnawat, Suriya and Jindapanpisan (2018:233) highlight the importance of integrating EMAPs with modern management accounting models using Lean concepts. Accordingly, they argue that this approach may improve environmental performance by efficiently using input resources (Chattinnawat, Suriya and Jindapanpisan, 2018:233). Similar strategic models incorporating Lean concepts, such as Kaizen, Six Sigma, JIT, and TQM, improve cost reduction, production processes, and product quality.

In another study, da Silva (2010:22) highlights the outcome of MFCA implementation using environmental simulation analysis and claims that air emission produced from propane and gas oil is the leading factor causing negative environmental impact. According to da Silva (2010:31), optimising the current energy sources, using cleaner energy sources, and recycling textile waste can minimise the environmental impact of air emissions and waste effluents generated during textile manufacturing. Burritt *et al.* (2019:483-484) maintain that the outcome of MFCA adoption by an Indonesian textile manufacturer exposes the extent of

raw materials, labour, energy, constituting waste and environmental costs. The case study, which is of an SME and is predominantly family-owned, made no effort to integrate environmental performance measures into its cost management and reporting structure before adopting MFCA. Burritt *et al.* (2019:483-484) concede similarly to da Silva (2010:31) and Schaltegger, Viere and Zvezdov (2012:73) that recycling wastewater from the textile dyeing process and energy optimisation lessens the production of harmful waste, therefore providing cost-saving incentives for TMOs.

In the South African context, some of the features of EMA and evidence of its application exists in industry practice. However, they are not known as EMA (Ambe, 2007:59). This creates a case for understanding the EMAPs employed for managing environmental costs in the TMI of SA. Therefore, this study seeks to explore the perception and views of participants regarding the EMAPs employed by TMOs in SA to identify, record, and allocate environmental cost information. Consequently, where TMOs can determine their current and future environmental information requirements logically, together with the physical and monetary measures of performance, they may be able to select EMAPs suitable for identifying, measuring, and allocating their environmental costs (Burritt and Christ, 2017:78).

Burritt *et al*. (2019:489) mention the value of employing EMAPs in phases with the support of various functions within the organisation. Burritt *et al*. (2019:489) assert that this may lead to rapid benefits, with all functions leveraging the learnings from the phased implementation. Burritt *et al*. (2019:489) argue that organisations need to consider their environmental position and situation to ensure the successful adoption of EMA. This confirms that a single EMAP, such as MFCA, is inadequate to identify and manage an organisation's environmental cost (Burritt *et al.*, 2019:479).

2.4.3 Benefits of environmental management accounting adoption

Gale (2006:1233) points out that EMA offers a comprehensive approach to managing environmental costs and provides managers with benefits such as cost visibility from which informed decisions can be made. Furthermore, Jasch (2003:670) argues that EMA provides a structure for capturing all relevant and significant environmental costs arising from physical and monetary flows to improve environmental decision-making. EMA, therefore, supports the identification, measurement, and allocation of environmental costs, facilitating organisations' internal assessment of environmental impact and management of all potential environmental costs (Amiruddin, 2016:27). Consequently, the information generated from EMA may be

valuable for decision-making and may avail organisations with economic and environmental benefits.

Qian, Burritt and Monroe (2018:161) contend that EMA provides opportunities for improving operational efficiency in public waste disposal services. They point out that EMA application provides valuable insights into savings from waste disposal and recycling service costs (Qian, Burritt and Monroe, 2018:161). This implies that EMA adoption may offer a structure for identifying cost-saving opportunities. Likewise, Christ and Burritt (2017:604) recommend that accurate cost allocation using MFCA can provide cost-saving opportunities and improve economic performance for restaurant industry organisations. Christ and Burritt (2017:609) argue that because MFCA implementation is inexpensive and simple, distinct projects may be undertaken to validate the benefits of waste minimisation in the restaurant industry. Nevertheless, Christ and Burritt (2017:609) caution that restaurants as small businesses need adequate support to implement EMA to overcome all potential barriers. This is necessary because the nature of the restaurant industry may mandate certain modifications to the MFCA model.

In the South African context, service-based organisations appear to neglect the application of EMA, especially when the benefits cannot be demonstrated in the short term (Ambe, Ambe and Ganda, 2015:286). Baldavoo and Doorasamy (2019:1) concur that EMA is not fully exploited in higher education. They argue that the key players within the higher education sector appreciate the benefits that EMA adoption provides for institutions (Baldavoo and Doorasamy, 2019:1). Literature review, however, reveals that EMA benefits remain untapped in the hospitality industry (Machete *et al*., 2016:421; Nyide and Lekhanya, 2016:482) and public utility organisations (Fakoya and Imuezerua, 2020). According to Nyide (2019:7), service-based organisations are becoming conscious of the benefits of EMA in improving environmental costs. Therefore, EMAP such as MFCA becomes more noticeable, with empirical evidence demonstrating that they can be applied to minimise losses and improve cost-saving decisions (Fakoya and Imuezerua, 2020:17-27).

Fakoya (2016:1028) claims that MFCA adoption improves waste reduction decisions in a small-sized brewery (Fakoya, 2016:1028). Furthermore, in complex manufacturing settings where sourcing PEMA information may require expertise, integrating MFCA and Enterprise Resource Planning Systems (ERPSs) may enhance the timeliness and veracity of waste information (Fakoya and van der Poll, 2013:140). Also, other studies, for instance, in a paper and pulp manufacturing organisation (Doorasamy, 2016:263), chemical (Smit and Kotzee,

2016:159) and coal mining industry (Mbedzi, van der Poll and van der Poll, 2018:10) highlight the value and benefits of employing EMAPs such as MFCA and LCC. Accordingly, organisations may maximise EMA benefits when PEMA and MEMA information are not in silos and readily available during waste reduction decisions.

Fakoya and van der Poll (2013:136) argue that an EMAP such as MFCA provides managers with accurate waste cost information compared to CASs. Consequently, costs concealed in overhead accounts signify lost prospects for cost savings and may hinder efficient production and product pricing decisions. Gale (2006:1234) mentions that organisations incur significant costs from the procurement of raw materials, other input resources, and the acquisition of equipment necessary to commence production. Likewise, the production process incurs substantial costs due to waste disposal or licencing fees permitting waste disposal. Burritt *et al.* (2019:483-485) validate that EMA is a valuable tool that employs various practices to improve waste minimisation and cost-saving decisions.

Burritt *et al.* (2019:483-485) stress that EMA adoption can provide enormous benefits using five distinct case studies in Southeast Asia. These organisations produce textiles, copper, and other fast-moving consumer goods. Burritt *et al.* (2019:483) observe from the experience of some of these case studies that EMA benefits can be optimised where all functional teams are involved in its implementation. Accordingly, Burritt *et al.* (2019:489) mention that because collecting and analysing PEMA information requires the engagement of specialised skills, EMA benefits can, therefore, be maximised where functional experts and personnel with current systems knowledge are involved during EMA implementation (Burritt *et al.*, 2019:489).

Sulong, Sulaiman and Norhayati (2015:1370-1372) point out that EMA can generate valuable benefits such as cost savings and waste minimisation using a metal producer as a case study. They mention that MFCA has provided environmental and economic benefits to Malaysian SMEs since its introduction in 2010 (Sulong, Sulaiman and Norhayati, 2015:1365). They caution, however, that several barriers, such as the quality of raw materials and supply chain reliability, can eliminate the value derived from adopting EMA (Sulong, Sulaiman and Norhayati, 2015:1372). According to Gunarathne and Lee (2021:6), EMA adoption benefits listed organisations in Sri Lanka. They argue that as organisations' environmental strategy evolves, visible enhancements appear in using EMAPs for controlling and reporting all environmental activities (Gunarathne and Lee, 2021:6).

Toprak and Anis (2017:435) corroborate that TMOs are compelled to adopt strategies that minimise resource usage, such as water and energy, due to the decline in clean water sources and the negative impact of effluents and emissions on the environment. In contrast, Resta *et al.* (2016:629) contend that TMOs use environmental initiatives to increase organisational value. Accordingly, Resta *et al*. (2016:629) recommend a decision support system through the LCA methodology to support TMOs in deriving benefits such as averting the risk of contingent liabilities, lost sales, managing corporate image and improving economic and environmental performance. The decision support system proposed, however, demonstrates only the textile manufacturing spinning process, ignoring the sizing, dyeing and finishing processes that similarly produce substantial environmental wastes (Qian *et al*., 2020:211).

Other EMA adoption studies, such as Burritt *et al*.'s (2019:483) case study of an Indonesian towel manufacturer and Ambe's (2007:64) case study of a South African towel and nappy producer, accentuates the importance of EMA adoption and its potential benefits for managing resources such as water, energy and input materials in TMOs. Doorasamy (2015:67) cites that South African organisations are not exposed to the potential benefits of EMA adoption. Therefore, most organisations employ CASs when managing environmental costs. Iredele and Ogunleye (2018:11) mention that South African organisations do not adopt EMA because of financial constraints. Ambe (2007:65) contends, however, that some aspects of EMA exist in practice, and EMA integration with other operational systems will support the identification, gathering and analysis of PEMA and MEMA information. Therefore, TMOs may improve their economic and environmental performance when EMA is integrated with the existing systems.

2.5 THEORETICAL PERSPECTIVES RELEVANT TO MANAGEMENT ACCOUNTING

This section presents the theoretical lens of the study. First, the Diffusion of Innovation Theory (DIT) and Technology Acceptance Model (TAM) are considered to understand motivations for adopting or rejecting innovations. Following this, an outline of the theoretical perspectives put forward by management accounting literature as underpinning EMA is presented. These are taken from the institutional and contingency theories, respectively.

2.5.1 Justification for a theoretical perspective

Rikhardsson *et al.* (2005:4) note that notwithstanding the evolving position of EMA literature, the pervasiveness of its adoption and application remains unexplored. Research on

innovation adoption over five decades from the DIT and TAM perspectives reveal that perceived attributes of innovations are useful for predicting the future rate of innovation adoption (Katz, Levin and Hamilton, 1963; Davis, 1989; Kapoor, Dwivedi and Williams, 2014). According to Rogers (2003:216), understanding how new ideas supersede existing ones and the visibility of their results is integral to the diffusion of innovation. Rikhardsson *et al*. (2005:2) plead that EMA is a semblance of managerial innovation that integrates knowledge and practice to improve environmental and economic performance.

Therefore, this study will review DIT and TAM because they are relevant to adopting strategic management accounting tools. However, the literature review also directs that other theoretical underpinnings may be more suited for EMA-related research (Amiruddin, 2016:82; Deegan, 2017:68; Oti, Effiong and Akpan, 2017:4; Mata, Fialho and Eugénio, 2018:1206). For example, legitimacy and stakeholder theories appear suitable for explaining the motivations behind organisations' environmental disclosure (Mata, Fialho and Eugénio, 2018:1206). Therefore, legitimacy and stakeholder theories are useful for explaining an organisation's societal and environmental relations (Fakoya and Chitepo, 2019:143).

Similarly, Qian, Burritt and Monroe (2018:149) note that contingency and institutional theories are evident theoretical underpinnings appropriate for EMA-related research. Otley (2016:5-9) stresses that contingency theory is useful for explaining motivations for adopting innovations based on an organisation's specific condition and situation. For instance, increased competition from cheap textile imports may impair local textile organisations' profit margins, negatively impacting their financial performance and restricting investments in environmental tools such as EMA. According to Meyer and Rowan (1977:347), institutional theory perceives organisations as not operating in isolation from their social system. It also recognises the various approaches through which socially acceptable rules and norms are rooted in organisations. In South Africa, for example, listed organisations have mandatory reporting obligations regarding their environmental activities, which is a form of stakeholder pressure by social actors (de Villiers and Maroun, 2018:5).

To ascertain the indicators of successful adoption of EMA, the theories highlighted above all appear valuable. Literature review, however, suggests contingency and institutional theories as suitable for explaining the motivations behind EMA adoption (Qian, Burritt and Monroe, 2018:148-149; Baldavoo and Doorasamy, 2019:1; Iredele, Tankiso and Adelowotan, 2019:5). Therefore, this study will consider only contingency and institutional theories as theoretical underpinnings. Other theories, such as the social life-cycle theory, may also be valuable for

explaining the motivation behind EMA adoption (Mokhtar, Zulkifli and Jusoh, 2014:517). Through the theoretical lenses of contingency and institutional theories, this study will attempt to ascertain the indicators of successful EMA adoption in the TMI of SA.

2.5.2 Diffusion and adoption theories of innovation

Rogers (2003:206) states that the perceived attributes of innovation are vital in understanding the speed of innovation adoption. Rogers (1983:2) contends that difficulties in understanding how DIT influence innovation adoption persist, even in the light of the persuading benefits of DIT. Davis (1989:320), on the other hand, addresses what causes people to accept or reject innovations with the use of TAM. As stated in the introduction to this chapter, this section will examine DIT and TAM to determine the relationship between and integration points of both theories. The chapter will also review the application of DIT in EMA-related research.

2.5.2.1 Diffusion of innovation theory

Research into the adoption and spread of innovations has a broad history. It has been put into practical use in many fields, such as information technology (IT), education, architecture, construction engineering, health as well as management sciences (Burritt *et al.*, 2019; Dintoe, 2019; Karampour *et al.*, 2021; Wu, Yang and Meyers, 2021). According to Rogers (1983:1-5), an innovation is “an idea, practice, or object that is perceived as new by an individual or another unit of adoption”. Diffusion, in comparison, is “the process by which innovation is communicated through certain channels over time among the members of a social system.” Similarly, Katz, Levin and Hamilton (1963:237) refer to the process of diffusion as “the acceptance over time of some specific item, an idea or practice by individuals, groups or other adopting units, connected to specific channels of communication, a social structure, to a given system of values, or culture”. Damanpour (1991:556) recognises the relevance of innovation theory to the spread of new products, services and technology. Innovation theory may equally be valuable in explaining the spread of new concepts, systems, and practices.

Rogers (2003:204-210) contends that potential users’ decision to adopt or reject innovations is governed by their beliefs about the innovation. In his ground-breaking work, he suggests five attributes of innovation as essential to the decision and speed of innovation adoption: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage means the degree to which an innovation is acknowledged as an improvement on an existing innovation. Relative advantage may be considered an essential predictor of innovation adoption as it uses a cost-versus-benefit model to express the economic or social

benefits of innovations. Compatibility, conversely, signifies the extent to which the experiences, requirements and beliefs of potential adopters are perceived as related to the features of innovation.

The similarity of innovation features and prior experiences of potential adopters may, therefore, aid easy understanding of innovation because it is familiar. Complexity indicates the perceived difficulty in comprehending innovations and the burden of using the innovations by the adopting unit. The complexity attribute suggests that the decision to adopt innovations may be influenced partly by how challenging it is to comprehend or use and if the adopting unit is required to develop a new set of skills. The less complicated innovations are to use, the more likely they may be embraced and adopted. Finally, trialability denotes the extent to which innovations can be tested on a limited basis. At the same time, observability refers to the extent to which the outcomes of innovations are evident and clear to the potential adopting unit (Rogers, 2003:204-251).

According to Tornatzky and Klein (1982:40), relative advantage, complexity, and compatibility are significantly related to adopting technological innovations. The results of their meta-analysis, however, indicate that the complexity attribute of innovation is negatively related to the intentions of the adopting unit. Rogers (2003:243) elaborates that complexity is negatively associated with the level of adoption in cases of new ideas and late adopters with lower technical expertise. He further points out that four decades ago, users of home computers were majorly engineers and lovers of computer gadgets, as the perceived complexity of home computers negatively affected their adoption rate. Ultimately, the rate of adoption rose once home computers became user-friendly. These attributes are useful for explaining innovation adoption and how potential adopters arrive at adoption decisions. Therefore, contemporary studies on DIT disregard trialability and observability as perceived attributes of innovation adoption due to their inconsistent results (Lou and Li, 2017:300; Faisal and Idris, 2019:67).

Rikhardsson *et al.* (2005:10-11) argue that most research about EMA adoption aims primarily at presenting the subject matter rather than empirical investigation. Bouma and Van der Veen (2002:279) agree with this position, pointing out that most EMA research emphasises the status of EMA use, disregarding practical insights into the efficacy of EMA. They argue, therefore, that further development of EMA can be attained by exploring its application to associated theory and various decision settings (Bouma and van der Veen, 2002:279). Consequently, this may propagate the current understanding of EMA, providing suitable explanations for EMA adoption and its efficacy.

The literature review reveals the application of DIT to explain EMA adoption within various contexts (Sulong, Sulaiman and Norhayati, 2015; Christ and Burritt, 2016; Burritt *et al*., 2019). These studies reveal similar and consistent patterns, agreeing that EMAP, such as MFCA, is gaining significant attention, especially in developing countries. This may be because of the simplicity of MFCA use and cost-effective implementation (Burritt *et al*., 2019;487). Shah *et al*. (2018:451) maintain that a significant increase in the application of DIT to EMA is expected shortly. They reckon that EMA will ultimately spread to organisations that seek to improve their competitive advantage and make their processes more efficient (Shah *et al*., 2018:459). The use of DIT in EMA research may explain the promotion and recognition of MFCA to its present position in management accounting research. Christ and Burritt (2016:1-2) recognise the potential increase in EMA adoption with the development of new standards on MFCA, such as ISO 14051. They claim that fusing MFCA and ISO 14051 establishes an incentive for increased uptake of MFCA (Christ and Burritt, 2016:1)

According to Sahu *et al.* (2021:16), SMEs are usually burdened with pollution management and sustainable production issues. They contend that financial constraints may also impede investment in environmental initiatives (Sahu *et al.*, 2021:16). Consequently, promoting EMA adoption, especially within SMEs, is vital because the traditional accounting view implies that investments in environmental initiatives impede economic performance (Iredele, Ogunleye and Okpala, 2017:198; Fakoya and Chitepo, 2019:142). EMA adoption may, nevertheless, improve financial and environmental performance. Likewise, Sulong, Sulaiman and Norhayati (2015:1373) view MFCA as a managerial innovation and argue that MFCA is adaptable to existing systems, simple to use and cost-effective to implement. Therefore, this may further encourage its diffusion to financially constrained SMEs.

Christ and Burritt (2015:1387) stress that DIT can equally provide insights into the impediments to and drivers of EMA adoption, therefore substantiating reasons organisations adopt or reject managerial innovations such as MFCA. They contend, nonetheless, that EMA adoption is at a low level, with doubts regarding its efficacy (Christ and Burritt, 2015:1378). Ariffin (2016:99-100) likewise opines that Malaysian-listed manufacturing organisations do not appreciate the importance of sustainable initiatives and are reluctant to change existing CASs. EMA adoption, nevertheless, continues to receive global attention, especially amongst developed nations such as Japan, Australia and Germany, which are front drivers and promoters of EMAP such as MFCA (Christ and Burritt, 2015:1380).

Burritt *et al.* (2019:489) claim that a common trait of the EMA adoption is a phased approach

rather than a wholesome modification. Equally, Sulong, Sulaiman and Norhayati (2015:1366) maintain that EMAPs such as MFCA can initially be used for controllable decision settings to run parallel with existing systems. This may provide visibility and appropriate measurement of results. Where EMA implementation is successful, further systems may then be integrated. Key performance indicators (KPIs) can also be designed to measure success against short- and long-term performance objectives (Burritt *et al.*, 2019:489). Therefore, DIT may be employed to explore EMA adoption as organisations pursue sustainable practices.

2.5.2.2 Technology acceptance model

The start of the Fourth Industrial Revolution (4IR) and the evolution of IT has been a major driver for the globalisation of the world economy, industrial and business growth (Niemand and Bwalya, 2020:41). The last decade has been dominated by IT growth, driven by artificial intelligence (AI), big data, cloud computing, sustainable informatics and machine learning replacing a variety of human cognitive abilities (OECD, 2017:13). The robustness of IT systems and processes has enhanced human capabilities, stimulating an increased trend in innovations which is spreading globally, bringing about efficiency in business processes and decision-making (Lee *et al.*, 2015:551). Also, the evolution of IT may have accelerated new strategic business models, such as the formation of the network and virtual organisations.

IT development has equally promoted the creation of new market segments through a shift from retail to e-commerce market segments (BPP Learning Media, 2021:657). As leading organisations seek to adopt and adapt current technological applications to their benefit, they continually encounter pressure and threats to existing business models because of constant technological changes. The rate at which businesses are willing to accept or reject technology is contingent on several factors, such as the technology's availability, convenience, and usefulness in meeting users' needs (Lai, 2017:21).

TAM was pioneered by Davis's (1985) doctorate research which centred on the development and experimentation of a theoretical model on the influence of system attributes on user acceptance of IT. Legris, Ingham and Collerette (2003:192) write that TAM is a modification of the Theory of Reasonable Action (TRA), which originated from the study of Ajzen and Fishbein (1977). Ajzen and Fishbein (1977:888) argue that TRA illustrates how users' attitudes and beliefs influence their intention to carry out specific actions. However, Legris, Ingham and Collerette (2003:193) observe that users' attitudes and behavioural intentions are common to TRA and TAM. Likewise, Davis (1985:24-26) agrees that TAM differs from

TRA in the manner in which beliefs in both theories are modelled and measured.

Davis (1985:24-26) remarks that the behavioural intention variables, although central elements of TRA, are ignored in TAM. Davis (1985:24-26) points out that TAM is explicitly tailored for modelling users' acceptance of IT by emphasising two specific elements; the perceived usefulness and the perceived ease of use. These elements are critical characteristics of the behavioural intentions to use IT and may be valuable for determining why people accept or reject technology. Davis (1985:26) defines perceived usefulness as "the extent to which users believe that IT will enhance their job performance", while perceived ease of use is defined as "the degree to which users believe that IT is free of mental and physical effort". TAM is widely used as a theoretical base in research involving IT adoption and facilitates the understanding of users' acceptance of IT (Rahman *et al.*, 2017; Souza *et al.*, 2017; Casquejo *et al.*, 2020).

Nayanajith and Damunupola (2019:282) cite that the main contributor towards the adoption of online banking by users in Sri Lanka is perceived usefulness and perceived ease of use. In a similar study, Lai and Zainal (2015:327) reckon that perceived usefulness, more than perceived ease of use, influences Malaysian consumers' acceptance of a single e-payment platform. Lai and Zainal (2015:327) argue that perceived risk can reduce users' intention to adopt technologies such as the single e-payment platform. Similarly, Walton and Johnston (2018:177) maintain that perceived usefulness is the variable with significant explanatory power for an individual's intention to use cryptocurrencies. Walton and Johnston (2018:177) agree that perceived risk influences the decision not to adopt Bitcoin technology.

Legris, Ingham and Collerette (2003:191) agree that TAM is a valuable theoretical model for explaining user behavioural attributes in IT adoption and use. They suggest that the elements within the model are also valuable for predicting the adoption of new technologies (Legris, Ingham and Collerette, 2003:193). Min, So and Jeong (2019:772) point out that several empirical research studies conducted to demonstrate the descriptive power of TAM have shown vague and inconsistent results. Legris, Ingham and Collerette (2003:191) concur that only about 40% of technology adoption can be explained using TAM (Hu *et al.*, 1999:104). Furthermore, Kiwanuka (2015:40) maintains that TAM has certain limitations because it does not consider the impact of social factors on the intention to accept or reject technology. Kiwanuka (2015:40) argues that some significant elements are not incorporated in the model, and TAM may provide useful results if integrated with other theories. This may include features such as human, cultural, reliability and quality of the new technology.

2.5.2.3 Integrating diffusion of innovation theory with technology adoption model

As underlined in Section 2.5.2.2, TAM is valuable for explaining the reasoning behind users' adoption of IT. However, it remains questionable if TAM can explain all IT adoption instances (Ullah *et al*., 2021:5-6). Literature review recommends the integration of TAM with other theories to improve the understanding of and rationale behind adopting new technologies (Moore and Benbasat, 1991; Legris, Ingham and Collerette, 2003; Wu and Wang, 2005; Lee, Hsieh and Hsu, 2011). Most of these studies maintain that TAM and DIT are related concepts and supplement each other to explain IT adoption. Also, these studies reveal that the elements used in TAM may be deemed to be related to two subsets of the perceived attributes of DIT. Clearly, the relative advantage attribute in DIT may be seen as equivalent to perceived usefulness in TAM. In contrast, the complexity attribute in DIT may be equivalent to the perceived ease of use in TAM.

Yuen *et al.* (2021:507) stress that TAM enables the reasoning behind the intention to adopt new technologies; however, TAM neglects certain attributes of innovations and social factors influencing adoption decisions. Wang, Meister and Wang (2008:13) regard TAM and DIT as theoretically different concepts, although they argue that both theories use similar parameters as measurement criteria (Wang, Meister and Wang, 2008:13). Accordingly, their application depends on the research context, particularly where a variety of technologies are accessible to the potential adopting units and comparisons between these technologies can be validated (Wang, Meister and Wang, 2008:14). Therefore, the perceived usefulness of technology may provide reasons for its adoption; relative advantage, in contrast, facilitates comparison with other existing technologies.

Roussou, Stiakakis and Sifaleras (2019:247) claim that perceived impediments are minimised when users understand and embrace technologies. They contend that perceived usefulness and reliability other than compatibility significantly influence the adoption of digital currencies for daily transactions in Greece (Roussou, Stiakakis and Sifaleras, 2019:247). This suggests that the more complicated and unfamiliar a new technology is, the less potential adopting units are likely to accept it. Al-Jabri (2015:31) argues that compatibility significantly influences the intention to use mobile banking in Saudi Arabia. Al-Jabri (2015:32) points out that perceived usefulness and perceived ease of use do not facilitate the intention to use mobile banking in Saudi Arabia.

Min, So and Jeong (2019:773) cite that Rogers (1983:6) defines diffusion as the transmission

of innovation within a social system; however, Min, So and Jeong (2019:773) argue that the five innovation attributes overlook the potential impact of social factors on the intention to adopt the technology. As this area remains highly unexplored, and EMA is perceived as a managerial technology, according to Rikhardsson *et al.* (2005:2), a model integrating the TAM, DIT and social systems may provide new insights into the motivations for EMA adoption. In addition, an integrated model may improve the descriptive power of the indicators of successful adoption of EMA in the TMI of SA. However, Oliveira and Martins (2011:110) contend that TAM, DIT and other related innovation adoption theories are typically applied at the individual adoption level. Therefore, the subsequent section will explore theoretical perspectives relevant to and appropriate for the social and organisational levels.

2.6 THEORETICAL PERSPECTIVES UNDERPINNING ENVIRONMENTAL MANAGEMENT ACCOUNTING

Mahmood and Ahmad (2015:136) state that theories based on political economy and social structure, such as stakeholder, legitimacy, and institutional theories, all appear valuable for explaining the motivations for adopting EMA. Qian, Burritt and Monroe (2011:118) contend that contingency theory alike provides useful insights into the motives behind EMA adoption. Qian, Burritt and Monroe (2011:97) also highlight that no theoretical framework exists for explaining the motivations behind EMA adoption. As presented in the introduction to this chapter, this section will offer two competing theories underpinning EMA. Literature review reveals that contingency and institutional theories can be complementary to explain the motivations behind EMA adoption (Qian, Burritt and Monroe, 2011:120; Iredele, Tankiso and Adelowotan, 2019:5; Elhossade, Abdo and Mas'ud, 2020:499). This study will adopt a similar approach.

2.6.1 Contingency theory

Parker (1997:147) points out that contingency theory originated over half a century ago from organisational theory and emerged from the seminal work of Burns and Stalker (1994). A decade later, contingency theory was found in accounting literature (Otley, 1980:413). Nevertheless, contingency theory has been extensively employed in organisational and behavioural aspects of EMA literature (Phan, Baird and Su, 2017; San *et al*., 2018; Gunarathne and Lee, 2021). Parker (1997:147-148) points out that contingency theory proposes no single approach concerning coordinating an organisation, leading or making decisions about appropriate structures, strategies, or control systems. Parker (1997:147)

maintains that an organisation's strategy depends on certain internal and external factors. Otley (1980:413) argues that contingency theory assumes that no widely acceptable accounting system is appropriate for all organisations in all instances.

Accordingly, adopting an accounting system such as EMA may depend on an organisation's specific environment and conditions. Consequently, contingency theory attempts to highlight an accounting system's features associated with an organisation’s situation to establish a suitable fit. Chenhall (2003:134) agrees with this assertion and mentions that when an alignment between accounting systems and organisational context is attained, performance will improve. This accentuates the notion that organisational context may determine an organisation's practices.

A few seminal authors propose the contingency theory approach as providing useful insights into motives behind EMA adoption (Parker, 1997; Bouma and van der Veen, 2002; Qian and Burritt, 2009). However, Qian, Burritt and Monroe (2011:100) mention that despite the major attention on EMA from prior literature, the use of contingency theory in EMA research remains limited. Qian, Burritt and Monroe (2011:100) contend that the limited use of contingency theory may be due to its focus on internal factors within organisations. Contemporary literature, however, reveals a significant increase in the use of the contingency theory in EMA research during the last decade (Phan, Baird and Su, 2017; Qian, Burritt and Monroe, 2018; Le, Nguyen and Phan, 2019).

Christ and Burritt (2013:165) justify the widespread use of contingency theory in management accounting literature, a subject area from which EMA emerged. Christ and Burritt (2013:164) maintain that contingency theory research can expand current knowledge by investigating if organisational context can be applied to advance insight into EMA adoption. They equally argue that EMA's current and future adoption is related to contingent variables such as industry type, organisational size and environmental strategy (Christ and Burritt, 2013:171). These variables may promote the ability of contingency-based research to expand current knowledge and foster an understanding of the indicators of successful EMA adoption.

The literature review suggests that other contingent variables such as industry type, financial condition, and environmental uncertainty are applicable for explaining EMA adoption (EL-Shishini and Upadhyaya, 2018:28; Latan *et al*., 2018:304; Le, Nguyen and Phan, 2019:18). Christ and Burritt (2013:170-171) note that industry type has a significant influence on EMA adoption in Australia. This study, in contrast, will not consider industry type because the target

population exists in an environmentally sensitive industry (Choudhary and Islam, 2017:22; Laitala, Klepp and Henry, 2018:1; Boffelli *et al*., 2019:1; Roy, Sen and Pal, 2020:1).

It is important to note that EMA adoption may be challenging for organisations because of financial and resource constraints (Le, Nguyen and Phan, 2019:7). Therefore, organisations can decide against EMA adoption if they perceive that little or no incentives exist in the short-term (Qian, Hörisch and Schaltegger, 2018:1613). Organisations must, however, be mindful that EMA adoption can be in phases, such as implementation within a particular product line, operations process, business segment, or geographical location (Amiruddin, 2016:86; Burritt *et al*., 2019:489). The phased approach to EMA adoption ensures that more detailed and complex functions are only introduced when prior phases succeed. Furthermore, Le, Nguyen and Phan (2019:22) see organisational size as a determinant of access to financial resources. This is because small-sized organisations may struggle compared to large organisations when accessing financial resources, necessary for EMA adoption. Therefore, the financial condition of an organisation may hinder investment in environmental tools such as EMA. This study, therefore, considers financial condition of an organisation under organisational size in the contingency theory perspective.

According to Chenhall (2003:137), the external environment is critical in contingency-based research, of which the most commonly applied factor is perceived environmental uncertainty. Environmental uncertainty may be regarded as constantly changing conditions within a business environment. As a result, organisations have little or no control over them. They are situations that cannot be predicted, such as natural disasters, changes in customer taste, competition, technology, climate, and economic downturn (Latan *et al.*, 2018:299). Likewise, changes in an organisation's external environment may be influenced by the advancement in IT, economic issues, and competitive strategy.

Existing research, consequently, suggests applying caution when considering environmental uncertainty because of the various measures rooted in it (Abdel-Kader and Luther, 2008:7). Environmental uncertainty may be relevant to the TMI of SA because the level of imported textiles has risen over the years due to trade agreements with countries such as China. This has led to a contraction of the TMI of SA (Smal, 2016:7; Claassens, 2017:1). Similarly, the influence of competition on adopting environmental tools such as EMA is becoming increasingly important. This is because organisations now engage in various forms of modern and strategic alliances, such as joint ventures and virtual organisations. The features of these alliances require certain changes in performance measurement and management systems,

which may influence the adoption of EMA (Chenhall, 2003:139).

Essentially, contingency-based research is relevant to this study as the overall rate of EMA adoption remains low. Therefore, further research to understand the indicators of successful adoption of EMA may be necessary (Christ and Burritt, 2013:165). In addition, the literature review indicates a significant number of contingent variables as relevant to EMA adoption (Christ and Burritt, 2013:166; San *et al.*, 2018:215; Gunarathne and Lee, 2021:3). This study will consider three contingency variables, which consist of top management support, environmental strategy, and organisational size, as indicators of successful adoption of EMA in the TMI of SA. These internal contingency variables will complement the institutional pressures perceived as external to organisations (Mbali, Ngibe and Celani, 2019:1).

2.6.1.1 Top management support

Phan, Baird and Su (2017:360) report that the success of adopting innovative solutions such as EMA depends on top management's support. According to Le, Nguyen and Phan (2019:22), implementing innovative solutions requires significant IT and other resources investments. Therefore, when top management supports environmental initiatives, they may be motivated to provide the funding required for investment in innovative solutions. Kokubu and Nashioka (2005:333) agree that when top management understands the metrics of innovative solutions and the potential benefits accruing from their use appear visible, such as cost savings, profitability, and brand visibility, they are motivated towards allocating resources for acquiring them. Dixon-Fowler, Ellstrand and Johnson (2017:434) point out that the existence of board committees in organisations, such as environmental committees, shows top management’s commitment towards environmental issues. Ellstrand and Johnson (2017:434) point out that when top management is devoted to environmental initiatives, environmental strategies are usually incorporated into the overall organisation strategy.

The literature review favours a top-down approach as a reasonable strategy for adopting EMA in Asia (Kokubu *et al*., 2003:10; Chan and Hawkins, 2010:646). Complications may, however, arise from using a top-down approach due to resistance from employees, particularly where the adoption process lacks employee participation (Nyide, 2016:76). A bottom-up approach may be adopted to complement a top-down approach with the use of a change management process (Chan and Hawkins, 2010:646; Gunarathne and Lee, 2019:170). Consequently, top management commitment and allocation of resources to environmental issues are important indicators for the successful adoption of EMA (Phan,

Baird and Su, 2017:360; Latan *et al*., 2018:204; Wang, Wang and Wang, 2018:239).

Lee and Gunarathne (2019:15) report that in Australia and Sri Lanka, most organisations only employ EMA in response to internal and external pressures. However, Lee and Gunarathne (2019:15) argue that top management support plays a crucial role in influencing EMA adoption. It is important to note that top management requires a decent understanding of EMA to facilitate their support and commitment to environmental initiatives. This may stimulate the allocation of resources and investment to support the adoption of EMA. It may also assist top management in successfully cascading its support for EMA to lower-level employees to generate the required support, dedication and attitude (Gunarathne and Lee, 2015:372; Phan, Baird and Su, 2017:369).

2.6.1.2 Environmental strategy

As outlined in the previous section, top management's dedication to environmental initiatives activates the provision of resources necessary to acquire environmental tools. Therefore, top management support can equally stimulate the capacity to develop a proactive environmental strategy (Bui and De Villiers, 2018:9; Latan *et al.*, 2018:299). As organisations attempt to achieve their objectives, managers may adopt a selection of strategic models to address the influence of the external environment on their corporate strategy. These organisations make strategic choices by considering the changes in the external environment and, on this basis, may develop new strategies to obtain a competitive advantage. Chenhall (2003:150) suggests that an environmental strategy is a tool for managers to influence decision-making by recognising internal and external environmental changes. Accordingly, several strategic management accounting models, such as Porters Generic Strategies and Boston Consulting Group (BCG) Matrix, may be useful for contingency-based research (Bouma and van der Veen, 2002:282; Chenhall, 2003:150; Otley, 2016:15). Organisations may use these strategic models for screening opportunities to attain efficient allocation of resources.

Although the importance of EMA varies between organisations, proactive strategies such as innovative environmental control and management information systems may be utilised to obtain a competitive advantage. Consequently, organisations are more likely to make internal environmental changes compared to a reactive strategy such as compliance monitoring that is developed as a result of pressure from regulatory agencies (Parker, 1997:148; Qian and Burritt, 2009:63). Some organisations in Australia, for instance, perceive EMA as a mere risk minimising strategy more than a proactive tool to address poor environmental behaviour (Lee

and Gunarathne, 2019:15).

Contingency theory implies that regardless of the strategic model adopted by an organisation, a range of practices may exist within the organisation (Chenhall, 2003:150). This implies that the nature and design of a particular strategy may make them more appropriate for conditions present within an organisation. According to Ferreira, Moulang and Hendro (2010:938), environmental strategy has no influence on EMA adoption in large Australian organisations. Literature review, nevertheless, provides evidence supporting the inclusion of environmental strategy within this theoretical perspective (Latan *et al*., 2018:304; Qian, Burritt and Monroe, 2018:158; Le, Nguyen and Phan, 2019:17). Environmental strategy influences the adoption of EMA, consequently creating improvements in the economic and environmental performance of organisations (Solovida and Latan, 2017:611).

Adomako, Ning and Adu-Ameyaw (2021;422) argue that organisations that adopt a proactive environmental strategy tend to embark on environmental initiatives to improve performance. In contrast, Qian and Burritt (2009:57) claim that a reactive or compliance strategy impedes the adoption of EMA. This is because organisations may place more emphasis on regulatory compliance and consider environmental information beyond legal reporting requirements as unnecessary. According to (Lee and Gunarathne, 2019:16), it is crucial to mention that in most cases, organisations incorporate environmental initiatives into their corporate strategy. PEMA and MEMA information, however, are not integrated strategically within CASs. Consequently, proactively incorporating environmental concerns into a corporate strategy can influence EMA adoption (Le, Nguyen and Phan, 2019:6).

2.6.1.3 Organisational size

According to Ahmed and Courtis (1999:44), the size of an organisation can be measured by the book value of its total assets, turnover or staff size. Contingency theory literature equally mentions turnover and staff size as common metrics of organisational size (Leite, Fernandes and Leite, 2016:69; Carlsson, 2017:17; Phan, Baird and Su, 2017:364; Wang, Wang and Wang, 2018:237). Furthermore, Christ and Burritt (2013:168) stress that staff size can be a reasonable yardstick for measuring organisational size. Regardless of their size, organisations may, nonetheless, require physical and monetary environmental information as they attempt to achieve their environmental goals.

Mokhtar, Jusoh and Zulkifli (2016:114) stress that producing environmental information requires investment in new systems, staff training and engaging specialist skills. Furthermore,

environmental initiatives may also necessitate changes or continuous upgrades to production systems which require extra financing. Consequently, the capacity to generate additional funding may provide better opportunities for organisations to adopt environmental tools that integrate monetary and physical indicators. Large organisations may have more access to funding compared to small organisations and may be able to demonstrate the long-term benefits of allocating resources to EMA adoption. Large organisations also tend to be more environmentally visible as their activities are more susceptible to substantial scrutiny. This may be a driving force behind EMA adoption by large organisations (Ahmadi and Bouri, 2017:496).

Christ and Burritt (2013:168) argue that organisations tend to embrace environmental tools such as EMA to improve environmental and economic performance as they grow. Le, Nguyen and Phan (2019:22) maintain that growth empowers large organisations to improve their process efficiency, permitting them to exercise significant control over their environment and to allocate additional resources to procure environmental tools such as EMA. Le, Nguyen and Phan (2019:22) argue that only large organisations with a healthy financial position can adopt environmental tools such as EMA.

In contrast, Amara and Benelifa (2017:52) argue that organisational size does not influence EMA adoption. However, the research results appear to suffer sampling limitations because the research context considered only small organisations. Christ and Burritt (2013:167-170) also see the perceived cost as a major factor impeding EMA adoption, especially amongst smaller organisations. Likewise, Christ and Burritt (2013:170-171) comment that despite extensive research on EMA and its potential to improve the performance of organisations of different sizes, smaller organisations fail to adopt EMA. Finally, Huang *et al.* (2019:23) contend that small organisations can employ an EMAP such as MFCA because it is less complex and more cost-effective.

Mokhtar, Jusoh and Zulkifli (2016:116-118) maintain that small organisations adopt EMA to a similar extent as large organisations and measure organisational size using total assets. Mokhtar, Jusoh and Zulkifli (2016:116-118) argue that organisational size does not influence EMA adoption; however, the statistical power of the results may be limited due to the relatively low sample size. Phan, Baird and Su (2017:367-369) support the view that no association exists between organisational size and the adoption of EMA. Phan, Baird and Su (2017:364), in contrast to Mokhtar, Jusoh and Zulkifli (2016:116), employ the number of full-time staff as a measure of organisational size.

Leite, Fernandes and Leite (2016:61) argue that organisational size as a contingent variable can explain EMA adoption in the Portuguese textile and clothing industry. Similar to the studies examined above, Leite, Fernandes and Leite (2016:69) reveal that no association exists between organisational size and the adoption of EMA. Leite, Fernandes and Leite's (2016:73) research results suffer from a similar sampling limitation as Mokhtar, Jusoh and Zulkifli (2016:120). In contrast, Leite, Fernandes and Leite (2016:69) use the average annual sales volume to measure organisational size. Considering that EMAP such as MFCA integrates MEMA and PEMA information into environmental decision-making, there may be a case for EMA adoption in the TMI of SA, where a substantial portion of the industry players consist of small organisations (Le Roes-Hill *et al.*, 2017:2). The next section reviews institutional theory.

2.6.2 Institutional theory

The contingency theory variables discussed in the previous section highlight how much they influence EMA adoption. Amara and Benelifa (2017:49) contend that size, strategy and top management commitment are all internal factors that influence organisations' actions. Contingency theory employs other variables, such as industry type and environmental uncertainty, which may influence EMA adoption. These variables are external factors influencing organisations' actions (Bouma and van der Veen, 2002:283). Institutional theory, as with contingency theory, emanated from organisational theory and was developed by (Dimaggio and Powell, 1983:147). Accordingly, institutional theory highlights the effect of external forces on organisational decision-making (Meyer and Rowan, 1977:348).

According to Ball and Craig (2010:284), the institutional theory is centred on external rules and norms that describe the effects of social, economic, and political views on organisational practices. Dimaggio and Powel (1983:150) suggest that organisations may adopt certain practices due to the influence of external and internal actors that require the execution of certain tasks. They, consequently, attribute organisational behaviour to the actions of these social actors (Dimaggio and Powell, 1983:148). These actors institutionalise their ideas and norms, pressuring organisations into implementing these pre-conceived notions (Meyer and Rowan, 1977:348). Accordingly, key stakeholders that affect, and are affected by, the actions of organisations, such as regulators and top management, may influence EMA adoption. Dimaggio and Powell (1983:148) endorse the isomorphic concept as a key component of institutional theory. They argue that considerable variations exist in practices within

organisational fields at the initial stages of organisational development. However, Dimaggio and Powell (1983:148) argue that the drive towards embracing similar practices becomes inevitable once the field becomes established.

The progression towards achieving similar practices is known as institutional isomorphism. This explains the compelling pressures that force organisational structures and processes to be alike (Dimaggio and Powell, 1983:148). This may arise either as a result of imitation or creativity within the same environmental context. Dimaggio and Powell (1983:149) stress that the objective is to recognise a widely accepted approach to problems associated with an organisational field. In this instance, the institutional theory is typically viewed in many divides as describing the similarity and stability of organisational structures within the same context. Dimaggio and Powell (1983:149-150) prescribe two categories of institutional isomorphism; institutional and competitive isomorphism. Dimaggio and Powell (1983:149-150) argue that institutional isomorphism provides insight into the practices and politics that permeate modern organisations; competitive isomorphism, in contrast, offers an inadequate understanding of modern organisations.

Dimaggio and Powell (1983:150) note that organisations, in monitoring the activities of others, do not merely compete for resources and clients but equally for political influence, economic relevance, and social and institutional validity. Accordingly, the institutional perspective may be required to complement competitive isomorphism to depict an appropriate image of modern organisations. The conventional classifications for understanding processes that lead to institutional isomorphism are arguably those originating from the work of Dimaggio and Powell (1983:150). They claim that coercive, mimetic, and normative pressures influence organisational changes (Dimaggio and Powell, 1983:150). Consequently, to establish the indicators of successful adoption of EMA, the institutional theory may offer valuable insights into the impact of institutional actors on organisations.

2.6.2.1 Coercive pressure

Dimaggio and Powell (1983:150) assert that coercive pressure arises when organisations are forced to adopt certain practices by influential stakeholders. These stakeholders may include other organisations, regulators or investors that provide resources or support to the adopting unit (Ferdous, Adams and Boyce, 2019:1007). Influential stakeholders, for instance, may apply coercive pressure on organisations to modify their conduct on the level of waste generated during production. Coercive pressure may be considered persuasive, imposed, or

solicited. Therefore, they shape the key elements of organisational structure and function.

Iredele, Tankiso and Adelowotan (2019:16) accentuate the influence of coercive pressure on EMA adoption. They cite that without pressure from influential stakeholders, organisations are less likely to adopt EMA (Iredele, Tankiso and Adelowotan, 2019:16). Similarly, Siskawati *et al.* (2019:260) comment that regulators, in an attempt to manage environmental pollution, can mandate organisations to adopt certain environmental management standards. Qian, Burritt and Chen (2015:417-420) consider coercive pressure the most compelling medium through which organisations adopt EMA. Qian, Burritt and Chen (2015:417-420) note in the same manner as Latif *et al.* (2020:4) that coercive pressure can also be exerted through the act of legislation. When enacted, these environmental laws empower regulatory authorities to enforce mandatory compliance and impose penalties for non-compliance. Strict enforcement of regulations such as the National Environmental Waste Act of South Africa, for instance, may enhance EMA adoption (Republic of South Africa, 2009).

Coercive pressure may be utilised within the institutional theory perspective to explore how organisations appreciate and respond to the changing business environment. For example, integrated reporting by listed organisations in South Africa, initiated with the release of King Code III of 2009, is a form of coercive pressure exerted by financial regulators in South Africa. Regulators such as the Johannesburg Stock Exchange (JSE) require all listed organisations to publish environmental information in annual integrated reports (Atkins and Maroun, 2015:200). Therefore, the pressure of being accountable for the environment and the responsibility of meeting stakeholders' demands may enhance EMA adoption. According to the researcher, the TMI of SA, however, consist of non-listed organisations; consequently, they may circumvent the pressure to adopt EMA as they are not required to report on their environmental activities.

Le, Nguyen and Phan (2019:8) note that EMA adoption can be enhanced when organisations are induced with incentives such as carbon tax rebates and government grants. Elhossade, Abdo and Mas'ud (2020:518) claim that when organisations face coercive pressure, they tend to embrace EMA to avoid fines for non-compliance. Therefore, coercive pressure may enhance the social legitimacy of these organisations when incentives are provided for compliance and penalties for non-compliance with environmental regulations.

2.6.2.2 Mimetic pressure

Dimaggio and Powell (1983:152) argue that mimetic isomorphism emanates as an outcome

of organisations seeking to adopt other organisations' effective methods or practices. This may be because they consider such practices to be legitimate and successful. According to Dimaggio and Powell (1983:147), organisational practices become similar due to mimetic pressure rather than the need to improve efficiency. Accordingly, if certain existing standards or new practices are perceived as valuable within an industry, organisations may adopt them without questioning their value. Similarly, as the imitation process takes shape, mimetic pressure may promote the adoption of similar practices and policies amongst organisations. In such instances, organisations may copy the practices undertaken by a significant number of organisations.

De Villiers and Alexander (2014:201) stress that new fields promote innovation and uncertainty, with mimetic pressure acting as a standard response to changes in these fields. This indicates that mimetic pressure can also be induced by uncertainty. Some organisations may also adopt business models that serve to improve on the failures of other organisations. Accordingly, imitating successful practices of other organisations may serve as a convenient source of new practices for organisations that shape themselves after others. Wang, Wang and Wang (2018:236) agree with this position by stating that organisations are likely to adopt the successful practices of others when faced with uncertainties. This may be due to the lack of resources to allocate appropriate strategies as a response to address the changing and dynamic environment. Gunarathne and Lee (2019:170) argue that developing countries lack regulatory capacity due to weak regulations and enforcement. Therefore, EMA adoption is largely influenced by organisations replicating successful practices within and outside their industry (Gunarathne and Lee, 2019:170). Likewise, EMA adoption may spread through employee attrition. Accordingly, when employees transfer innovative ideas from their previous employment, they generate prospects for adopting and applying successful practices in other organisations (Dimaggio and Powell, 1983:151).

It may be important for organisations to adopt successful practices of others to minimise any potential exploration and experimentation costs because EMA adoption requires substantial investments with the potential benefits accruing long term (Latif *et al.*, 2020:4). This supports the position that organisations may only adopt EMA in response to competition or industry norms. Organisations, for instance, may adopt ERPSs to enhance their industry reputation as industry leaders and remain competitive and visible within the business or area of trade. The literature review suggests that mimetic pressure is the least compelling reason influencing EMA adoption amongst organisations (Wang, Wang and Wang, 2018:240;

Elhossade, Abdo and Mas'ud, 2020:519). In South Africa, for instance, pressure from regulators such as the JSE forcing listed organisations to comply with integrated reporting guidelines has reduced the necessity of copying practices of other organisations (Iredele, Tankiso and Adelowotan, 2019:16). This may not be the case in the TMI of SA, because it comprises a substantial number of small organisations that are not listed on the JSE (Le Roes-Hill *et al.*, 2017:2).

2.6.2.3 Normative pressure

Dimaggio and Powell (1983:152) point out that normative pressure is derived principally from professionalism. They contend that the two leading elements guiding professional conduct in organisations originate from formal training and the existence of professional associations (Dimaggio and Powell, 1983:152). Normative pressure is a significant factor driving ethical conduct and promoting the awareness of responsibility towards the environment in emerging markets (Latif *et al*., 2020:4). The absence of strict regulations and enforcement may facilitate certain socially compliant behaviours and actions (Gunarathne and Lee, 2019:170). Normative pressure may demonstrate an organisation's pursuit of social legitimacy and recognition. Latif *et al*. (2020:4) mention that organisations that fail to comply with instituted rules and norms can suffer financial losses, risk competitive advantage and reputational damage.

Normative institutions may develop and cultivate a shared understanding of rules and values that transcend the period of professional as well as educational development. Dimaggio and Powell (1983:152) mention that embracing professional development implies the shared effort of members in defining the norms of their profession. The process of creating an intellectual base, therefore, establishes legitimacy and autonomy for the profession. Given that EMA application in South Africa is still in its infancy (Ambe, 2007:59), it implies that formal education may influence the knowledge and experience of employees within the TMI of SA. This can enhance the use of EMAPs and improve environmental decision-making amongst TMOs in SA (Gunarathne and Lee, 2019:165).

International organisations such as the UNDSD also provide publications on the application of EMA (UNDSD, 2001:10). Normative pressure may, consequently, be extended to industry, practice, and accounting professionals by reference to published guideline documents. For instance, the 2030 agenda for sustainable development is a global plan of 17 SDGs intended for all UN member states. SDGs 12 and 13 explicitly consider responsible consumption and

production and a call to climate action, respectively (United Nations, 2016:23-24). According to the researcher, the GHGs in 2020 and 2021 are likely to lessen due to global travel restrictions, though this improvement may only be temporary. Nevertheless, the textile and apparel industry practices imply that the existing methodologies are a long way from achieving the UNs SDGs (Cai and Choi, 2020:1-2).

Elhossade, Abdo and Mas'ud (2020:518) contend that the absence of partnerships between educational institutes, professional associations, and organisations impacts EMA adoption in Libya. Elhossade, Abdo and Mas'ud (2020:519) demonstrate that normative pressures are inadequate to influence EMA adoption in circumstances where this separation exists. Global organisations, such as IFAC that advocate developing, adopting and implementing international standards for the accountancy profession also exert normative pressure on organisations through international guidance documents on EMA (IFAC, 2005:23).

Furthermore, professional accounting bodies that are members of IFAC research EMA benefits and how EMAPs such as MFCA, ABC and LCC can be employed to manage environmental costs (IFAC, 2005:61; Irons, 20101-6). Therefore, professional accountancy bodies such as the Association of Chartered Certified Accountants (ACCA), Chartered Financial Analysts (CFA) Institute, Chartered Institute of Management Accountants (CIMA) and the South African Institute of Chartered Accountants (SAICA) use some normative pressure through their members who are engaged in employment across various industries (ACCA Singapore, 2013; ACCA and CFA Institute, 2019; Lee and Gunarathne, 2019). Therefore, accountants have a role in promoting EMA adoption because normative pressure may be used when professional accounting bodies train their members about contemporary EMAPs.

2.7 SUMMARY

This chapter provided the context of this study and presented literature on EMA, introducing two types of information (MEMA and PEMA) that can be generated through EMA. First, two compatible EMA definitions, according to IFAC, were presented. In addition, a description of environmental cost types, key information required for identifying environmental costs, and a review of EMAPs used in minimising environmental costs were considered. Several authors agree that EMA implementation may require substantial investment, and EMAPs such as MFCA may be inexpensive to implement. Likewise, organisations may require multiple EMAPs to manage their environmental costs. Next, the adoption of EMA in TMI was

examined together with the various types of EMAPs employed by TMOs. EMA adoption in South Africa was also examined, together with the benefits of EMA adoption. Following this, the theoretical underpinning for this study was reviewed. This is intended to mirror the empirical findings on the indicators of successful adoption of EMA amongst the selected TMOs in SA. The succeeding chapter describes the application of the appropriate research methodology for this study.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter Two presented an overview of the research context and reviewed the literature on EMA adoption. An outline of competing theoretical frameworks underpinning this research was also introduced. This chapter introduces the research methodology and outlines the research paradigm and design. A presentation of the data collection instrument, sampling and data analysis approaches follows this. This chapter also provides a succinct description of the measures of trustworthiness and authenticity applicable to the qualitative accounts of this study and justification for the choice of the research strategies adopted.

3.1.1 Goal of chapter

This chapter aims to discuss the research strategies employed in this study. Each stage of the methodology process is described chronologically to provide concise accounts of the research strategies adopted. This chapter, accordingly, presents the appropriate strategies necessary to recognise and assess the participants' view of the phenomenon being explored.

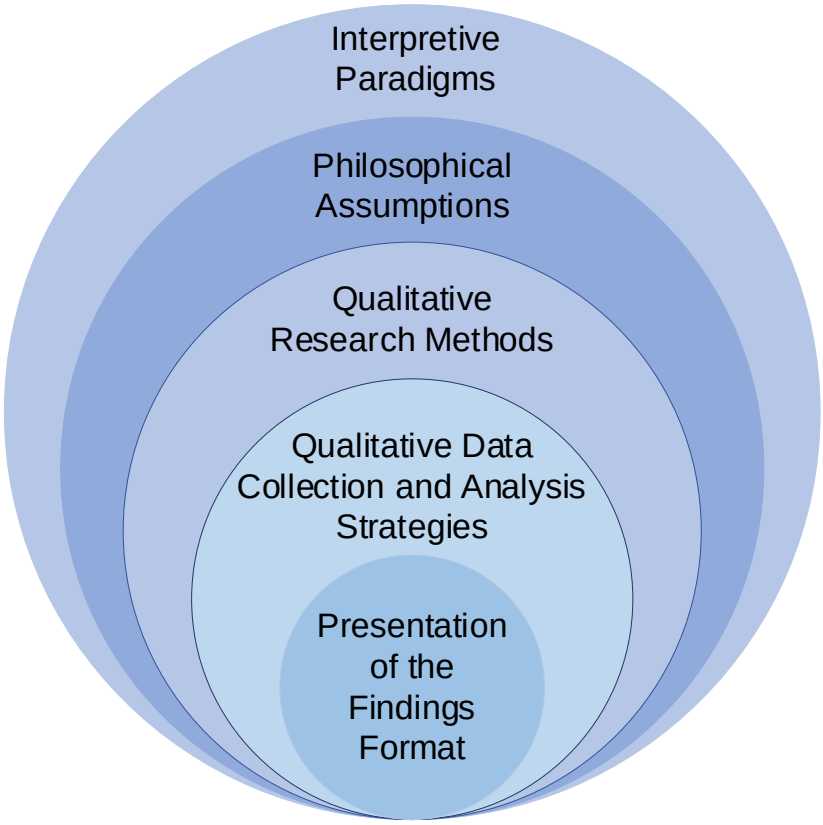
3.1.2 The layout of the chapter

This subsection provides a layout of the chapter. First, in Section 3.1, the chapter introduction is presented. Next, Section 3.2 outlines the research paradigm and Sections 3.3 and 3.4 present the research questions and objectives. Following this, the research design is discussed in Section 3.5. Furthermore, this section outlines the data collection instrument, sampling, and data analysis approach. Finally, the methodology limitations of this study are considered in Section 3.6, and a review of the ethical requirements in Section 3.7. Finally, the chapter concludes with a summary in Section 3.8.

3.2 RESEARCH PARADIGM

Research paradigms are a set of assumptions and rules for undertaking quality research. It merges concepts, principles, theoretical frameworks, and research methods to facilitate the conduct of research (Tolley *et al.*, 2016:12). The positivists assume that objective facts evidence social reality; in contrast, the interpretivist holds that social reality relies less on objective facts (Saunders, Lewis and Thornhill, 2019:144-145). Accordingly, the positivist philosophy is linked closely to theory testing, while interpretivist involves theory building (Bhattacpherjee, 2012:103). Furthermore, interpretivists maintain that interpretations of

social reality are subjective and contingent on specific circumstances (Biggam, 2018:172). Finally, Saunders, Lewis and Thornhill (2019:145) emphasise that interpretative research typically follows an inductive approach and involves thorough analysis and a small sample size. Consequently, the interpretivist philosophy is associated closely with qualitative methodology (Bhattacpherjee, 2012:35). Figure 3.1 illustrates the elements that constitute the approach adopted for this study.



Source: *Adu (2019:7)*

Figure 3.1: How interpretive paradigms inform the qualitative research process

Figure 3.1 illustrates the flow of the qualitative research process adopted for this study. The research problem informs the selected research methodology and approach. Therefore, this approach must be consistent along the selected research paradigm, assumptions, methods, strategies, and presentation of findings. Creswell and Creswell (2018:64) state that qualitative methodology appropriately addresses a research problem with unidentified variables. The need to provide multiple contexts and generate comprehensive information that ensures that the participants' viewpoints are complete informs the choice of a qualitative approach. This study adopted a qualitative exploratory design to investigate EMA adoption in the TMI of SA. Lee and Gunarathne (2019:7) adopted a similar methodology in the second phase of a

comparative study, where the implementation and usefulness of EMA in Australia and Sri Lanka were investigated.

3.2.1 Justification for the research paradigm

According to Lee and Gunarathne (2019:3), research on EMA adoption in developing countries remains scarce. Iredele, Tankiso and Adelowotan (2019:5) argue that EMA adoption in South Africa is in its early stages compared to developed countries where modern environmental concepts are seen as vital to an organisation's existence and growth. As emphasised in section 2.7, related literature review findings suggest limited evidence to support the efficacy of EMA in small organisations, which is the case of the TMOs in SA. Consequently, the scenarios in which EMA would be adopted are poorly understood, necessitating an in-depth investigation into EMA adoption in the TMI of SA. Creswell and Creswell (2018:64) further claim that qualitative research is suitable for addressing a research problem where scarce literature exists. There is a need to provide valuable information that ensures the participants' opinions are complete. This is the case with the TMI of SA.

Saunders, Lewis and Thornhill (2019:149) argue that the interpretivist view is highly suitable for management accounting research because the context in which organisations operate is unique and complex. Likewise, Interpretivist researchers claim that employees engaged in various organisational functions will have different interpretations of the organisation (Saunders, Lewis and Thornhill, 2019:149). Therefore, the interpretivist paradigm is appropriate for this study because it facilitates the creation of valuable insights and interpretation of the research context. Interpretivist researchers agree that this is accomplished by taking a comprehensive view of the sampled organisations through the views of employees (Islam and Aldaihani, 2021:2). Consequently, this study adopted a qualitative design to investigate EMA adoption in the TMI of SA. Lee and Gunarathne (2019:7) utilised a similar methodology in the second phase of a comparative study, where the implementation and usefulness of EMA in Australia and Sri Lanka were investigated.

3.3 RESEARCH QUESTIONS

Ngulube (2020:28) opines that research questions are designed to support and improve understanding of an identified research problem. Accordingly, research questions attempt to analyse an identified research problem into more manageable tasks. In this way, the research question is also valuable for deciding the most suitable approach for addressing the research problem. Therefore, the research questions of this study were formulated to aid the research

problem:

RQ1: What practices do the selected textile manufacturing organisations in South Africa use to manage environmental costs?

RQ2: What benefits does environmental management accounting adoption bring to the selected textile manufacturing organisations in South Africa?

RQ3: What indicators stimulate the successful adoption of environmental management accounting amongst the selected textile manufacturing organisations in South Africa?

3.4 RESEARCH OBJECTIVES

The role of EMA in highlighting and providing visibility on environmental costs is evident from the literature review in Chapter Two. Consequently, contemporary practices for managing environmental costs are increasingly receiving global attention. The literature review reveals that EMA adoption in South Africa is still growing (Fakoya and Imuezerua, 2020:2; van der Poll, 2021:88). Its application may provide TMOs in SA with valuable information required for managing environmental costs. The research objectives of this study were designed based on the research questions:

RO1: Identify the practices that a selection of textile manufacturing organisations in South Africa use for managing environmental costs.

RO2: Explore the benefits of environmental management accounting adoption for the selected textile manufacturing organisations in South Africa.

RO3: Ascertain the indicators of successful adoption of environmental management accounting amongst the selected textile manufacturing organisations in South Africa.

3.5 RESEARCH DESIGN

Creswell and Creswell (2018:53) state that research designs are types of investigations within qualitative, quantitative, and mixed methods methodologies that offer a detailed path for the procedures employed in research. As far as Mosweu and Mosweu (2020:389) are concerned, research designs comprise the blueprint for conducting research and involve the process undertaken to incorporate the various parts of a study in a structured, clear, and consistent manner, consequently offering an appropriate solution to the research problem. The quantitative methodology uses a confirmatory scientific design as it emphasises hypothesis testing; in contrast, qualitative methodology produces new theories and depicts participants'

viewpoints using an exploratory design (Saunders, Lewis and Thornhill, 2019:144). Qualitative research is typically inductive and does not involve generalisation but is inclined towards exploring the research problem in its distinct situation (Tolley *et al.*, 2016:54).

Qualitative research methodology is exploratory and is valuable for understanding a topic in sufficient depth (Creswell and Creswell, 2018:104). Exploratory research design is connected directly to qualitative research methodology (Biggam, 2018:167-168). Therefore, this study adopted an exploratory research design to deliver valuable descriptions of EMA adoption in the TMI of SA. The exploratory design is particularly suitable where limited research has been undertaken in the past (Antwi and Kasim, 2015:220), as with the research problem at hand.

3.5.1 Research method

The research method refers to the approach the researcher intends to employ in carrying out the research and may be designed based on qualitative, quantitative, or mixed methodologies (Mavodza, 2020:3). Research designs are plans that entail the use of various investigation methods to address research problems; in contrast, research methods are strategies utilised to execute the plans (Mavodza, (2020:3). Accordingly, the research method usually mirrors the research design most appropriate for addressing the research problem. This study adopts a method of triangulation to gather data on EMA adoption in the TMI of SA. Triangulation is a method used in gathering and substantiating research data from various sources (Creswell, 2015:629). The research data for this study was assembled using existing literature, in-depth interviews, and a web-based document analysis. According to Creswell (2015:259), method triangulation can enhance this study's credibility by corroborating the qualitative accounts of the findings.

3.5.2 Data collection instruments

Qualitative data collection involves using tools for gathering text or image data and recording information gathered (Creswell, 2015:506). This study employs in-depth and semi-structured interviews to collect information from participants. Qualitative information was obtained by employing face-to-face interviews. Electronic methods such as Microsoft Teams™ and Zoom™ were also used where physical visits were impossible. The interviews involved open-ended questions to elicit the views and opinions of participants. This was collected at an organisation's site and during electronic interviews with participants, which included a flexible approach to gain penetrating insights unique to each participant. A web-based document analysis was also conducted to gather added information on green initiatives within the last

five years.

According to the researcher, environmental information is limited because TMOs in SA are mainly SMEs and are not listed on the JSE. They are also not mandated to report on the environmental initiatives performed within any reporting period. However, at least two selected samples have information on environmental initiatives carried out within the last five years on their websites. Interview questions focused on participants' awareness of EMAPs for managing environmental costs, how major environmental costs are recorded, and the impediments to and benefits of EMA adoption for the TMI of SA. The choice of the data collection instrument improves the depth and quality of the information gathered. It may encourage meaningful responses, ensuring participants are not confined to limited responses. Interviews provide an additional advantage over other methods, such as focus groups and observation, because research information is only sourced from participants knowledgeable about textile manufacturing, environmental waste, and sustainability issues. This may reduce the cost of execution and eliminate any bias and secrecy introduced using group interviews (Biggam, 2017:190).

3.5.3 Population

An important component of qualitative research methodology is identifying and selecting the appropriate individuals who represent the research population and are willing to participate. Consequently, researchers that employ qualitative methods refer to individuals involved in research as participants in contrast to subjects in quantitative research (Tracy, 2019:66). In qualitative research, a population is a collection of individuals that have similar traits that separate them from other groups; in contrast, a target population is a group of individuals with some common defining characteristics that researchers can identify and study (Creswell, 2015:142). Accordingly, The TMI of SA was adopted because it consists of small organisations with informal operations (Le Roes-Hill *et al.*, 2017:2) and are not required to meet any mandatory environmental regulations or produce environmental reports. Therefore, the target population is the TMOs in the three major textile clusters of South Africa: the KCTC, CCTC, and SASTAC. Therefore, the researcher employed the databases of industry players within the TMI of SA, such as the Textile Federation (Texfed), KCTC, CCTC and SASTAC, to identify the TMOs that fit the parameters of this study.

Table 3.1 depicts the databases of industry players in the TMI of SA employed for this study. As highlighted in section 2.2 of this study, the TMI of SA comprise organisations that produce,

process, and sell textiles, footwear, and leather. Likewise, the database selected includes organisations operating within the textile supply chain in South Africa. The context of this study, however, relates only to textile manufacturing, which mainly consists of value addition and enhancements such as dyeing, printing, weaving, knitting and chemical finishing to textile products. Consequently, only organisations that fall within the borders of textile manufacturing and meet this study's parameters were selected. The selected TMOs only manufacture and process fibres, yarns, threads, wool, fabrics, linen, carpets, rugs, and other technical textile products. The inclusion criteria for individuals interviewed is contingent upon the employee's years of experience in their respective organisations (Knott *et al.*, 2022:2). This selection approach ensures that all valuable research information is sourced directly from employees most knowledgeable about MEMA, PEMA, and environmental strategy information.

Table 3.1: Population size of databases and samples selected

S/N	Selected Databases of Industry Players	Number of Organisations	Organisations Selected	Individuals Interviewed
1.	Textile Federation (Texfed)	117	6	7
2.	KwaZulu-Natal Clothing and Textile Cluster (KCTC)	31	1	2
3.	Southern African Sustainable Textile and Apparel Cluster (SASTAC)	5	0	0
4	The Cape Clothing and Textile Cluster (CCTC)	25	1	1
	Total	178	8	10

Source: *Researcher's compilation*

3.5.4 Sampling technique

A sample is a subgroup of the target population to be studied and from which the researcher intends to collect data (Biggam, 2018:168). Consequently, this study employed a purposeful sampling technique by choosing a meaningful sample that fits the parameters of the research objectives. Individuals and sites were selected intentionally to explore EMA adoption in the TMI of SA. The sample comprises directors, accountants, and production or environmental

managers who are well-informed about textile manufacturing, environmental waste management, and sustainability issues. The average length of the selected individuals' relevant job experience is 13 years.

Guest, Bunce and Johnson (2006:74-78) contend that when qualitative research is employed, sufficient data themes become evident as early as six interviews, and data saturation often occurs within the first 12 interviews. According to Islam and Aldaihani (2021:9), interviews as a data-gathering method can be terminated when no new data is obtained from additional interviews. Knott *et al.* (2022:2) also claim that data saturation is based on the logic of employing a systematic approach, where data analysis collection, coding and the write-up of research findings occur concurrently. The data analysis of this study co-occurred with other aspects of the developing qualitative study, such as data collection, coding, thematic analysis and the write-up of research findings (Creswell and Creswell, 2018:314). Mthuli, Ruffin and Singh (2022:5) contend that qualitative data is usually gathered from a small sample where a suitable approach is employed. Therefore, no more than 10 sampled participants were interviewed, as data saturation was attained after six interviews.

The choice of the sample size becomes necessary as qualitative research is typified by the researcher's need to explore and develop an understanding of the research problem, where the quality of the chosen samples is of more value than its quantity (Creswell, 2015:209; Tracy, 2019:138). Furthermore, it is often impossible to include all population members within the sample size. A study sample is usually selected from the population to participate in a research study. Creswell and Creswell (2018:353) note that qualitative research entails using small samples to examine a research problem in an in-depth manner. Researchers employ various sampling techniques when the study population is large, and it is practically unrealistic to test the entire population because they are not accessible. Bhattacpherjee (2012:104) argues that a small sample size is deemed suitable in interpretive research if they fit the nature and purpose of the study. A small sample guarantees that all relevant information is sourced from sampled participants.

Table 3.2: Categories of individuals interviewed

S/N	Group	Participant Groups	Sampling Method	Sample Interviewed
1.	1	Accountant	Purposeful sampling	3
2.	1	Bookkeeper	Purposeful sampling	1

S/N	Group	Participant Groups	Sampling Method	Sample Interviewed
3.	2	Production Manager	Purposeful sampling	1
4	2	Production Staff	Purposeful sampling	1
5	2	Environmental Manager	Purposeful sampling	1
6	3	Director	Purposeful sampling	3

Source: *Researcher's compilation*

The samples for this study were divided into three distinct groups where information about environmental issues within the organisation could be sourced. Table 3.2 below documents the categories of individuals interviewed, indicating the employee groups selected and the sample size for this study. The employees engage in various organisational functions and can provide rich and valuable insights on MEMA, PEMA, and strategic information.

3.5.5 Data collection procedure

The data collection process involved three stages. The first stage focused on selecting research participants, the second stage concentrated on data collection, and the third involved transcribing the collected data.

3.5.5.1 Selection of research participants – stage 1

The contact details of potential participants were obtained from the organisation's website and through the officer at the service desk. Thereafter, a snowball approach was employed to recruit additional participants (Creswell, 2015:146). The research participants were divided into three groups. The first group are employees engaged in the accounting function and can provide monetary information on managing environmental waste cost. The second group consists of employees engaged in the production or environmental function and can provide physical waste information on dry and wet processing of textiles. Finally, the third group comprises employees that are ultimately accountable and can provide insight from the environmental strategy and policy point of view.

Likewise, employees without knowledge of environmental waste cost management in the form of monetary information were excluded. In addition, employees without knowledge of dry and wet processing of textiles in the form of physical information and environmental strategy and policy were excluded. This goal-directed sampling approach ensures that research information is sourced directly from those most knowledgeable about MEMA,

PEMA, and environmental strategy information.

3.5.5.2 Data collection – stage 2

The data collection instrument permitted the collection of qualitative accounts on EMA adoption in the TMI of SA. In-depth interviews were employed as the primary source of data collection: this ensured that participants' opinions were obtained to address the three research objectives. The interviews were conducted from June to December 2021. Ten interviews were conducted in total, of which three were held at the organisation's manufacturing site, while the remaining seven were conducted using Microsoft Teams™ and telephone. This was because they had declined access to their premises due to an increased risk of infection during the Covid-19 pandemic. Similarly, the country-wide civil unrest in July 2021, which originated in KwaZulu-Natal, further delayed interviews and data collection scheduling.

During the research interviews and data collection, four participants withdrew their consent after receiving the participant information sheet, which contained a summary of the potential research questions. It is possible that the research participants felt uneasy, as the research questions appeared too direct and probing about their organisations. Therefore, the researcher modified the research questions in the participant information sheet, making them more general and directed towards the TMI of SA. In addition, the researcher recruited four new participants and committed to signing a non-disclosure agreement (NDA) with the research participants.

Ethical clearance was obtained before initial data collection, provided in appendix E. The researcher also obtained approval for the revisions in the participant information sheet and recruitment of new participants. Consequently, four additional TMOs and, by extension, four additional research participants were recruited to participate in the research. The research participants were informed that the interviews would be recorded, and they consented. The average time for each research interview was 45 minutes long, and all the participants answered all the questions willingly.

The research questions for this study were identified and extracted from existing literature that explored the adoption of EMA as a tool for managing environmental costs. First, the appropriate literature fitting the parameters of this study was selected and matched to the research problem at hand. Subsequently, the in-depth interview questions were drawn from this study’s research questions and linked to the relevant literature. Table 3.2 documents the

interview protocol matrix.

Table 3.3: Interview protocol matrix

S/N	Interview Questions	Relevant Literature	Research Objectives
1.	What practices do the selected TMOs in SA use for managing environmental costs?	(Doorasamy and Garbharran, 2015:9; Qian, Burritt and Chen, 2015:408; Smit and Dikgwatlhe, 2015:117; Katherine Leanne Christ and R. Burritt, 2017:609; Nyide, 2017:36).	**RO1:** Identify the practices that a selection of textile manufacturing organisations in South Africa use for managing environmental costs.
2.	What benefits does EMA adoption bring to the selected TMOs in SA?	(Salim, Mohd Amir and Sulaiman, 2017:116; Sahu *et al.*, 2021:14; Walz and Guenther, 2021:596).	**RO2:** Explore the benefits of environmental management accounting adoption for the selected textile manufacturing organisations in South Africa.
3.	What indicators stimulate the successful adoption of EMA amongst the selected TMOs in SA?	(Ntalamia, 2017:4; Le, Nguyen and Phan, 2019:20; Lee and Gunarathne, 2019:7).	**RO3:** Ascertain the indicators of successful adoption of environmental management accounting amongst the selected textile manufacturing organisations in South Africa.

Source: *Researcher's compilation*

Table 3.3 illustrates the primary interview questions, related literature sources, and research objectives being addressed. The interview sessions were recorded using an audio recorder, and handwritten notes were taken during the interviews to serve as a backup in case the recording equipment malfunctioned (Creswell and Creswell, 2018:312). According to Qu and Dumay (2011:254), when qualitative research methodology is used and a small number of participants are engaged, the researcher should design an interview protocol to guide the researcher when conducting the interviews.

The interview protocol for this study covered the research questions and was used as a manual for the interview process. This was often modified as new themes emerged during data collection (Creswell, 2015:17). The interviews were allocated to various themes to guarantee a thorough and coherent analysis of the research problem. Biggam (2018:195) believes that research themes position the researcher and participant on the right path with a focus on the research problem. Likewise, Biggam (2018:195) claims that research themes

aid the analysis of the transcripts. Appendix B depicts the in-depth interview questions and the recurring themes from the data gathered from participants.

3.5.5.3 Transcribing – stage 3

Bhattacpherjee (2012:96) notes that after each research interview, the audio recordings should be transcribed correctly and documented in a text format for interpretation and analysis. The researcher transcribed the audio-recorded interviews of this study to ensure the completeness and correctness of the data. The transcriptions of the interviews were grouped under various themes to support data analysis (Biggam, 2018:197). All the transcribed data were reconciled to the audio recordings to ensure all the relevant information was captured correctly.

Chaterera-Zambuko (2020:151) claims that transcription is an invaluable phase in qualitative research analysis, although researchers need to employ mechanisms to mitigate data confidentiality. To minimise concerns about data confidentiality, the researcher substituted participant identifiers with pseudonyms. Furthermore, all interview transcripts, notes, audio, and electronic files were stored in secure storage. Only the researcher has access to all paper-based records stored at home and electronic-based records stored in his computer, storage drives and audio recording device. All the researcher's equipment and devices are password-protected to prevent unauthorised access. The next section presents the data analysis method for this study. Appendix C indicates the interview transcript of sample WS09.

3.5.6 Analysis of the data

Guest, Bunce and Johnson (2006:74-78) contend that when qualitative research is employed, sufficient data themes become evident as early as six interviews, and data saturation occurs within the first 12 interviews. Therefore, the researcher terminated the search for additional samples when the in-depth interviews were not presenting any new information (Islam and Aldaihani, 2021:9; Knott *et al.*, 2022:2). Therefore, no more than 10 persons were interviewed because data saturation was attained after the sixth interview (Guest, Bunce and Johnson, 2006:78). Figure 3.2 below portrays the data saturation matrix with no fresh themes emerging after the sixth interview. Consequently, based on the information already gathered and themes identified, additional interviews will not generate any new information.

Data saturation matrix	Sequence of emerging themes per participant									
Initial themes	KD01	KD02	KA03	KN04	KN05	GL06	GZ07	GT08	WS09	WA10
Production of harmful environmental waste	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Types of environmental waste produced	✓	✓	✓	✓	✓					
Environmental costs tracking and measurement	✓	✓	✓	✓	✓					
Environmental initiatives	✓	✓	✓	✓	✓	✓				
EMAPs benefits	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cost of implementing EMAPs	✓	✓	✓	✓	✓	✓	✓	✓		
Government legislation	✓	✓	✓	✓	✓					
Functional collaboration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Industry challenges	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: *Researcher's compilation*

Figure 3.2: Data saturation matrix

Qualitative data analysis involves interpreting text and descriptive data to search for patterns and themes (Creswell and Creswell, 2018:313). The interview recordings of this study were transcribed into words, and the data were subjected to thematic analysis. Microsoft Excel™ was utilised to code and thematically analyse the qualitative data from the interview recordings. According to Lochmiller (2021:2043), thematic analysis commences with examining the transcribed data to recognise and structure the central ideas described by the research participants. To synthesise the study's findings, the data acquired was structured according to themes that align with the overall objectives of the study and cross-referenced with related literature review findings. The next section discusses the limitation of the research methodology employed in this study.

3.6 LIMITATIONS OF THE METHODOLOGY

The research design used in this study demonstrates its appropriateness for addressing the research objectives. Nevertheless, it is limited in some ways. The primary data of this study was gathered through in-depth interviews. Consequently, the researcher was restricted to the available sample size that fits the parameters of this study. Additionally, the researcher's challenge was selecting participants who could provide the most meaningful information regarding the research problem. The extent to which the study's findings may be relevant to other populations can be enhanced by carefully documenting the conceptual links between the research problem, sample selection process, and emerging data (Tolley *et al*., 2016:54). The TMI of SA comprises small organisations that have informal operations (Le Roes-Hill *et al*., 2017:2), and they consider information around environmental issues as highly

confidential. Therefore, this study strengthened its findings by employing relevant literature and web-based document analysis to support in-depth interviews.

In the positivist paradigm, the quality of research is judged using the validity, reliability, and objectivity criteria; in contrast, interpretivists judge the quality of research by its trustworthiness (Chaterera-Zambuko, 2020:150). Accordingly, the researcher employed adequate precautions to proactively reduce the limitations of this study and improve its quality. A succinct explanation of the measures to safeguard this study's trustworthiness is presented below.

3.6.1 Credibility

Member checks are an important qualitative tool for guaranteeing credibility. Therefore, to substantiate the qualitative accounts of the study, strategies like member checking and method triangulation were adopted (Creswell, 2015:630). In addition, the transcripts of interviews and findings were referred to sampled participants to verify the accuracy of the resulting themes (Creswell and Creswell, 2018:324). This ensures that all interpretations represent fairly and also serves the purpose of additional data collection. Also, method triangulation was used to ensure the credibility of the study. This was done by synthesising the literature review and study findings as well as information on environmental initiatives on the websites of the TMOs in SA (Creswell and Creswell, 2018:341).

3.6.2 Dependability

To ensure the findings' consistency and stability, the research process's roadmap, such as the sampling approach and data collection methods, was detailed and presented clearly. Furthermore, an intercoder analysis was also used to improve the study's quality, and this guarantees that the process can be reproduced in a different context to obtain consistent findings (Tolley *et al.*, 2016:26). Dependability ensures that a clear and systematic approach is adopted in collecting, analysing and interpreting research information that may be used in developing a conceptual framework (Chaterera-Zambuko, 2020:149).

3.6.3 Confirmability

To separate the influence of the researcher's values on this study's findings, a description of how interviews were conducted, data collected, and the review of secondary data were produced. This ensures that the data interpreted accurately supports the study's findings and conclusions. In the interpretivist paradigm, confirmability eliminates potential researcher

emotions and biases regarding the study's findings. The researcher, therefore, referred to existing studies covering a similar sample as this study (Chaterera-Zambuko, 2020:150). The findings were also referred to participants to verify if they agreed with the inferences drawn by the researcher (Bhattacpherjee, 2012:111). Furthermore, the assumptions and limitations of this study were clearly stated to eliminate any conflicts and minimise the occurrence of personal judgements.

3.6.4 Transferability

To evidence that this study's findings can be employed in other research contexts, such as a different population or interval, the context of the study and a detailed account of the research approach was presented. Likewise, the problem statement, research methodology and study findings were compared to existing research that examined a similar phenomenon to establish replication and permit links among studies from various sources (Tracy, 2019:239).

3.6.5 Authenticity

To establish the scientific integrity of the conduct and evaluation of this study, an appropriate research design and data collection method was adopted to address the research objectives. A clear justification was similarly presented for the site population size, sampling method and final sample size applied to generate the findings of this study (Chukwuere and Chukwuere, 2020:546).

3.7 ETHICAL CONSIDERATIONS

This study observed all ethical requirements as stipulated by UNISA. Before conducting the interviews, ethical clearance was obtained from the UNISA College of Accounting Sciences Research Ethics Committee. Permission to collect research data was requested from several identified organisations, of which 10 participants formally agreed to participate in the research interviews. These participants had to sign informed consent forms to acknowledge that they had been provided with the relevant information to decide whether to participate in the study. The researcher kept the participants' identities private using pseudonyms and removed all personal identifiers from research-related information. In addition, only the researcher can access all research-related information, as all paper-based records are stored at home. All electronic-based records stored in his computer, storage drives, and audio recording device are password-protected.

Four participants withdrew their consent at the commencement of data collection. It is possible that the research participants felt uneasy as the research questions appeared probing about their organisations. Therefore, the researcher amended the research questions, making them more generic to the TMI of SA. The researcher also agreed to put an NDA in place to protect and reassure the participants. Likewise, the researcher obtained additional approval for revising the research questions and recruiting four new research participants. The ethical approval for this study is provided in Appendix D.

3.8 SUMMARY

In this chapter, the research methodology and data collection process were presented. This study employed in-depth interviews to collect data about EMA adoption in the TMI of SA. The nature of the research problem and the research objectives of this study informed the choice of research methodology, data collection instruments and sampling approach. The study participants consisted of employees knowledgeable about environmental management issues from a strategic and operational point of view. The researcher presented measures to ensure the trustworthiness and authenticity of data collection, analysis, and findings. Finally, the study utilised thematic analysis to summarise findings. The next chapter analyses and presents the study findings.

CHAPTER FOUR: ANALYSIS AND PRESENTATION OF FINDINGS

4.1 INTRODUCTION

Chapter Three presented the research methodology and offered a comprehensive description of the research paradigm applicable to this study. An exploratory research design was utilised to deliver the qualitative descriptions of EMA adoption in the TMI of SA. The research strategies adopted to implement each process were discussed. The data collection procedure involved three stages. The initial stage focused on selecting the research participants, and the succeeding stage described the data collection process. The final stage involved transcribing the audio recordings. Finally, Chapter Three concluded with a discussion of the limitations of the methodology used for this study. Additionally, the ethical issues pertaining to this study were also considered.

This chapter analyses and presents the findings of the data gathered from the participants of this study. The interview data collected from the participants were transcribed, and the resulting data were analysed using Microsoft Word™ and Excel™. Each data extract was categorised by creating and assigning codes to each participant's response, which involved labelling and grouping similar data types. These codes were analysed using thematic analysis to derive the initial themes. Further analysis of the initial themes produced subsequent themes classified under four main themes. These four main themes will be used to address the research objectives. Finally, this chapter presents a proposed framework for the adoption of EMA.

4.1.1 Goal of chapter

This chapter offers a detailed analysis of the findings and discusses its implications for practice and the existing body of knowledge. This chapter presents the findings of this study by organising the collected data according to themes that align with the research objectives. This will be cross-referenced with related literature review findings and the relevant theories considered in the preceding chapters. This chapter may offer evidence necessary to support the findings of this study further and contribute new ideas to the existing body of knowledge.

4.1.2 The layout of the chapter

This subsection provides a layout of the chapter. First, in Section 4.1, the chapter introduction is presented. Next, Section 4.2 offers an analysis of the interview data. Next, section 4.3

presents the findings of this study based on the themes and patterns derived from the codes assigned to the data extract. Next, section 4.4 details a proposed framework for EMA adoption. Finally, this chapter concludes with a summary in Section 4.5.

4.2 ANALYSIS OF THE INTERVIEW DATA

The interview questions were thoroughly designed to gather appropriate responses from the participants of this study. The interview questions were grouped into three broad sections, representing this study's three objectives. The participants were taken from the various functions with knowledge of PEMA and MEMA information. Additionally, insights from employees that are ultimately accountable and responsible for the organisations from the environmental strategy and policy point of view were sourced.

Table 4.1: Demographics of research participants

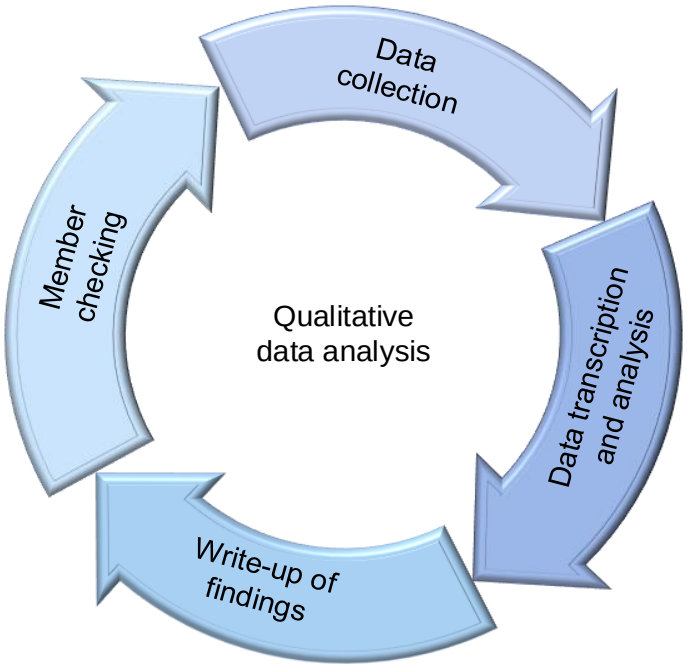
Participant	Designation	Industry Segment and Product	Years of Relevant Experience
KD01	Chief Financial Officer (CFO)	Commission dyers, finishers, and printers	15
KD02	Bookkeeper	Commission dyers, finishers, and printers	10
KA03	Environmental Manager	Yarns, textile surfaces, and seat covers	10
KN04	Production Manager	Laces, trims, specialised ropes, and cords	15
KN05	Production Staff	Laces, trims, specialised ropes, and cords	8
GL06	Chief Executive Officer (CEO)	Curtaining, upholstery, and various fabrics	10
GZ07	Chief Executive Officer (CEO)	Weaving, knitting, dyers, and finishers	15
GT08	Director	Textile trade association	15
WS09	Chief Financial Officer (CFO)	Curtaining, upholstery, and technical fabrics	10
WA10	Chief Financial Officer (CFO)	Woven crochet and knitted narrow fabrics	15

Source: *Researcher's compilation*

Table 4.1 reveals that participants of this study were drawn from the various functions within the organisation with an average of 13 and a minimum of eight years relevant experience. Furthermore, the table shows the industry segment and product types manufactured by the textile organisations. This may increase the depth of PEMA and MEMA information gathered and improve the quality of the study findings.

4.2.1 Qualitative data analysis

Qualitative data analysis involves systematically interpreting transcribed data and identifying meaningful themes to derive a coherent sequence of evidence. Tracy (2019:200) notes that the qualitative data analysis process entails various activities that interchange repeatedly and can occur along with data collection. Therefore, the data analysis of this study occurred concurrently with other aspects of the developing qualitative study, such as data collection, coding and the write-up of research findings (Creswell and Creswell, 2018:314). Figure 4.1 indicates how the simultaneous approach was useful for identifying meaningful themes and the similarities between them as they emerged.



Source: *Researcher's compilation*

Figure 4.1: Simultaneous procedures used in qualitative data analysis

Figure 4.1 presents the simultaneous approach used to collect qualitative data, transcription and data analysis, write-up of findings and member checks. Burdine, Thorne and Sandhu (2021:341) argue that this method ensures that the interview transcripts, developing themes

and study findings accurately account for the responses gathered from the research participants. In quantitative research analysis, in contrast, these actions are not undertaken interchangeably (Creswell and Creswell, 2018:315). Accordingly, the qualitative data analysis of this study followed a five-stage sequential structure (Creswell and Creswell, 2018:316). This includes:

- Stage 1: Transcribing the interviews for analysis.
- Stage 2: Gathering the general ideas about the data.
- Stage 3: Assigning codes to categorise the data.
- Stage 4: Generating themes from categorised data.
- Stage 5: Aggregating the themes and descriptions.

This structure was organised and performed systematically to guarantee the validity of the data analysis process. This may improve the transparency of the method, guaranteeing that other researchers can trust and replicate this process. Consequently, the data analysis process involved transcribing the interview recordings into individual Microsoft Word™ documents and identifying with separate markers using (I) interviewer and (R) respondent. Subsequently, the individual documents were transferred to Microsoft Excel™, and each question and response was split into two columns with the markers stated above. The texts were prepared for coding by cleaning, trimming, removing all blank spaces, and formatting. The interview questions were highlighted in bold to distinguish them from the responses (Ose, 2016:4-5).

4.2.2 Qualitative coding in action

Qualitative coding entails transforming data extracts from the original form in which they were gathered into a suitable structure for data analysis (Salkind, 2018:131). According to Adu (2019:23), qualitative coding is a methodical approach to shrinking data to a manageable and meaningful size to address the research objectives. The recorded interviews were transcribed and assigned individual codes. These codes were categorised in a distinct Microsoft Excel™ worksheet according to similar data (Ose, 2016:6-8). The qualitative coding process involves extracting and summarising relevant data representing participants' responses to the interview questions. Figure 4.2 below demonstrates the qualitative data reduction process where data that can assist in addressing the research objectives is separated from raw data.

Source: *Adopted from Adu (2019:26)*

Figure 4.2: Qualitative data reduction process

Figure 4.2 depicts how raw data were subjected to a qualitative data reduction process based on the researcher's understanding of the relevant data. Phrases were used to code the data, and these codes were further examined to develop categories and initial themes. Finally, the initial themes were further analysed to develop the main themes.

4.2.3 Qualitative coding strategy

This study adopted an inductive coding approach; consequently, the researcher observed the emergence of codes during the review and analysis of the data set. Creswell and Creswell (2018:301) mention that qualitative coding entails developing patterns using a ground-up approach. This allows some flexibility and prospects for the researcher to alternate between the qualitative analysis stages until a thorough set of themes have been derived. According to Adu (2019:32), an interpretative coding strategy entails recognising meaningful information and coming up with a phrase that is a true interpretation of the data set. An interpretative coding strategy is suitable for studies that aim to explore a phenomenon which requires in-depth data analysis to locate, create and assign codes (Adu, 2019:37). Consequently, this study implemented an interpretative coding strategy where information in the data set was considered as a part of a group of verifiable evidence.

This allowed the researcher to run-through the data set to establish a coherent sequence of evidence that underpins each research theme (Creswell and Creswell, 2018:301). Each sentence within the cleaned-up text was analysed and given a code name that captures the essence of the text. This ensures that afterwards, where text with the same meaning was encountered, it was assigned the same code.

Roberts, Dowell and Nie (2019:1) claim that thematic analysis is an uncomplicated approach to performing hermeneutic content analysis designed for qualitative data. Therefore, thematic analysis is suitable for qualitative interpretative analysis because content analysis ignores the context of text documents during the coding process (Bhattacpherjee, 2012:116). The interpretative coding strategy was adopted because it accentuates the interpretation of the

research participants' view and account of EMA adoption in the TMI of SA. This study employed an inductive approach to assigning broad and rough codes to the data set at the initial stage. This was built upon by adopting a line-by-line coding approach to delve deeper into the data set and organise them into a formalised set of codes. Subsequently, the codes were analysed and sorted into categories to determine the central themes and similarities within the themes. The initial themes derived were further categorised into the overarching themes and linked to the research objectives.

4.3 ANALYSIS OF THE FINDINGS

Lochmiller (2021:2036) proposes that to successfully convey the qualitative findings of any research, it is essential to shape the findings regarding themes and validate them using illustrations taken from the dataset. Therefore, the findings of this study are presented under four themes used to address the research objectives. In addition, direct quotes from the respondents were used to substantiate the findings. Creswell and Creswell (2018:317) argue that this method is useful for designing detailed descriptions for various research projects. Accordingly, the four themes of this research appeared as the major findings and will be used as headings in this section. Table 4.2 below depicts the themes and sub-themes.

Table 4.2: Themes and sub-themes

Themes	Sub-themes
Theme 1: Environmental waste (Research objective 1)	• Production of harmful environmental wastes • Types of environmental wastes produced
Theme 2: Environmental initiatives (Research objective 1)	• Environmental cost tracking and measurement • EMAPs employed
Theme 3: Benefits of EMAPs (Research objective 2)	• Cost allocation and product pricing • Waste minimisation and production efficiency
Theme 4: Drivers of EMAPs (Research objective 3)	• Environmental legislation • Functional collaboration • Industry challenges

Source: *Researcher's compilation*

Table 4.2 illustrates the research themes and sub-themes. The themes are cross-referenced to the in-depth interview guide in Appendix B. The themes and sub-themes based on the data collected through in-depth interviews will be discussed in detail in the succeeding sections, beginning with the categories of environmental wastes generated by TMOs in SA.

4.3.1 Theme 1: Environmental waste

Globally, the TMI is regarded as one of the most polluting industries (Yaseen and Scholz, 2019:1193). The textile manufacturing process, which includes dyeing, spinning, weaving, knitting, and finishing, demands substantial levels of raw materials, energy and water (Jia *et al*., 2020:2). The resources employed during the production process may generate harmful environmental wastes such as wastewater, carbon emissions and dry waste. Consequently, Theme 1 includes all sub-themes that examine whether the selected TMOs in SA generate harmful environmental waste and the types of waste generated. This theme is linked to the first objective, which seeks to identify the EMAPs that the selected SA TMOs employ to manage environmental costs. Likewise, Theme 1 represents responses collected from the in-depth interviews which embodies the first research question.

4.3.1.1 Sub-theme 1: Production of harmful environmental waste

The first objective seeks to identify the EMAPs that the selected TMOs in SA use to manage environmental costs. To identify these EMAPs, it is crucial to ascertain if these organisations generate harmful environmental waste. All 10 research participants demonstrated a good grasp of the interview questions and revealed that their organisations generate considerable quantities of harmful environmental waste. Participant KA03 commented:

> *The only hazardous waste we generate are effluents. These are primarily wastewater, gas, and some insignificant dry waste. The carbon emission is generated from boilers that utilises heavy fuels to generate power.*

Additionally, participant WA10 stated that:

> *The TMI is a dirty industry, and our organisation is involved in a lot of dyeing of textile products. We do generate a significant amount of wet waste through our dyeing process. Additionally, we generate significant levels of dry waste from yarns within the production process because most of our raw materials inputs are made up of man-made fibres. Finally, some form of emissions, such as nitrogen and sulphur from energy use, is generated from the steam boilers that utilise Heavy Fuel Oil (HFO). This is obviously more polluting than other forms of oil fuel. We fall into the category of organisations that generate significant dry and wet waste because we manufacture yarns, dye textiles, and likewise produce apparel. I expect some form of negative impact on the landfills and waterways where these wastes are disposed from a biodegradable point of view. We, however, dispose our waste in an ethical manner.*

The statement above validates Jia *et al.*'s (2020:2) claims that textile manufacturing operations produce harmful environmental waste. Chu *et al*. (2021:55), in a similar way,

argue that textile manufacturing employs significant volumes of water, energy, and chemical compounds. This process generates wastewater and carbon emissions, producing high economic losses and negative human and environmental impacts. Therefore, this study's findings reinforce the existing literature's conclusions that textile manufacturing generates harmful environmental waste.

4.3.1.2 Sub-theme 2: Types of environmental wastes produced

Consequent to verifying that the participating TMOs in SA generate harmful environmental wastes, this sub-theme presents three major environmental waste classifications based on the interview questions. The classification may offer useful insights into appropriate practices that TMOs in SA can employ to minimise their negative environmental impact. All participants provided information on the types of waste and how these wastes are generated by their organisations. In addition, they mentioned how these wastes are disposed of or recycled. Three participants admitted that carbon emission is the primary environmental waste generated from their textile manufacturing operations. Participant GZ07 mentioned that:

> *Our principal wastes are emission, wastewater, and dry waste. The emission is discharged openly to air, while the wastewater and dry waste are treated and recycled.*

Five participants admitted that dry waste is the main environmental waste their textile manufacturing operations generated. Participant KN04 commented that:

> *… we have a diverse range of products as a braiding factory, and we do generate a significant amount of dry waste from cutting, weaving, and resizing. We do not generate significant wet waste as we procure our input materials to specification. Our emissions are equally insignificant.*

Eight participants acknowledged wastewater as the leading environmental waste from their textile manufacturing operations. Participant WS09 admitted that:

> *… our most significant waste is wastewater arising from fabric finishing and dyeing processes. We also generate dry waste from fabric cutting, and resizing, they are, however, not significant.*

Similarly, participant GL06 affirmed that:

> *… our only significant waste includes wastewater effluents from the processing of value addition to various fabrics.*

Participant KD02 expressed that:

> *… we are a commission dye house for several other textile manufacturers in South Africa and beyond, therefore, our main waste is wastewater because our production*

process consumes a lot of water. About 27 million litres per month and approximately 55 litres per kg of fabric is utilised in our production process. In terms of energy, gas is utilised instead of coal or other heavy fuels, which is insignificant in terms of pollution. … hmm, other insignificant wastes are dry wastes from packaging, and they are largely recycled in-house. Waste effluents are discharged through a sea pipeline, and the licence to discharge these effluents is provided by the Department of Environment Forestry and Fisheries.

Figure 4.3 portrays the distribution of the categories of environmental wastes generated by the selected TMOs in SA.

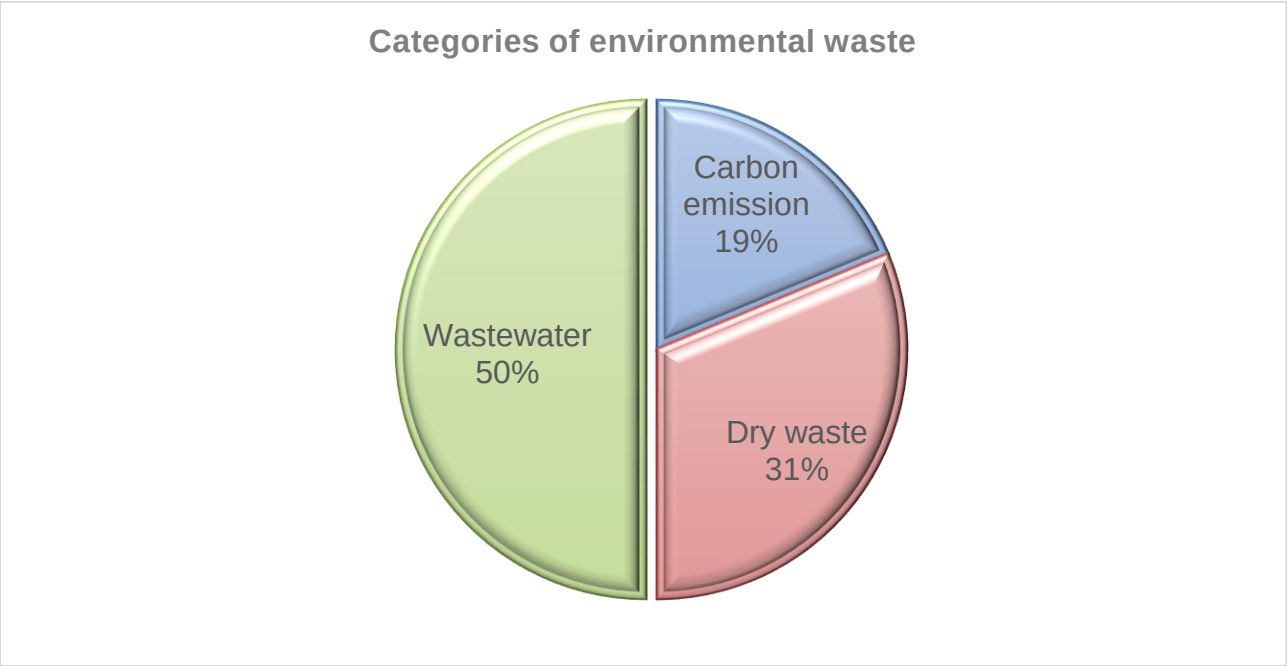


Figure 4.3: Categories of environmental waste

Figure 4.3 illustrates that 50% of the selected TMOs in SA indicate that wastewater is the dominant type of environmental waste generated. The finding is plausible because the textile manufacturing process, which includes value additions such as dyeing, requires a substantial volume of water (Madhav *et al*., 2018:32). According to Olusanmi *et al*. (2021:8), research on WMA is limited. Therefore, TMOs in SA may find MFCA valuable for managing environmental costs. This is because MFCA employs physical and monetary measures to determine the flow of resources. MFCA seeks to measure and minimise the cost of physical quantities of raw materials, inputs and output of finished goods, waste and packaging (Huang *et al*., 2019:4).

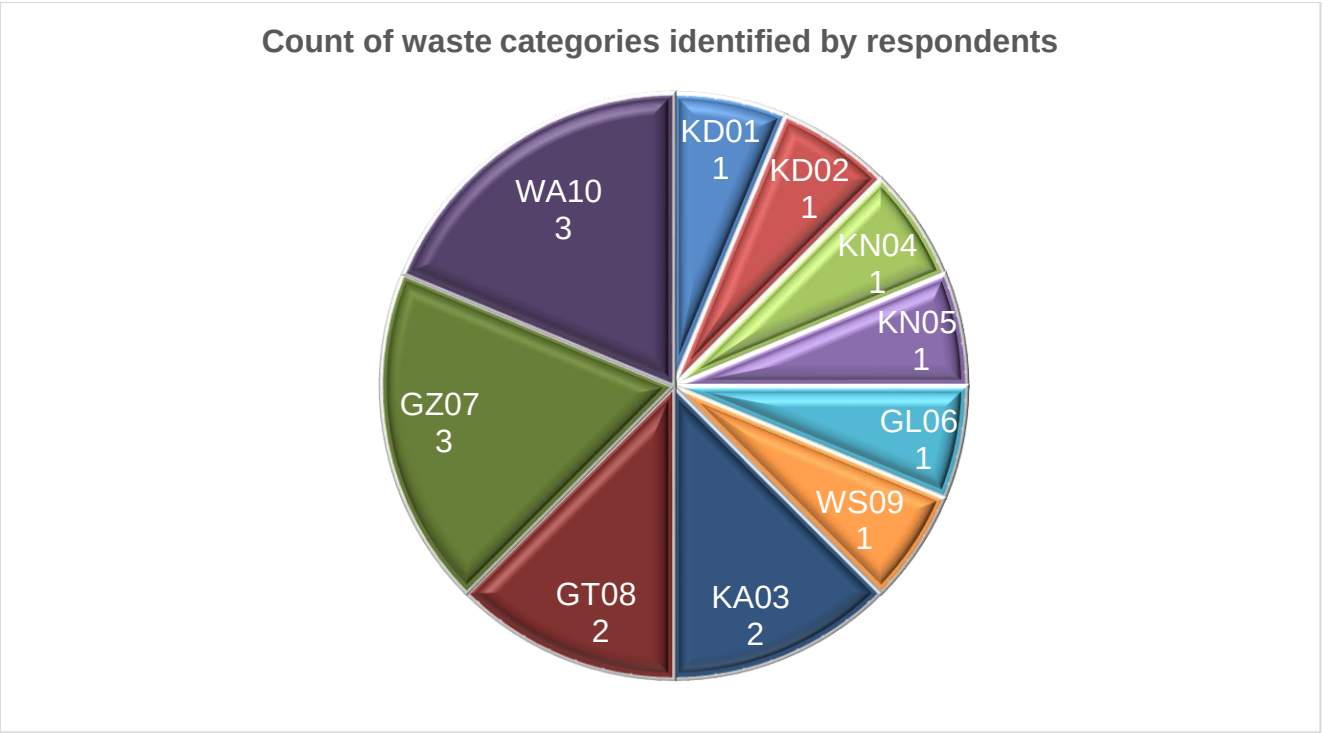


Figure 4.4: Count of waste categories identified by respondents

Figure 4.4 reveals the count of waste types generated by the selected textile organisations as identified by the respondents. Based on the responses, figure 4.4 indicates that only two of the TMOs in SA produced all identified categories of environmental waste. Likewise, only two TMOs in SA produced two categories of the environmental waste identified. Lastly, Six TMOs in SA each produced only one category of the environmental waste identified.

4.3.2 Theme 2: Environmental initiatives

Environmental initiatives may be described as being conscious of environmental problems and acting in a way that benefits the environment. This entails adopting measures designed to minimise waste and consumption of resources that cause negative environmental impact. Environmental initiatives may entail implementing a robust environmental policy, designing relevant environmental KPIs and employing EMAPs that assist TMOs in minimising the negative environmental impact of waste. Therefore, Theme 2 addresses the first research objective, which seeks to identify the EMAPs that the selected SA TMOs use to manage environmental costs. Theme 2 represents responses collected from the in-depth interviews, which embodies the first research question.

4.3.2.1 Sub-theme 1: Environmental costs tracking and measurement

Environmental costs take into account all internal and external costs of managing negative

environmental pollution, such as the costs of avoiding, recycling, disposing, and cleaning up hazardous waste (UNDSD, 2001:11). As highlighted in Chapter Two, MFCA is designed to identify physical flows and estimate its monetary equivalent (Burritt and Saka, 2006:1262). This sub-theme is connected to the first objective, which seeks to identify the EMAPs that the selected SA TMOs employ to manage environmental costs. In acknowledging the importance of EMAPs, it is necessary to understand how the TMOs employ their current systems to manage environmental costs (Herzig *et al*., 2012:8). The respondents of this study all agree that the environmental waste generated from their organisations' operations give rise to significant environmental costs. Participant WA10 stated:

> *The cost of waste treatment and recycling is a burden for us. The consumer does not see the value in the environmental initiatives employed by most TMOs. There is a perceived value, but the real value is soft.*

Similarly, Participant GL06 mentioned that:

> *… we incur significant environmental cost on the treatment of waste effluents before they are discharged.*

Furthermore, all the respondents expressed that before employing their current EMAPs, the CASs they employed did not adequately identify and track environmental costs. Participant KD01 acknowledged that:

> *Prior to ABC implementation, a large portion of our environmental costs were hidden in our overheads. Likewise, we are currently implementing a new system that calculates water toxicity and enables recycling 20% of wastewater.*

The findings point out the weakness of the CASs in identifying and managing environmental costs. Le and Nguyen (2019:11) recognise that CASs do not collect important environmental cost information that can assist managers in measuring and managing environmental costs. Similarly, Gulluscio *et al*. (2020:5) agree that CASs do not consider environmental and social issues. Consequently, it is important for TMOs in SA to embrace the appropriate EMAPs required to address the inadequacy of CASs. Using suitable EMAPs may facilitate adequate management of environmental costs and further support the waste minimisation efforts of TMOs in SA. This may also make SA TMOs greener, eliminating negative environmental impact. The next sub-theme will discuss the EMAPs employed by the selected TMOs in SA for managing environmental costs.

4.3.2.2 Sub-theme 2: Environmental management accounting practices employed

EMA has continued to receive growing interest due to the high profile of environmental issues

and liabilities incurred by organisations (Smit and Kotzee, 2016:152; ACCA, 2019:1). EMAPs are, therefore, considered effective for managing the environmental and economic performance of organisations (Elhossade, Zoubi and Zagoub, 2022:479). This sub-theme covered EMAPs employed by the selected TMOs in SA. Likewise, this sub-theme explores how the selected TMOs in SA identify and classify environmental costs within their current accounting systems. This informs the types of EMAPs employed for managing environmental costs. Furthermore, a brief description of how environmental costs are recorded in the financial statements was captured. Participant KD02 stated that:

> *… we identify steam, gas, electricity, and all other utilities employed in production. They are measured and traced to each product based on the activities consumed, and they form a significant portion of production costs. Environmental costs are estimated on a daily basis, and any increase above normal levels are identified and recorded under an environmental cost centre.*

Participant KD02 stated in addition that:

> *We implemented a system for testing wastewater in the treatment plant. Environmental costs are assigned based on activities used in production. This is employed largely for internal management accounting to redistribute manufacturing overheads for product costing and pricing. Products that utilise more resources are charged a higher price.*

Sub-theme 2 suggests that 50% of the selected TMOs in SA employ ABC to identify and manage environmental costs. The respondents agree that ABC improves decision-making by bringing products that generate harmful waste to their attention. Therefore, products that generate harmful wastes may be relatively more expensive and less attractive. Respondents that employed ABC also recorded environmental costs as a separate line item in their financial statements. Participant KN04 commented that:

> *… we identify and record all environmental-related cost separately in the financial statement. Our waste is categorised per product group, and any associated costs are charged based on the activities employed to make each product. We try as much as we can to estimate these costs accurately. We understand this costing type is activity based; however, we are still trying to find a balance due to the complex nature of our business and diverse range of products we manufacture.*

The findings suggest that ABC is a common EMAP amongst the selected TMOs in SA. MFCA appears to be popular amongst the selected TMOs in SA. The findings indicate that, although 40% of the respondents employed MFCA to manage environmental costs, they were unaware they used MFCA. The respondents that employed MFCA recognised the approach as material and energy cost accounting. Participant KA03 stated:

> *… we estimate our environmental waste in a separate system that is integrated with our ERPSs. We estimate wastes from material inputs, and wastes generated during the production process. We compare this to the output and final product. This is estimated in physical and monetary terms.*

Similarly, Participant WA10 mentioned that:

> *… we monitor our waste regularly by employing a method similar to the mass balance approach to determine the recycled content of our inputs, outputs, and final products. This helps us to calculate the flow of materials, energy, and water during the production cycle. We estimate the recycled content of our raw material inputs, waste outputs and final product in physical and monetary terms. These waste costs are captured and included in the cost of the final product.*

MFCA detects and tracks all costs of inputs and outputs that cause negative environmental impacts (Tran and Herzig, 2022:40). These costs may include environmental costs of energy, water, and other materials used in production. Literature review reveals that MFCA continues to receive significant attention as a valuable practice to minimise textile waste (Chattinnawat, Suriya and Jindapanpisan, 2018:210; Burritt *et al*., 2019:483; Tran and Herzig, 2020:7-8). The findings of this study indicate that some TMOs in SA are currently uncovering the use and application of EMAPs such as MFCA. TMOs in SA employ ERPSs and manual methods to identify and estimate their environmental costs. According to Lee and Gunarathne (2019:11), water, carbon, and waste are crucial environmental challenges that require urgent attention. Therefore, employing ERPSs such as System Applications and Product (SAP) may improve environmental decision-making. Participant WA09 stated:

> *… we are currently in the early stages of estimating our waste cost. It appears a difficult process for us as we have various tools which we employ for identifying and capturing our waste cost. We utilise ERPSs that capture the flows of materials inputs and outputs, subsequently, we manually calculate the resulting environmental costs.*

The diffusion of MFCA may be linked to the introduction of ISO 14051, an international standard on MFCA, issued by the ISO (Christ and Burritt, 2016:2). MFCA is a “tool for quantifying the flows and stocks of materials in processes or production lines in both physical and monetary units” (ISO, 2011:3). Consequently, MFCA may assist TMOs in SA to minimise the negative environmental impact of their waste because it integrates the identification and measurement of monetary and physical resource flow to allocate environmental costs. Figure 4.5 below reveals the categories of EMAPs employed by the selected TMOs in SA to manage environmental costs. Sub-theme 2 reveals that ABC, MFCA and PEF are EMAPs employed by the selected TMOs in SA.

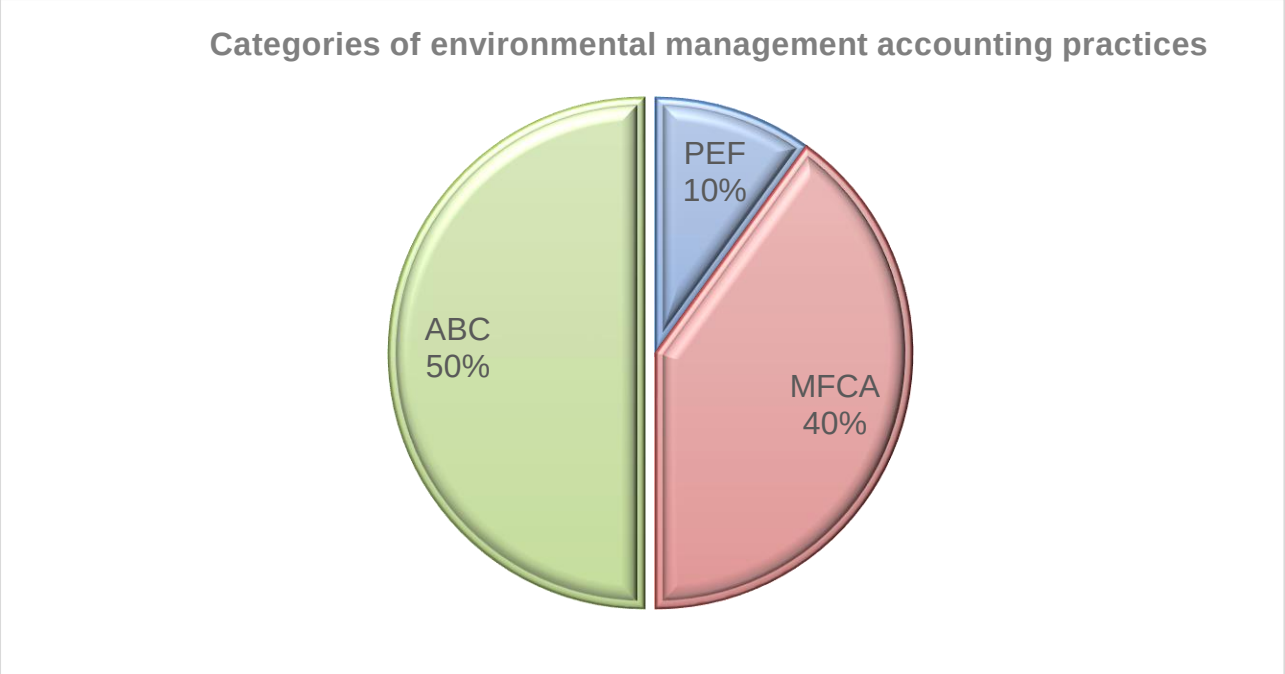


Figure 4.5: Categories of environmental management accounting practices

Figure 4.5 indicates that ABC and MFCA are the most common EMAPs employed by the selected TMOs in SA. About 50% of the respondents, though, confirmed they had been exposed to PEF while they were engaged with other TMOs. Participant WS09 stated that:

> *I am aware of various international standards and methodologies in use globally by textile organisations such as PEF, which utilises chemical, water and carbon footprints methods to estimate the environmental impacts of textile waste. I do not believe that these method(s) will be useful for us.*

It is, therefore, plausible that PEF, which employs a life-cycle approach, is uncommon amongst the selected TMOs in SA. This is because PEF seems suitable for estimating and minimising the environmental impact of textile waste from the cradle to the grave. This study, however, is limited to the textile midstream and downstream sectors involving textile dyeing, fabric, and garment manufacturing. Also, the previous theme highlights wastewater as the main environmental waste identified by the respondents. This study, though, finds that none of the TMOs in SA utilises WMA. Nonetheless, WMA appears to be an area of interest for some of the selected TMOs in SA. Participant KD01 notes that:

> *… we recently commissioned a new treatment plant, and we are currently planning to acquire a new system that calculates water toxicity and enables recycling wastewater by at least 20%.*

The use of WMA may be lacking amongst the selected TMOs in SA because it is an emerging EMAP, and extant literature is limited (Olusanmi *et al*., 2021:7-8). Qian, Burritt and Monroe

(2011:100) claim that contingency theory can be employed for investigating EMA adoption in instances where prior research is scarce. According to Otley (2016:5-9), contingency theory is underpinned by the assertion that organisations tend to employ approaches that maximise performance based on their current position and condition. As considered in Chapter Two of this study, size may affect an organisation's access to various resources. SMEs for instance, may struggle to obtain funds required for investing in green initiatives (Le, Nguyen and Phan, 2019:22).

Le, Nguyen and Phan (2019:22) argue that growth empowers large organisations to improve their process efficiency, permitting them to exercise significant control over their environment and to deploy extra resources for implementing green initiatives. Likewise, Christ and Burritt (2017:384) argue that suitable EMAPs for SMEs are in short supply and rather than employ new EMAPs such as WMA, organisations may prefer to rely on established EMAP such as MFCA. Sulong, Sulaiman and Norhayati (2015:1367) forecast how ISO 14051 can influence the adoption of MFCA by organisations using the DIT. Likewise, Christ and Burritt (2016:1) revealed using the DIT that, with the introduction of ISO 14051, MFCA may see increased adoption and more research opportunities. Therefore, as MFCA spreads to small organisations in the TMI of SA, they may be open to its adoption since it is less complex and more cost-effective to deploy (Huang *et al*., 2019:23).

In addition to the EMAPs identified by the respondents, a web-based document analysis was performed to gather added information on their environmental initiatives. According to the researcher, environmental information is limited since TMOs in SA are mainly SMEs and are not listed on the JSE. They are also not mandated to report on the environmental initiatives performed within any reporting period. However, a web-based analysis revealed that two of the selected TMOs in SA have information on current environmental initiatives within the last five years on their websites. Before the web-based analysis, participant KD01 remarked that:

> *We are OEKO-TEX™ and Facility and Merchandise Authorization (FAMA) compliant on all our products. KPIs are in place to measure the level of and changes in effluents, carbon emissions and indirect emissions that occur in our value chain.*

Table 4.3 below summarises the details of the green initiatives of two TMOs in SA. The web-based document analysis supports the findings of this study and literature review that TMOs use various environmental initiatives to minimise the negative impact of environmental waste generated from their operations (Burritt *et al.*, 2019:483).

Table 4.3: Green initiatives on the website of the textile manufacturing organisations

Organisation	Environmental Initiatives Summary	Details of the Environmental Initiatives
Organisation: KD	This organisation employs various environmental initiatives to ensure appropriate environmental impact management.	• Utilises a new air dyeing system that minimises water usage and recycles wastewater. • Employs new formulation dyes that require less dye to achieve the required colours. This minimises energy used during purification. • New Light-emitting Diode (LED) lighting systems and dye machine technology are employed to reduce the expenditure on indoor and outdoor lighting needs.
Organisation: KA	This organisation perceives green initiatives as a shared responsibility and pursues various sustainable solutions to protect the quality of life and the environment.	• Recycling of bottles and creation of lightweight modules. • Natural fibres are used to weave dyed spun yarns. • Utilises new systems that reduce resource usage, waste, and emissions production in the textile value chain. • They are concerned about minimising the organisation's ecological footprint and encouraging all partner organisations to play their part in improving sustainability.

Source: *Researcher's compilation*

Table 4.3 explains the projects and plans two TMOs in SA implement to reduce their wastewater and carbon footprint and protect the natural environment. The two selected TMOs in SA published this information on green initiatives they currently promote on their websites. However, this interview finding could only verify the accuracy of some of these green initiatives. It is important to note that even with growing awareness of greenwashing, organisations continue to employ strategies that exaggerate their environmental initiatives (Montero-Navarro *et al.*, 2021:548; Wedari, Jubb and Moradi-Motlagh, 2021:3721; Nemes *et al.*, 2022:1-2). In addition, various organisations invest substantial resources to amplify information on environmental initiatives rather than concerted efforts to improve their

environmental and social performance (Bricker and Justice, 2022:521).

Consequently, to eliminate any concerns regarding greenwashing, it may be valuable for TMOs in SA to provide information on specific environmental KPIs. Also, certifications by organisations such as OEKO-TEX™, renowned for testing textiles for harmful substances, may authenticate environmental initiative claims published on the websites of the selected TMOs in SA. Therefore, the next theme presents the benefits of EMAPs.

4.3.3 Theme 3: Benefits of environmental management accounting practices

The literature review indicates that CASs do not provide a critical focus on the existence and size of environmental costs to support environmental decision-making (Burritt *et al*., 2019:480; Elhossade, Zoubi and Zagoub, 2022:9; Tran and Herzig, 2022:43). EMA, in contrast, provides valuable information to identify and manage environmental costs (Qian, Burritt and Monroe, 2018:161). This suggests that EMA usage may provide visibility on environmental costs and highlight cost savings opportunities. Theme 3 is linked to the second objective, exploring EMA adoption's benefits for the selected TMOs in SA. The theme represents responses collected from the in-depth interviews, which embodies the second research question.

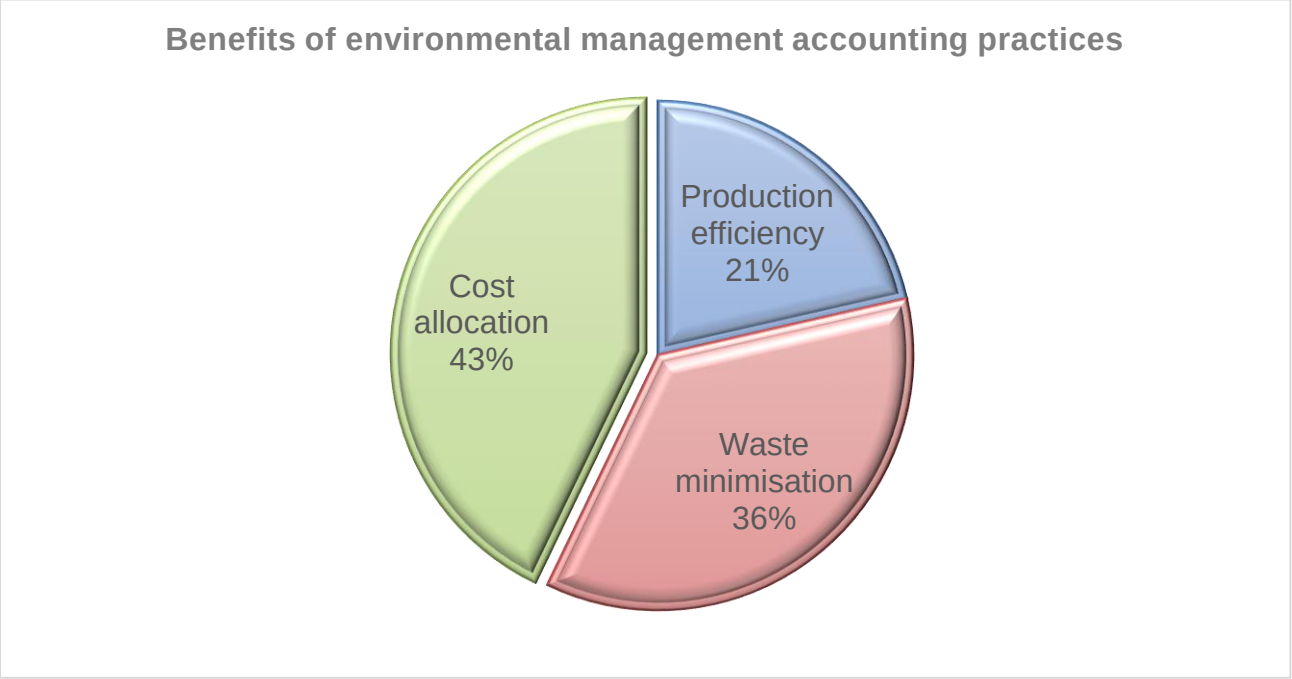


Figure 4.6: Benefits of environmental management accounting practices

Figure 4.6 uncovers the distribution of the benefits of EMAPs as identified by the respondents. It was established that a substantial portion of the selected TMOs in SA employ EMAPs

primarily for cost allocation and product pricing.

4.3.3.1 Sub-theme 1: Cost allocation and product pricing

Otley (2016:3) states that ABC is useful for determining product costs and improving decision-making rather than control. Concerning the environment, organisations use ABC to improve cost management as well as eliminate waste and non-value-adding activities (Hilsenrath, Eakin and Fischer, 2015:2). This echoes the findings of this study since all the selected TMOs in SA that employ ABC also identified cost allocation as the benefit derived from employing ABC. Participant GZ07 remarked that:

> *I will say prior to adopting our current methods, we struggled a lot with identifying and apportioning our environmental costs appropriately.*

Similarly, Participant KD02 stated that:

> *The benefits are predominantly around cost allocation.*

Environmental ABC distinguishes between environmental-related costs and environmental-driven costs. Environment-related costs can be traced to a shared environmental cost centre, such as an effluent recycling plant. Environment-driven costs, in contrast, are concealed in general overhead costs (BPP Learning Media, 2021:591).

4.3.3.2 Sub-theme 2: Waste minimisation and production efficiency

Using ABC may demotivate managers, where product costs are reallocated based on cost drivers. This is because product lines previously earning substantial margins may become loss-making because ABC identifies and reallocates environmental-driven costs. Similar to TMOs that utilise ABC for cost allocation, TMOs in SA that employed MFCA equally identified waste minimisation and production efficiency as the primary benefit derived from MFCA. Participant WS10 stated that:

> *The benefits in my mind are clear, improvement in production efficiency, reduction in costs, improvement in product margins and waste minimisation. Additionally, from a manufacturing perspective, it stimulates growth and saves the environment. We are able to identify environmental costs appropriately and minimise waste.*

Similarly, Participant WS09 mentioned that:

> *We are able to identify environmental costs appropriately and minimise waste.*

It was established that the anticipated benefits of employing a specific EMAP might influence its adoption. Though TAM and DIT are primarily employed for explaining the reasoning

behind users' adoption of IT, they may provide useful insights on adopting EMA (Ullah *et al.*, 2021:5-6; Yuen *et al.*, 2021:507). Consequently, the perceived usefulness and relative advantage of an EMAP may influence its use. For example, through innovative EMAPs, users may be able to identify improvements in their job performance. Furthermore, users may be inclined to use new EMAPs that are evidently superior to existing EMAPs. The next subsection discusses the drivers of EMAPs.

4.3.4 Theme 4: Drivers of environmental management accounting practices

According to Christ and Burritt (2013:163), EMA has received growing interest in recent years due to increasing environmental concerns. Accordingly, EMA has been acknowledged as a practice organisation can use to manage environmental and economic performance. Qian, Burritt and Chen (2015:410) argue that EMA is valuable for explaining environmental performance measures such as minimising water and energy. Qian, Burritt and Chen (2015:410) claim that EMA adoption in developing economies is influenced not only by the potential economic benefits but also by pressure from influential stakeholders and political reasons. Theme 4 is related to the third objective that ascertains the indicators of successful adoption of EMA in the TMI of SA. Theme 4, therefore, represents responses collected from the in-depth interviews, which embodies the third research question.

4.3.4.1 Sub-theme 1: Environmental legislation

This sub-theme represents the influence of environmental legislation on EMAPs as perceived by the respondents. The finding of this study identified that compliance monitoring of TMOs in SA by environmental regulators is largely absent (Doorasamy, 2016:285). Participant KD01 mentioned that:

> *We pay for what we discharge… the toxicity level of wastewater discharged is above the municipal threshold, however, no penalty or fines has been paid till date. We try to comply with the municipal by-laws, such as the level of effluent wastes generated from our operations.*

In accentuating this deficiency, Participant KA03 pointed out that:

> *We are most of the time compliant, however, there are times when we get notices that our Chemical Oxygen Demand (COD) content is too high. I have asked the municipality regarding the waste threshold on several occasions. Their answer is always the same that there is no specific limit, they, nevertheless, charge us arbitrarily whenever they claim the COD content of our waste effluent is too high. They come to our facility once a month to obtain a sample of our effluents, and they check it in their lab and send us*

the results. We have not paid any specific fines for breaching municipal bylaws.

This finding indicates the lack of adequate environmental waste monitoring by the respective regulators. Gunarathne and Lee (2019:170) argue similarly to the findings of this study that coercive pressure required to promote the adoption of environmental initiatives is lacking in developing countries. Likewise, Doorasamy (2016:285) claims that adopting environmental initiatives in South Africa is low among organisations due to a lack of regulatory enforcement. Therefore, the sampled TMOs in SA employ EMAPs primarily for the perceived benefits and not because of pressure from influential stakeholders such as environmental regulators. The findings of this study are not comparable to the research results of Iredele, Tankiso and Adelowotan (2019:15), that coercive pressure through regulatory enforcement influences the extent of EMA adoption in South Africa. The research context featured publicly listed manufacturing companies in South Africa (Iredele, Tankiso and Adelowotan, 2019:15).

Nonetheless, it is pertinent to note that the TMI of SA features quite a substantial number of organisations with informal operations (Le Roes-Hill *et al.*, 2017:2). Furthermore, EMA adoption and application is not mandatory for South African organisations (Smit and Kotzee, 2016:152). Organisations listed on the JSE are required to provide specific environmental information in their annual integrated reports (Atkins and Maroun, 2015:200). According to the researcher, a substantial portion of the TMOs in SA are not listed and may not be required to produce environmental reports. Furthermore, sourcing information on and identifying the location of most unregistered TMOs in SA is challenging. Consequently, this may impede the enforcement drive of environmental regulations. Participant GT08 pointed out that:

> *In terms of monitoring, most municipalities are not efficient, and TMOs that generate significant waste tend to conceal their activities.*

Participant KD01 mentioned that many unregistered TMOs exist in the interior districts of KwaZulu-Natal. Participant KD01 admitted that:

> *A lot of unregistered operators and competitors in Ladysmith and Newcastle area are polluting the rivers, which negatively impacts several downstream industries, such as farming. Because they operate in the interior, small municipalities with little resources are not capable enough to monitor the polluting activities of these organisations, and this will cause devastating environmental problems in a few years' time.*

According to Le, Dang and Le (2020:403), the leading coercive drivers include environmental legislation, governmental initiatives and environmental pressure groups. Therefore, the literature review presents coercive pressure as significantly influencing EMA adoption (Lee and Schaltegger, 2018:122; Ferdous, Adams and Boyce, 2019:1007). The findings of this

study reveal, however, that TMOs in SA employ EMAPs primarily because of the benefits obtained from the application of EMAPs, such as cost allocation and waste minimisation. Cardoso de Oliveira Neto *et al*. (2020:13), in a similar manner, contend that SMEs are primarily interested in employing EMAPs to minimise costs. Latif *et al*. (2020:11) claim that when managers recognise the potential gains of employing EMAPs, they are motivated to devote resources towards acquiring them. The subsequent sub-theme presents the influence of functional collaboration on the use of EMAPs.

4.3.4.2 Sub-theme 2: Functional Collaboration

This sub-theme represents the influence of functional collaboration on using EMAPs as perceived by the respondents. For example, identifying and analysing PEMA and MEMA information may require the support of top management as well as collaboration amongst functional teams. Ellstrand and Johnson (2017:434) advocate that when top management is committed to environmental initiatives, they tend to implement strategies across functions to improve environmental performance. Nyide (2016:76) argues, in a similar manner, that the success of EMA adoption requires employee participation and consultation. Consequently, to effectively manage the potential environmental impact of hazardous waste, the collaboration between the finance, production and environmental functions is essential (Smit and Kotzee, 2016:154).

All the respondents of this study admit that the three functions mentioned above collaborate effectively to manage environmental issues. Participant KD01 stated that:

> *Our finance, production and environmental functions are all instrumental to employing environmental initiatives. They collaborate efficiently to improve all waste management and pollution issues. They also partner to provide the annual environmental report.*

Burritt *et al.* (2019:489) accentuate the influence of functional collaboration on EMA adoption. They concede that gathering and analysing PEMA and MEMA information requires expert skills. Therefore, collaboration among functional teams may influence the use of EMAPs (Burritt *et al.*, 2019:483). The findings of this study established that, in most cases, two or more functions collaborate to produce environmental cost information and prepare reports. Participant KN04 stated that:

> *The production and environmental managers provide inputs in terms of physical waste to the finance manager, who then generates the monetary values. They communicate efficiently and partner to prepare the environmental reports. We also regularly have management meetings where we discuss environmental issues specifically.*

Functional collaboration may appear useful to improve the application rather than adopting EMA. In either situation, it is, nonetheless, important to establish a logical structure for sourcing environmental information to support effective decision-making. Burritt, Hahn and Schaltegger (2002:43-48) suggest a logical decision-making framework for EMA that can support functional teams in identifying their environmental information needs. The framework contains a variety of decision circumstances and related practices that managers can employ to improve their organisations' economic and environmental performance (Christ, Burritt and Varsei, 2016:430). Therefore, when functional teams employ the EMA framework, they can identify their current and future environmental information needs as well as physical and monetary measures of performance (Burritt and Christ, 2017:78). This may assist managers of the selected TMOs in SA in evaluating appropriate or additional EMAPs to employ to improve their environmental performance.

4.3.4.3 Sub-theme 3: Industry challenges

This sub-theme represents the challenges confronting the TMI of SA. The respondents of this study identified various challenges hindering the industry's growth and, by extension, the use of EMAPs by TMOs in SA. Figure 4.7 below indicates the industry challenges as indicated by the respondents.

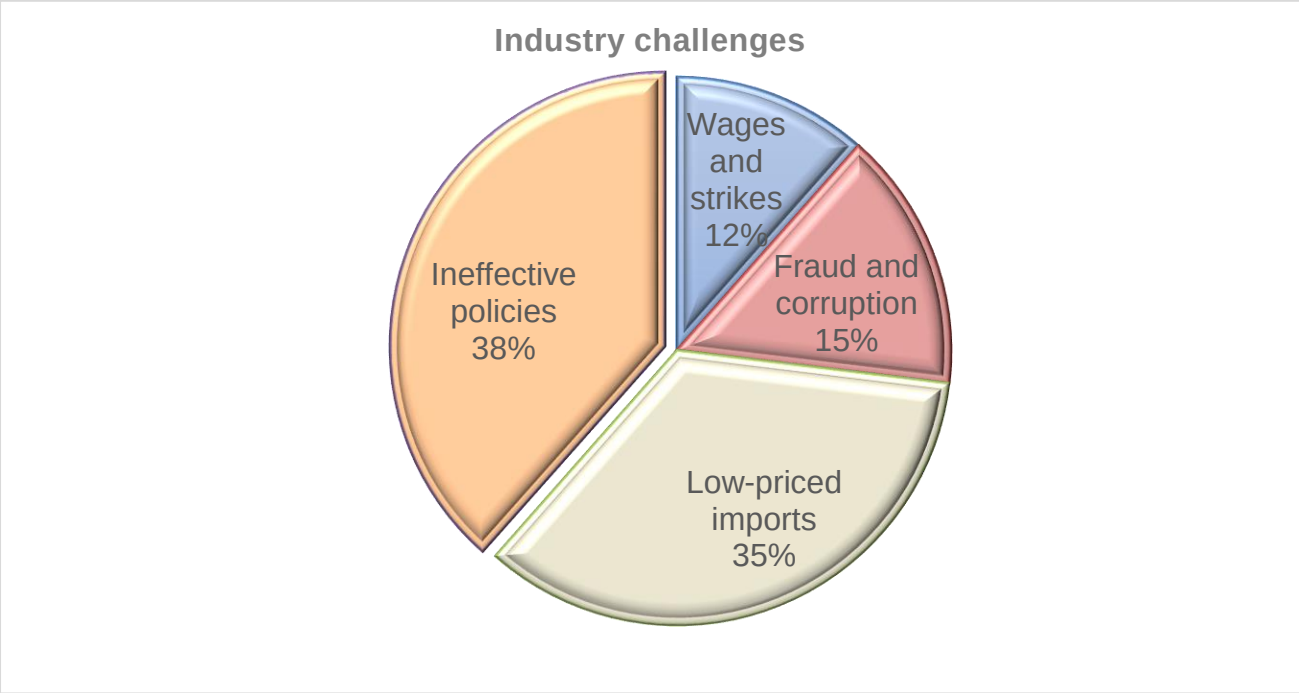


Figure 4.7: Industry challenges

Figure 4.7 illustrates that all the respondents agree that the TMI of SA is undergoing

significant contraction. The respondents mentioned that several TMOs in SA have shut down their operations. The researcher confirmed the respondents' claim during factory site visits and observed that two popular and established TMOs in SA, Frame and Gelvenor textiles, were non-operational (SA Labour Bulletin, 1993:38). Furthermore, workers' struggle, labour strike actions and wage demand are major problems that have plagued the TMI of SA for over four decades (SA Labour Bulletin, 1993:18-20). Participant KA03 confirmed that:

> *Strikes and stayaways due to wage issues affect smooth operations, production, and sales. The is a serious problem impacting the TMI of SA.*

Participant KN05 shared a similar perspective:

> *In terms of the growth, TMOs in SA are currently facing some serious challenges based on the imports that are coming from China, and you find that most of our customers locally are now opting to import majority of their products, and then they buy very little from us. That is limiting us in terms of growth, and it appears the life cycle of some business areas will soon come to a halt, but it's not all areas. There are other untapped opportunities that may improve growth in the future. The imports coming in from China are cheaper, and you will also find that it is easier and faster for most customers to get them delivered. Equally, they are able to get variations, and bespoke products they desire from China, which is always cheaper than what is available in South Africa. We had Frame and Gelvenor textiles which used to employ over 25 000 people. They experienced various challenges over the years and closed down recently.*

Participant GZ07 stated:

> *It's becoming very difficult to manufacture textiles in South Africa. Textile organisations in South Africa are shutting down their operations. There is stiff competition from China, and it's impossible to compete with them. It appears textiles are imported duty-free, or the importers are able to circumvent the duty payment process. There is no support from the South African Government to encourage local production and exportation of textiles. Foreign textile manufacturers from Asia get rebates and incentives from their governments that encourage exportation. Additionally, they are under-declaring their invoices, therefore, they are able to charge very low prices compared to local textile organisations.*

Participant GT08 confirmed this assertion by adding:

> *Output from the TMI of SA declined by 14.8% during 2020. Furthermore, because of the poorly conceived lockdown measures during the coronavirus disease, the industry has seen a significant declining trend through 2021. Capacity utilisation is currently at about 66%, and Government policies that have been pursued have resulted in the de-industrialisation of the textile industry. South African textile products cannot compete with the likes of China, Pakistan, Indonesia, and India. Likewise, competitiveness is severely hampered by illegal and under-valued imports from the Far East, and the*

South African customs authorities have been unable to counter and combat these problems.

This study also uncovers that the respondents were particularly worried about the heightened importation of low-priced textile products, especially from Asia. Participant WS09 stated that:

> *In terms of financial viability, the industry has gone through a significant decimation of numbers. In the last 20 years, the market has opened up to the Far East territory. These regions benefit from lower prices and economies of scale in production. Their operations in South Africa created opportunities for criminality, such as under-invoicing and tax evasion. Accordingly, the industry lost a lot of steel, and it's finding it difficult to regrow itself.*
>
> *Additionally, because of the import duty protection offered to importers by the Government, the industry has lost its position of strength. It is now a matter of survival, and so many big textile organisations have closed down, and our organisation continues to shrink. For instance, in over 20 years our staff strength shrunk from over 2 000 to about 500. Importers with questionable practices are making money in the industry. Finally, a considerable portion of our raw materials are sourced from China, very few local agents are still in business that can meet our raw material needs.*

The respondents stress that the policies introduced by the Government have failed to deliver the necessary support and protection to boost the local production of textile products. According to Claassens (2017:2), the bilateral trade agreements with other countries have reduced homemade textile products, resulting in the contraction of the textile industry and a decline in employment. The respondents indicated that, even though these policies are brilliant ideas, they lack design and execution. Participant GT08 added that:

> *The Government launched a master plan for the textile, clothing, and retail value chain in early 2020. It was intended to arrest the decline of the industry, but it has been met with limited success in achieving its aims. South Africans are good at devising plans but are not very adept at implementing them. The Government is not providing enough incentives for local textile manufacturers.*

Participant GZ07 considers policy implementation lacking by adding that:

> *The Government is not providing enough incentives for local textile manufacturers. The Black Industrialist Scheme (BIS), created by the Industrial Development Corporation (IDC) of South Africa, is a good initiative. The grants provided by IDC, nevertheless, are difficult to access by genuine manufacturers due to corruption and the tender process in South Africa. There are equally other policies aimed at helping local manufacturers, but implementation is a big issue. The government, regulators and industry players are not doing enough to protect the continuous existence of the local TMOs. There are no entry barriers into the South Africa market, and China is destroying the local market, and local manufacturing is on the decline.*

Participant WS10 believes the current political climate and the Covid-19 crisis have impacted the industry. He adds that:

> *The efforts of the Government and industry players to boost local production since the Covid-19 pandemic have been unsuccessful. There are lots of improvements plans by the Government to help support the industry as far as manufacturing infrastructure is concerned. This is probably the biggest initiative by the Government. Also, the clothing clusters, such as the CTCC, design several initiatives, and they support the industry to improve productivity. This has not paid the expected dividends required to make the TMI of SA competitive on the world stage.*

Figure 4.8 illustrates the count of industry challenges identified by each respondent. This reveals the types of industry challenges impacting each respondent's organisation.

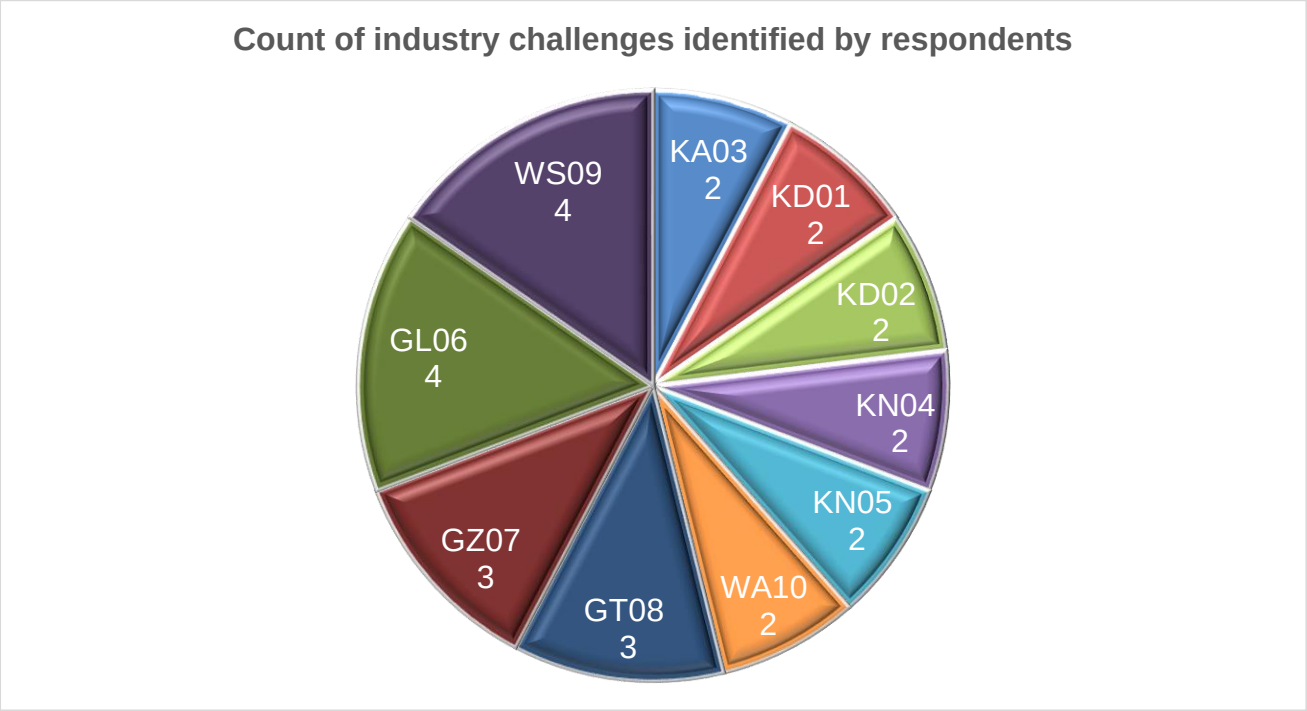


Figure 4.8: Count of industry challenges identified by respondents

Figure 4.8 established that any of the respondents did not identify the cost of implementation as a barrier to using EMAPs. Instead, all the respondents pointed towards ineffective government policies and low-priced imports as the principal problems plaguing the TMI of SA. Additionally, all the respondents agree that they may require additional EMAPs to ensure they become greener. However, most of the respondents that made this assertion admit that they will not consider investing in additional EMAPs because of their organisation's current financial position.

4.4 AN ADOPTION FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

This study proposes a framework for researching the adoption of EMA by integrating TAM, contingency, and institutional theories. EMA adoption may provide valuable environmental information for improved decision-making regarding waste management and reduction in energy, water, and material consumption, as well as provide prospects for waste recycling. Furthermore, EMA adoption may be attributed to potential benefits such as cost allocation, product pricing, waste minimisation, and production efficiency. Lee and Gunarathne (2019:14) argue that the key benefits influencing EMA adoption are cost reduction and reputational improvements. The findings of this study support this claim because most TMOs in SA employ EMAPs for cost allocation.

Consequently, the perceived usefulness of adopting EMA is integrated into the proposed framework. Wu and Wang (2005:721) cite that TAM and DIT are related in certain constructs and supplement one another to explain the adoption of Information technology. Furthermore, Moore and Benbasat (1991:197) suggest that the principles employed in TAM are akin to two subsets of the perceived attributes of DIT.

The proposed EMA framework did not consider certain constructs of DIT and TAM. According to Wu and Wang (2005:721), the relative advantage of innovation in DIT is similar to its perceived usefulness in TAM. Also, the level of complexity of innovation in DIT is similar to its perceived ease of use in TAM. Consequently, DIT's relative advantage and complexity attributes were excluded from the proposed framework. In addition, the perceived ease of use of adopting technology was excluded from the proposed EMA adoption framework because EMAPs such as MFCA are relatively less complex to deploy (Huang *et al*., 2019:23). According to Rogers (2003:242), the less complex innovations are to use, the more likely they will be embraced and adopted. Rogers (2003:234) likewise claims that the compatibility attribute of DIT is a less important predictor for the rate of innovation adoption. Contemporary research based on the DIT theory, in addition, has excluded trialability and observability as attributes of innovation (Lou and Li, 2017:300; Faisal and Idris, 2019:67). Therefore, the proposed EMA adoption framework excludes compatibility, trialability and observability.

Company size may be a key indicator for explaining EMA adoption because organisations require investments in environmental information to improve decision-making. Organisations, however, may not have access to the required funding for environmental investment due to their size and current financial condition. Huang *et al.* (2019:23) note that small organisations

can employ EMAPs such as MFCA because it is inexpensive to implement. However, Christ and Burritt (2013:170-171) argue that despite extensive research on EMA and its potential to enrich the environmental and economic performance of organisations of different sizes, small organisations fail to adopt EMA. Additionally, Burritt *et al.* (2019:489) contend that organisations may require several environmental initiatives to remain green. These additional environmental initiatives entail substantial investments which small organisations may struggle to fund. Consequently, the proposed EMA adoption framework of this study excludes environmental strategy and top management support because the findings of this study reveal that these indicators are present in the sampled TMOs.

Regulatory agencies exert coercive pressure, and EMA adoption may be enhanced by encouraging and providing organisations with incentives for compliance and penalties for non-compliance with environmental regulations. According to Elhossade, Abdo and Mas'ud (2020:518), organisations with coercive pressure tend to embrace EMA to avoid fines for non-compliance. The proposed framework for EMA adoption accentuates the influence of coercive pressure on EMA adoption. Qian, Burritt and Chen (2015:417-420) consider coercive pressure the most powerful medium through which organisations adopt EMA. Consequently, without coercive pressure from influential stakeholders, organisations are less likely to adopt EMA (Iredele, Tankiso and Adelowotan, 2019:16). The proposed EMA adoption framework also excludes mimetic and normative pressures because the findings of this study reveal that these indicators are present in the sampled TMOs.

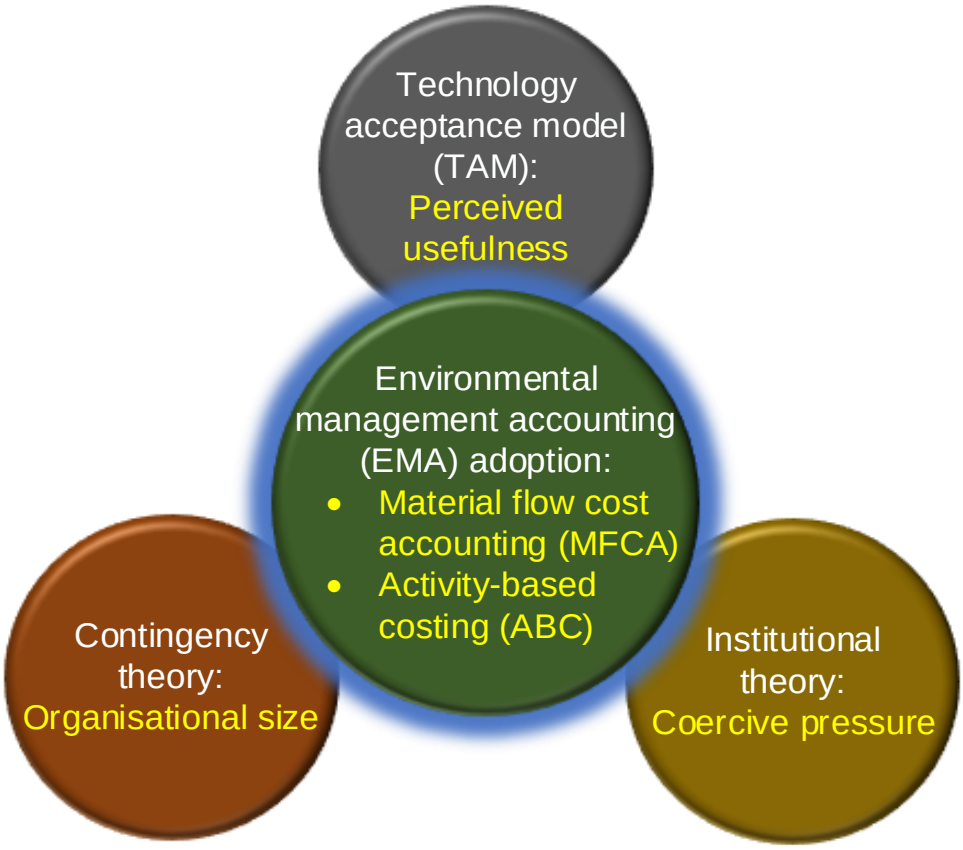


Figure 4.9: Illustration of a proposed framework for EMA adoption

Source: *Researcher's compilation*

Figure 4.9 above depicts a proposed framework for EMA adoption. As described in Chapter Two of this study, contingency and institutional theories use internal and external indicators which may be applied to provide motivations behind EMA adoption (Mbali, Ngibe and Celani, 2019:1). TAM is a useful theoretical model for explaining user behavioural attributes and may be applied, likewise, to demonstrate motives behind innovation adoption (Legris, Ingham and Collerette, 2003:191) Consequently, the proposed framework for EMA adoption in Figure 4.9 above, suggests that organisational size, coercive pressure and perceived usefulness are all relevant at organisational, social and individual levels respectively. Therefore, the proposed EMA adoption framework may support TMOs in SA when choosing suitable EMAPs such as MFCA and ABC, facilitating identifying and managing environmental costs and eliminating negative environmental impact.

4.5 SUMMARY

This chapter presented the qualitative accounts of EMA adoption in the TMI of SA. This study employed mainly in-depth interviews to collect qualitative data, and the interview recordings were transcribed and analysed using Microsoft Word™ and Excel™. First, the chapter

introduction, goal and layout were presented. Subsequently, the qualitative analysis steps and coding strategy were presented. Next, to synthesise the findings, the data acquired was structured according to four themes that align with the overall objectives. The findings of this study were, afterwards, cross-referenced with the theoretical perspectives and related literature review findings to contribute new ideas to the existing body of knowledge. Finally, this study presented a proposed framework for EMA adoption for the TMI of SA. The thematic analysis suggests that TMOs in SA use EMAPs mainly for cost allocation. Furthermore, the lack of regulatory pressure regarding environmental monitoring and compliance inhibits the use of additional EMAPs that can make TMOs in SA greener. The next chapter offers this study's summary, conclusions, and recommendations.

CHAPTER FIVE: SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

Chapter Four presented the qualitative data analysis and findings of this study. Subsequently, four main themes were generated to address the research objectives. Finally, an adoption framework for researching EMA was conceived and presented. This chapter highlights the significant findings and provides an overall summary of this study. Recommendations are made to the industry and for legislation. Also, the limitations of this study and areas where future work can be undertaken are presented.

5.1.1 Goal of chapter

This chapter aims to summarise this study's findings and demonstrate how this study's research objectives were addressed. In addition, this chapter explains how the findings of this study relate to the problem statement and research questions. Finally, the implications of the findings for practice and recommendations for additional research are determined.

5.1.2 The layout of the chapter

This subsection provides a layout of the chapter. First, in Section 5.1, the chapter introduction is presented. Next, Section 5.2 summarises the findings of this study, and Section 5.3 depicts how the research objectives of this study were addressed. Recommendations to the government and industry are presented in Section 5.4. Section 5.5 considers the limitations of this study, and Section 5.6 suggests areas for future research. This chapter closes with a conclusion in Section 5.7.

5.2 SUMMARY OF FINDINGS

This study aimed to explore EMA adoption in the TMI of SA by identifying EMAPs that TMOs in SA employ, EMAPs benefits and the indicators of its successful adoption. CASs fails to highlight environmental costs adequately. Consequently, managers have no visibility of these costs and the incentive to manage them is lost (Burritt *et al.*, 2019:480-481). CASs disregard the balance between the opposing objectives of profitability and environmental responsibility (Qian, Hörisch and Schaltegger, 2018:1609). This study was conceived on the problem statement that “evidence to demonstrate the efficacy of EMA amongst South African small organisations remains scarce.” The problem statement initiated the formulation of three research objectives that investigated EMA adoption in the TMI of SA. The successive sub-

sections re-examine the research problem, summarises the findings of this study and how they contribute to existing literature.

This study adopted a qualitative approach to explore EMA adoption in the TMI of SA. The research data for this study was compiled using existing literature, in-depth interviews, and web-based document analysis. The target population was the TMOs in the three major textile clusters of South Africa. A purposeful sampling method was employed, and individuals and sites that fit the parameters of this research were selected intentionally. The data gathered were transcribed into words, and the resulting data was analysed using thematic analysis. The data analysis of this study co-occurred with other aspects of the developing qualitative study, such as data collection, coding, thematic analysis, and the write-up of research findings. Mthuli, Ruffin and Singh (2022:5) argue that qualitative data is usually gathered from a small sample where a suitable approach is employed. Therefore, no more than 10 sampled participants were interviewed, as data saturation was attained after six interviews.

The review of related literature indicates that environmental problems created by the TMOs in SA from the usage of resources and unethical disposal of harmful environmental waste are increasing (Mazibuko *et al.*, 2019:720). However, according to Fakoya and Imuezerua (2020:2), adopting tools such as EMA remains low in South Africa. The findings of this study indicate that EMA exists in practice, and EMA integration with other systems may support and improve environmental cost management. Environmental enforcement in South Africa may increase awareness and influence EMA adoption. Furthermore, the success of EMA adoption may require TMOs in SA to consider their current position and situation. This confirms that a single EMAP may be inadequate for TMOs in SA in all circumstances for identifying and managing an organisation's environmental cost (Burritt *et al.*, 2019:479).

The review of competing theoretical frameworks underpinning this study defined the borders of the research. It provided insights into the underlying indicators of the successful adoption of EMA in the TMI of SA. This study considered the contingency and institutional theories as motivations behind the successful adoption of EMA in the TMI of SA. This study regarded the contingency theory as internal, complementing the institutional theory regarded as external to organisations. The findings of this study show a lack of adequate environmental waste monitoring and enforcement by the respective regulators in the TMO in SA. According to Doorasamy (2016:285), EMA adoption in South Africa is low among organisations due to a lack of regulatory enforcement. Consequently, financial incentives, such as green tax rebates and pioneer tax incentives for compliance and penalties for non-compliance with

environmental regulations, may encourage EMA adoption by TMOs in SA.

5.2.1 Re-examining the research problem

Literature review indicates an increased recognition of CASs weakness in providing visibility and highlighting relevant information necessary to reduce negative environmental impact and control environmental costs (Burritt *et al*., 2019:480; Elhossade, Zoubi and Zagoub, 2022:9; Tran and Herzig, 2022:43). EMA, in contrast, provides significant visibility and highlights the existence, nature, and size of environmental costs, therefore, making them part of financial cycles and strategic actions (Christ, Burritt and Varsei, 2016:460). This informed the research problem that "research evidence to demonstrate the efficacy of EMA amongst South African small organisations remains scarce" (Doorasamy and Garbharran, 2015:15; Nyide, 2017:38; Iredele, Tankiso and Adelowotan, 2019:17). The findings of this study imply that TMOs in SA use various environmental tools to minimise their negative environmental impact and environmental control costs. Equally, the findings of this study reveal that respondents possess an excellent knowledge and understanding of the EMAPs employed. The findings also signify that respondents are aware of other environmental initiatives employed in other segments of the textile industry.

5.2.2 Outcomes of the research objectives

The ensuing subsections below provide a summary and appraise this study's findings and literature review discussions in the previous chapters.

5.2.2.1 Objective 1: Identify the practices that a selection of textile manufacturing organisations in South Africa use for managing environmental cost

This objective was formulated to identify the EMAPs employed by the selected TMOs in SA. Section 4.3.1.1 established that the selected TMOs in SA use toxic raw materials, water and energy during production that generates harmful environmental waste. Jia ***et al.'s*** (2020:2-3) assertion supports the position above that TMOs produce harmful environmental waste. These wastes translate into economic losses and negative human and environmental impacts. The implication for the selected TMOs in SA is that, because of the negative social and environmental impact, these wastes require treatment, recycling, or disposal to reduce their negative environmental impact. This study's findings suggest that managing these wastes by TMOs in SA gives rise to environmental costs. Consequently, the initial step of identifying the categories of environmental waste generated by TMOs in SA provided insights

into the EMAPs used for managing environmental costs.

Section 4.3.1.2 presented three categories of environmental wastes generated by TMOs in SA: wastewater, carbon emissions and dry waste. Half of the selected TMOs in SA found wastewater as the dominant type of environmental waste produced. Additionally, the findings of this study established that some of the selected TMOs in SA offer commission dyeing and finishing services for several other TMOs in SA. The dyeing of materials like polyester and cotton requires millions of litres of water monthly. It is, therefore, plausible that the dominant waste amongst the TMOs in SA is wastewater because the textile production process requires a substantial volume of water (Madhav *et al*., 2018:32). Identifying the flow of these inputs and the destination of the outputs requires systems that treat or recycle waste as well as EMAPs for ascertaining their physical quantities and monetary values.

Section 4.3.2.1 concluded that before implementing the current EMAPs, the CASs employed by the selected TMOs in SA were inadequate for identifying and tracking environmental costs. Section 4.3.2.1 revealed that all the respondents agree that prior systems failed to consider environmental costs (Le and Nguyen, 2019:11). EMAPs, in contrast, highlight the existence of environmental costs and are deemed effective for managing the environmental and economic performance of organisations (Elhossade, Zoubi and Zagoub, 2022:479). Therefore, Section 4.3.2.2 identified three types of EMAPs used by TMOs in SA for managing environmental costs. The findings in Chapter Four identified ABC, MFCA and PEF as EMAPs employed by the selected TMOs in SA. Furthermore, the findings of this study indicate that none of the selected TMOs in SA use WMA. It, however, appears to be an area that they are interested in pursuing because of the level of wastewater generated from their operations. The absence of WMA amongst TMOs in SA may be because of its recent emergence and limited literature on its application in organisations (Olusanmi *et al*., 2021:7-8).

5.2.2.2 Objective 2: Explore the benefits of environmental management accounting adoption for the selected textile manufacturing organisations in South Africa

This objective was formulated to explore the benefits of adopting EMA for TMOs in SA. This study's findings indicate that most respondents identified cost allocation as the benefit derived from employing EMAPs. The findings in Chapter Four reveal that before adopting ABC, some of the selected TMOs in SA had key challenges with appropriately identifying and apportioning their environmental costs. Section 4.3.3.1 likewise indicates that all the selected TMOs in SA that employ ABC also identified cost allocation as the benefit derived from

employing ABC. Baird, Su and Tung (2018:407) agree that ABC involves tracking costs of environmental activities to products, improving the accuracy of cost identification and allocation. This may also improve pricing and incentivise discontinuing products that generate substantial environmental costs.

Section 4.3.3.2 revealed that the selected TMOs in SA that employed MFCA identified waste minimisation and production efficiency as the primary benefit of MFCA. Research on MFCA within the context of the textile industry appears to be gaining increased recognition (Chattinnawat, Suriya and Jindapanpisan, 2018:210; Burritt *et al.*, 2019:483; Tran and Herzig, 2020:7-8). According to Fakoya (2016:1028), MFCA adoption improves waste-reduction decisions. In complex manufacturing settings where sourcing PEMA information may require some expertise, integrating MFCA and ERPSs may enhance the timeliness and veracity of waste information produced (Fakoya and van der Poll, 2013:140). The findings of this study imply that TMOs in SA do not employ WMA for waste reduction. This may be because of limited research on WMA (Olusanmi *et al*., 2021:7-8). However, the findings in Chapter Four reveal that MFCA may be useful for TMOs in SA for minimising waste and negative environmental impact.

5.2.2.3 Objective 3: Ascertain the indicators of successful adoption of environmental management accounting amongst the selected textile manufacturing organisations in South Africa

This objective was formulated to ascertain the indicators of successful adoption of EMA amongst the selected TMO in SA. Qian, Burritt and Chen (2015:410) argue that adopting EMA is influenced not only by the potential economic benefits but also by pressure from influential stakeholders and political reasons. Similarly, Lee and Schaltegger (2018:122) admit that coercive pressure exerted by forces such as regulators and environmental pressure groups significantly influences the adoption of EMA. However, section 4.3.4.1 established that compliance monitoring of the selected TMOs in SA is generally absent. Consequently, coercive pressure is not an indicator of the successful adoption of EMA amongst TMOs in SA. Furthermore, the findings of this study indicate that a substantial number of unregistered TMOs in SA exists in the interior districts of KwaZulu-Natal. Municipalities with little or no resources are, therefore, not capable of providing effective monitoring of their polluting activities.

Section 4.3.4.2 determined that in several cases, two or more functions within the selected

TMOs in SA collaborate to produce environmental cost information and reports. Burritt *et al.* (2019:483) admit that gathering and analysing PEMA and MEMA information requires expert skills; therefore, collaboration amongst functional teams may influence the adoption of EMA. Furthermore, Schaltegger *et al.* (2014:3081) suggest that a stronger collaboration and involvement of functional units can enhance relations with top management, improving commitment to environmental initiatives. Consequently, this study's findings show that functional collaboration indicates the successful adoption of EMA amongst the selected TMOs in SA.

Section 4.3.4.3 presented four major challenges hindering the industry's growth and use of EMAPs by TMOs in SA. First, the findings of this study reveal that the TMI of SA is undergoing significant contraction, and several TMOs in SA have shut down their operations. In addition, the TMI of SA is impacted negatively by importation from Asia. The higher cost of production in South Africa has encouraged importing lower priced raw materials and finished goods from Asia. Finally, the findings of this study indicate that some of the selected TMOs in SA are now diversifying into other areas. These TMOs still import their raw materials from Asia. However, they provide some value addition to fabrics, a niche market that has been identified as profitable with very little competition.

5.3 HOW THE RESEARCH OBJECTIVES WERE ADDRESSED

The summary of how the objectives of this study were addressed is depicted in Table 5.1

Table 5.1: Summary of how the research objectives were addressed

Research Objectives		How the research objectives were addressed	Where the research objectives were addressed
1	Identify the practices that a selection of textile manufacturing organisations in South Africa use for managing environmental cost	This objective was addressed by the qualitative accounts of respondents regarding EMAPs employed for managing environmental costs by the selected TMOs in SA. In addition, these accounts were cross-referenced with the related theoretical perspectives and literature review findings. The findings of this study reveal that two of the EMAPs (ABC and MFCA) identified in the extensive literature review are employed by TMOs in SA.	Chapter: 2 Sections: 2.3.4 and 2.4.2
			Chapter: 4 Sections: 4.3.1 and 4.3.2
2	Explore the benefits of environmental management accounting adoption for the selected textile manufacturing organisations in South Africa	This objective was addressed by the qualitative accounts of respondents regarding the benefits of EMA for the selected TMOs in SA. These accounts were cross-referenced with the related theoretical perspectives and literature review findings. The findings of this study reveal that TMOs in SA employ EMAPs primarily for cost allocation and waste minimisation.	Chapter: 2 Sections: 2.4.3
			Chapter: 4 Sections: 4.3.3
3	Ascertain the indicators of successful adoption of environmental management accounting amongst	The qualitative accounts of respondents regarding the indicators of successful adoption of EMA amongst the selected TMOs in SA addressed this objective. These accounts were cross-referenced with the related theoretical perspectives and literature review findings. The	Chapter: 2 Sections: 2.5.2, 2.6.1 and 2.6.2
			Chapter: 4 Sections: 4.3.4

Research Objectives		How the research objectives were addressed	Where the research objectives were addressed
	the selected textile manufacturing organisations in South Africa	findings of this study uncover that regulatory pressure concerning environmental compliance is largely absent. Owing to resource constraints, regulators cannot ensure environmental compliance by most TMOs in SA.	

Source: *Researcher's compilation*

Table 5.1 identifies each research objective and how the findings of this study addressed these objectives. It also illustrates the sections within the study where the research objectives were addressed.

5.4 IMPLICATIONS OF THE STUDY

This study generated various discoveries about the categories of waste generated by and the EMAPs employed by TMOs in SA. The respondents also outlined the benefits of EMAPs for managing environmental costs and indicated several improvements in policy implementation in the TMI of SA. This study adopted two competing theories as underpinning for EMA and defined the borders of this study through the theoretical lens. This provided insights into the underlying indicators influencing EMA adoption in the TMI of SA. TMOs in SA employed EMAPs based on their specific condition and situation, suggesting that TMOs in SA may require more than a single EMAP to reduce their negative environmental impact. Based on the findings of this study, it is evident that the perceived benefits of an EMAP may be an indicator of its adoption. Additionally, adopting units may be able to compare with other EMAPs and may be inclined to use new EMAPs that are evidently superior to existing EMAPs. Adopting units may also be able to identify improvements in their job performance.

This study proposed an adoption framework for researching EMA, which may provide valuable environmental information for improved decision-making. In addition, individuals, regulators, and TMOs may find the proposed framework for EMA adoption valuable because the framework implies that organisational size, coercive pressure, and perceived usefulness are applicable at organisational, social, and individual levels, respectively. Therefore, the proposed framework for EMA adoption may support TMOs in SA when choosing suitable EMAPs, facilitating managing environmental costs and eliminating negative environmental impact.

5.5 RECOMMENDATIONS TO GOVERNMENT AND INDUSTRY

The findings of this study offer recommendations for actions that the government should consider seeing improvements in the current state of environmental pollution and economic contraction within the TMI of SA. Gunarathne and Lee (2019:170) claim that EMA adoption is low in developing countries due to weak regulations and enforcement. Similarly, regulatory enforcement is absent in South Africa. Therefore organisations are not motivated to adopt EMA (Doorasamy, 2016:285). EMA adoption, consequently, can be promoted by exerting coercive pressure. The government can exert coercive pressure by providing tax incentives for compliance and penalties for non-compliance with environmental regulations. Incentives such as environmental policy mechanisms, tax credits, and subsidies may encourage EMA adoption by TMOs in SA. The findings of this study revealed that the TMI of SA has suffered

substantial contraction because of illegitimate and low-priced imports of raw materials and finished textiles. Entry barriers such as high import taxes and licensing requirements may boost local production and improve global competitiveness.

The governments should also work more closely with other industry players in the TMI of SA to design programmes and implement policies that will boost the competitiveness of the TMI. The findings of this study reveal that there is currently little or no support from the government to boost local production and encourage the exportation of textiles. Previous programmes such as the CTCP jointly established by the South African government and key industry players have played an important role in repositioning the TMI (Smal, 2016:4; Le Roes-Hill *et al*., 2017:2; GreenCape, 2019:4). Accordingly, additional policies such as export rebates and incentives may boost local production and encourage exportation. Likewise, the South African textile clothing clusters such as the CTCC, KCTC and SASTAC can promote initiatives such as clean manufacturing to improve productivity in the TMI of SA. These initiatives stated above may create an environment that drives competitiveness and promotes using EMAPs that positively impact the environment.

5.6 LIMITATIONS OF THE STUDY

Some limitations should be considered when interpreting the findings of this study. First, Madhav *et al.* (2018:31-32) suggest that water is an essential resource input for textile wet processing. Consequently, WMA adoption may be valuable for TMOs. A key limitation of this study is the scarce literature on WMA adoption (Olusanmi *et al.*, 2021:8). Therefore, there is limited evidence linking the successful adoption of WMA with financial and environmental performance. Another key limitation of this study is the small sample drawn from the three major textile clusters in South Africa. Data saturation primarily influenced the sample size, but the sampling approach improved the data quality and insights generated. The use of a large sample size incorporating additional TMOs in the interior districts of the three major textile clusters may broaden the insights generated. Finally, most TMOs in SA regard environmental information as highly confidential, therefore, the level of disclosure by research participants was limited. The limitations of this study, nevertheless, presents prospects for areas of future study.

5.7 RECOMMENDATIONS FOR FUTURE RESEARCH

A number of potential future studies may be conducted using similar methods employed in this study. Future research can focus on WMA because the findings of this study reveal in

section 4.3.1.2 that wastewater is the dominant environmental waste produced by the selected TMOs in SA. Literature review reveals the existence of extensive research on MFCA in various industries, including the TMI (Huang *et al*., 2019:22; Dechampai *et al*., 2021:16; Sahu *et al*., 2021:16). Therefore, WMA may offer valuable insights into how TMOs can manage their environmental costs and reduce negative environmental impact. Burritt *et al*. (2019:489) note that more complex EMAPs are incorporated to achieve environmental objectives as organisations progress towards improved sustainable production. Consequently, future research can focus on how MFCA and ABC integration can assist TMOs in waste minimisation decisions. Finally, future research can employ a quantitative approach focusing on a large sample size. This will include carter for TMOs in the interior districts of the three textile clusters in South Africa and may provide deeper insights into how they manage their environmental costs.

5.8 CONCLUSION

The activities of the textile supply chain are expected to worsen the negative environmental impact of harmful wastes in the future. Therefore, there is a growing need to develop innovative tools to prevent the negative impact of harmful environmental waste. Qian, Hörisch and Schaltegger (2018:1609) argue that CASs disregard the balance between the conflicting objectives of profitability and environmental responsibility. Consequently, the increased recognition of CASs weakness in highlighting environmental costs informed the research problem that “research evidence to demonstrate the efficacy of EMA amongst South African small organisations remains scarce.” Burritt *et al.* (2019:480) state that EMA facilitates and supports the management of environmental costs. Therefore, EMA may be regarded as superior to CASs due to its ability to deliver accurate environmental cost information.

This study aimed to explore EMA adoption by TMOs in SA and establish what EMAPs TMOs employ to minimise waste. Three research objectives were formulated to aid the research problem, and four main themes were developed to address the research objectives. The collected data were organised according to specific themes that align with the research objectives. This was cross-referenced with related literature review findings and relevant theories. The first objective sought to identify the EMAPs employed by a selection of TMOs in SA. The findings of this study reveal that TMOs in SA primarily employ ABC and MFCA to manage their environmental costs and eliminate harmful waste. The TMOs that employed MFCA for managing environmental costs generate significant wastewater as their main

waste. Similarly, TMOs that employ ABC for managing environmental costs generate a significant level of dry waste.

The second objective explored the benefits of EMAPs employed by the selected TMOs in SA. The findings of this study established that TMOs in SA use EMAPs mainly for cost allocation and waste minimisation. The third objective sought to ascertain the indicators of successful adoption of EMAPs amongst the selected TMOs in SA. The findings of this study revealed that the size of an organisation is not an indicator of the successful adoption of EMAPs in the TMO in SA. TMOs in SA are disinclined towards employing additional EMAPs because they face various financial difficulties as small organisations. The findings of this study also reveal that TMOs in SA employ MFCA, which is less complex and more cost-effective to deploy. In addition, compliance monitoring by environmental regulators is generally absent in the TMI of SA. Policymakers and regulators may enhance EMAPs adoption by offering incentives for compliance or punitive measures for non-compliance.

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APPENDIXES

APPENDIX A: GLOSSARY

Contingency theory: claims that there is no best way to organise a corporation, to lead a company, or to make decisions. Instead, the optimal course of action is contingent upon the internal and external situation.

Conventional accounting systems: traditional system of recording business transactions using direct material, direct labour hours and machine hours as a primary method of allocating overheads**.**

Diffusion of innovation theory: seeks to explain how, why, and at what rate new ideas and technology spread.

Enterprise resource planning software: platform organisations employ to manage and integrate the essential parts of their businesses.

Exploratory research: qualitative approach that investigates topics and research questions that have not previously been studied in-depth.

In-depth interview: qualitative data collection method that allows for the collection of a large amount of information about the behaviour and perception of the research participants.

Institutional theory: seeks to understand organisations and management practices as the product of social rather than economic pressures.

Monetary environmental management accounting: assigning of value to organisations' environmental impact.

Physical environmental management accounting: determination of the quantity of environmental impact of an organisation on the environment.

Technology acceptance model: measures the adoption of new technology based on customer attitudes.

Textile manufacturing: conversion of fibre into yarn, then yarn into fabric. These are then dyed or printed, fabricated into cloth which is then converted into useful goods such as clothing, household items, upholstery, and various industrial products.

APPENDIX B: IN-DEPTH INTERVIEW GUIDE FOR TEXTILE MANUFACTURING ORGANISATIONS

Research Themes	Interview Questions	Research Questions
Theme 2: Environmental Initiatives	Question for specific for directors	Question 1
	What is the content of your organisation's environmental policy framework and how often is it referred to when environmental issues arise?	
	What types of environment-related key performance indicators (KPIs) are employed to measure environmental performance in your organisation?	
	What are your organisation's major environmental challenges?	
	What projects has your organisation undertaken to address these challenges?	
Theme 1: Environmental Waste	Question specific for all participants	Question 1
	What major wastes does your organisation generate that are harmful to the environment?	
	Does the waste give rise to major environmental costs?	
Theme 1: Environmental Waste	How are the physical and monetary environmental costs sourced, captured, and categorised within the current accounting systems?	
	How are environmental costs accounted for in the financial statements?	
Theme 2: Environmental Initiatives	What practices does your organisation currently employ for managing environmental costs?	
	What EMA technique(s) for managing environmental costs are you knowledgeable about?	
Theme 4: Drivers of EMAPs	Question specific for production and environmental managers	Question 3
	What laws require your organisation to comply with municipality environmental waste thresholds?	
	How often does your organisation pay levies to your municipality where the threshold is breached and how are the levies evaluated?	
	Who is responsible for providing environmental cost information and how are they held accountable?	

Research Themes	Interview Questions	Research Questions
	Who is responsible for providing environmental reports and what is the content of the environmental reports produced?	
Theme 4: Drivers of EMAPs Theme 3: Benefits of EMAPs	Question for all participants	Question 2 & 3
	What drives or impedes the use of EMAPs in your organisation and within the TMI?	
	What benefits does your organisation derive from the current EMAPs employed for managing environmental costs?	
	What are your thoughts about the current state of the TMI of SA?	
	What are the initiatives designed by the Government and/or industry players to promote cleaner production in the TMI of SA?	
	What is the nature of communication and exchange of information between the accounting, production, and environmental team?	

Source: *Researcher's compilation*

APPENDIX C: INTERVIEW TRANSCRIPT OF SAMPLE WS09

Questions	Individuals	Details	Codes	Sub-themes	Themes
1	**Interviewer**	**What major wastes does your organisation generate that is harmful to the environment?**			
	Respondent	Our significant waste is wastewater as a result of fabric finishing and dyeing processes. We also generate dry waste from fabric cutting, and resizing, they are, however not significant.	Wastewater	1. Harmful environmental waste	1
2	**Interviewer**	**Does the waste generated give rise to major environmental costs?**			
	Respondent	Yes, wastewater treatment gives rise to environmental costs.	Waste treatment	1. Significant environmental cost 2. Harmful environmental waste	2
3	**Interviewer**	**How are the physical and monetary environmental costs sourced, captured, and categorised within the current accounting systems?**			
	Respondent	We are currently in the early stages of estimating our waste cost. It appears a difficult process for us as we have various tools, we employ for identifying and capturing our waste cost. We employ a system that compares inputs to final products, identifying all waste along the production process.	Input and output analysis	1. Application of EMAPs	2
4	**Interviewer**	**How are environmental costs accounted for in the financial statements?**			
	Respondent	They are recorded as a separate item in the accounts	EMA	1. Application of EMAPs	2
5	**Interviewer**	**What practices does your organisation currently employ for measuring and managing environmental costs?**			

Questions	Individuals	Details	Codes	Sub-themes	Themes
	Respondent	We utilise a software that captures the flows of materials inputs and outputs, we them manually calculate the resulting environmental costs.	MFCA	1. Application of EMAPs	2
6	**Interviewer**	**What environmental management accounting practices for managing environmental costs are you knowledgeable about?**			
	Respondent	I am aware of various international standards and methodologies in use globally by textile organisations such as product environmental footprint which utilises chemical, water and carbon footprints methods to estimate the environmental impacts of textile waste. I do not believe that this method(s) will be useful for us.	PEF	1. Application of EMAPs	2
7	**Interviewer**	**Do you think your current process adequately identifies, measures and records environmental cost accurately?**			
	Respondent	No, as I mentioned earlier, we are still in the early stages of accounting for our waste cost. Gradually we will identify all the loopholes	Costs hidden in overheads	1. Inadequate cost tracking	2
8	**Interviewer**	**What is the content of your organisations environmental policy framework and how often is it referred to when environmental issues arise?**			
	Respondent	We do have an informal environmental policy that is usually consulted when environmental issues arise. It assists in planning and managing all environmental issues including waste disposal and accounting.	Environmental planning and management, referred to on needs basis	1. Waste reduction initiatives	2
9	**Interviewer**	**What types of environment-related key performance indicators are employed to measure environmental performance in your organisation?**			
	Respondent	None	None	1. Environmental	2

Questions	Individuals	Details	Codes	Sub-themes	Themes
				Performance KPIs	
10	**Interviewer**	**What are your organisation's major environmental challenges?**			
	Respondent	We live in an age where environmental awareness has started to dawn on people, though they have not been internalised. The major environmental challenges include our organisations sense of responsibility and attitude towards waste. Equally our organisations financial position has reduced investments in initiatives tailored towards cleaner production.	Attitude to waste, financial limitations	1. Attitude towards waste 2. Significant environmental cost	2
11	**Interviewer**	**What projects has your organisation undertaken to address these challenges?**			
	Respondent	I learnt that my organisation has committed to several environment projects in the past prior to my joining. Any new initiatives will require some form of financial commitment which our organisation cannot afford currently.	None	1. Waste reduction initiatives	2
12	**Interviewer**	**What laws require your organisation to comply with municipality environmental waste thresholds?**			
	Respondent	City of Cape Town Municipal System Act, 2000 (Act 32 of 2000)	Municipal by-laws	1. Applicable environmental laws	4
13	**Interviewer**	**How often does your organisation pay levies to your municipality where the threshold is breached and how are the levies evaluated?**			
	Respondent	We have never paid any penalties.	None	1. Regulatory compliance challenges	4
14	**Interviewer**	**Who is responsible for providing environmental cost information and how are they held accountable?**			

Questions	Individuals	Details	Codes	Sub-themes	Themes
	Respondent	Management Accountant. He is responsible for producing the periodic environmental reports on a quarterly basis.	Accountant, produce quarterly reports	1. Environmental reporting responsibility	4
15	**Interviewer**	**Who is responsible for providing environmental reports and what is the content of the environmental reports produced?**			
	Respondent	Management Accountant. He is assisted by the Production Manager. It details the environmental issues during the period and the extent of waste produced recycled and disposed in physical and monetary terms.	Accountant, changes in waste generated, periodic environmental reporting	1. Environmental reporting responsibility	4
16	**Interviewer**	**What drives or impedes the use of environmental management accounting practices in your organisation and within the textile manufacturing industry?**			
	Respondent	The cost of acquiring environmental systems is significant for textile manufacturers, especially in the light of poor financial performance.	Cost of implementation	1. EMAPs implementation costs	4
17	**Interviewer**	**What benefits does your organisation derive from the current environmental management accounting practices employed for managing environmental costs?**			
	Respondent	We are able to identify environmental costs appropriately and minimise waste.	Cost allocation and waste minimisation	1. Benefits of EMA	3
18	**Interviewer**	**What are your thoughts about the current state of the South African textile manufacturing Industry?**			

Questions	Individuals	Details	Codes	Sub-themes	Themes
	Respondent	In terms of financial viability, the industry has gone through a huge decimation of numbers. In the last 20 years the market has opened up to the far east territory. These regions benefit from lower prices and economies of scale in production. Their operations in South Africa have opened doors for a lot of criminality such as under-invoicing and tax evasion. As a result, the industry has lost a lot of its steel and it's finding it difficult to regrow itself. Also due to import duty protection offered to importers by the Government, the industry has lost its position of strength. It's now a matter of survival and so many big textile organisations have closed down and our company continues to shrink. For instance, in over 20 years our staff strength shrunk form over 2 000 to about 500. Mainly importers with questionable practices are making money in the industry. For instance, a significant portion of our raw materials is sourced from China, very few local agents are still in business that can meet our raw material needs. We also buy some technical yarns from America.	Cheap Imports from Asia, fraud and corruption, manufacturing plant closures, loss of employment, sourcing raw materials locally	1. Industry operating challenges	4
19	**Interviewer**	**What are the initiatives designed by the Government and/or industry players to promote cleaner production in the textile manufacturing industry of South Africa?**			
	Respondent	The Government assists some organisations and neglects others. The financial state and the nature of our operations makes it difficult to divest ownership, therefore, we do not qualify for several incentives as we do not meet some of the BEE criteria. All the same the Government is not providing enough incentives for local textile manufacturers. There are too many negatives the Government is not addressing, as imports are brought into South Africa at cheap prices. The Government is not realistic as to its understanding of the business dynamics. The wage issues are equally a problem,	Inadequate government support, cheap Imports from Asia, strike and wage issues, power load-shedding	1. Government policy challenges 2. Industry operating challenges	4

Questions	Individuals	Details	Codes	Sub-themes	Themes
		as the wages in the industry are high. Most organisations engage in only value addition of some sort. We are also exposed to power issues due to the power shortages over the years. This impacts our efficiency.			
20	**Interviewer**	**What is the nature of communication and exchange of information between the accounting, production, and environmental team?**			
	Respondent	The Production Manager provides data on physical quantities of waste to the Management Accountant. They cooperate efficiently to generate our environmental reports.	Collaboration of functions	1. Collaboration between functions	4

Source: *Researcher's compilation*

APPENDIX D: ETHICS APPROVAL

UNISA university of south africa

UNISA COLLEGE OF ACCOUNTING SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

Date: 9 June 2021

ERC Reference # : 2021_CAS_026
Name : T Omoworare
Student no: 66357675

Dear Mr T Omoworare,

Decision: Ethics Approval from 8 June 2021 to 7 June 2024

Researcher(s): Mr Temitope Omoworare (66357675@mylife.unisa.ac.za)
Supervisor(s): Prof Huibrecht Margaretha van der Poll (vdpolhm@unisa.ac.za)

Working title of research:
Adoption of Environmental Management Accounting in the Textile Manufacturing Industry of South Africa

Qualification: MPhil and Non-degree

Thank you for the application for research ethics clearance by the Unisa College of Accounting Sciences Research Ethics Review Committee for the above mentioned research. **Ethics approval is granted for data collection through interviews.** The certificate is valid for the period **8 June 2021 to 7 June 2024.**

*The **low risk application** was **approved** by the CAS RERC on **8 June 2021** in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the CAS RERC.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

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4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No fieldwork activities may continue after the expiry date **(7 June 2024)**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:
*The reference number **2021_CAS_026** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Signature : **Prof Lourens Erasmus**

Chair of CAS RERC

E-mail: erasmli1@unisa.ac.za
Tel: (012) 429-8844

Signature : **Dr Chisinga Chikutuma**

Digitally signed by Dr CN Chikutuma, PhD
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Acting head: Office for Graduate Studies and Research
By delegation from the Executive Dean: College of Accounting Sciences

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APPENDIX E: TURNITIN REPORT

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APPENDIX F: PROOF OF EDITING

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CERTIFICATE

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TO WHOM IT MAY CONCERN

This is to certify that I have edited this document for English style, language usage, logic and consistency; it is the responsibility of the author to manually accept or reject the suggested changes and interact with the comments to finalise the text.

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Sincerely

Dr Felicity Horne for Expert English Editors
B. A. (Wits); T.T.H.D (Wits); B.A. Hons (Unisa); M.A. (Unisa); D. Litt. et Phil. (Unisa)

Electronically signed

2022-12-07