NELSON MANDELA UNIVERSITY

A DESKTOP ANALYSIS OF SUSTAINABLE BEST PRACTICES REGARDING ELECTRONIC WASTE MANAGEMENT PRACTICES IN SOUTH AFRICAN ORGANISATIONS

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DECLARATION:

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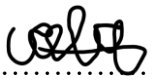

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ABSTRACT

The rising electronic usage and poor disposal of electronic waste (e-waste) is becoming a greater threat to South Africa's environment and public health. This is mainly because South Africa generates approximately 6.2 kgs of e-waste per capita annually yet maintains an alarming low formal recycling rate of only 12%, indicating widespread improper disposal through landfills and informal, hazardous treatment. With the use of qualitative, mono-method research design situated within an interpretivist/constructive paradigm it will explore the sustainable e-waste management practices by evaluating existing innovations, problems, and options in five South African organisations. Data was collected exclusively through a comprehensive desktop analysis, and the results reveal a mixed landscape whereby leading organisations demonstrate commendable practices such as Extended Producer Responsibility (EPR), Circular Economy models, and collaborations with certified recyclers. To advance responsible e-waste governance throughout South African organisations, this research provides actionable recommendations to enhance organisational sustainability, foster collaboration between public and private sectors, strengthen policy enforcement and guide the creation of more effective national strategies, thereby contributing to environmental preservation and the transition a circular economy.

Key terms: E-waste Management, Organisations, Sustainability, Best practices, Circular Economy.

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CHAPTER ONE
INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Electronic waste (e-waste) management refers to the systematically way of discarding electrical and electronic equipment, such as mobile phones, laptops, televisions, and many other consumer gadgets that have reached the end of their useful life (Moyo, Sadan, Lotter and Petersen, 2022). This has become a global concern due to the increasing consumption of electronic devices and the environmental hazards associated with improper disposal.

South Africa has emerged as a significant contributor to the global e-waste problem, generating approximately 6.2 kg of e-waste per person each year, while maintaining an alarming recycling rate of only 12% (Stickland, 2024). According to Stickland (2024), this indicates that most of the country's e-waste is either sent to landfills or treated informally hazardously, resulting in both human and environmental health hazards as e-waste contains extremely harmful chemicals such as mercury, flame retardants, and certain phthalates.

The growing concern over e-waste management is intensified by its implications of environmental sustainability and public health (Patil and Ramakrishna, 2020). The rapid technological advancements have driven widespread use of electronic devices, but they have also led to challenges in the responsible disposal of obsolete equipment, many of which are complex and costly to recycle. Sofian, Hanafiah, and Hassan (2023) emphasise that, especially in developing countries like South Africa, organisations face mounting pressure to manage e-waste responsibly while adapting to technological progress and evolving consumer demands.

Although there have been numerous studies conducted on electronic waste management internationally, there remains a significant gap in the documentation of sustainable best practices specifically within South African organisations. Moyo et al. (2022) highlight that sustainable e-waste management is not only an environmental imperative but also a legal requirement under South Africa's National Environmental Management Act (No. 59 of 2008) and the Extended Producer Responsibility (EPR), yet organisations remain inconsistent with e-waste management policies as the law enforcement of these policies remains weak and some lack structured e-waste management programs.

Despite the rising volume of e-waste, most South African organisations still lack well-defined and established sustainable practices for managing e-waste (Moyo, Lubbe and Ohei, 2023). However, organisations such as South Group Recycling, ATS Recycling, ERA, eWaste Africa, and Circular Energy have restructured their operations to address e-waste challenges. This study will examine these organisations to identify effective practices and develop insights that can help guide other organisations in improving their compliance, sustainability, and cost efficiency of electronic waste management.

This study aims to identify and assess best practices of e-waste management that can be adopted by organisations to address this prevalent gap within e-waste management in the South African context. Sustainable management practices, emerging trends, the potential economic value of e-waste, and the challenges/barriers to effective implementation will be highlighted through a review of secondary sources, such as academic literature, sustainability documents, and institutional reports. The study's ultimate goal is to contribute a more unified and effective national approach to e-waste management.

1.2 PROBLEM STATEMENT

South African organisations are demonstrating poor adaptation to sustainable electronic waste management methods, this is evident from the low recycling rates and weak compliance with regulations like the National Environmental Management Waste Act and Extended Producer Responsibility, causing further harm to the environment and socioeconomic progress (Mouton and Roux, 2024). This non-compliance partly stems from a lack of awareness and commitment among consumers and organisations about the importance of sustainable e-waste management and corporate responsibility, leading to improper disposal practices of e-waste that pose environmental and health risks (Ichikowitz and Hattingh, 2020).

Furthermore, despite regulations, informal recycling and inappropriate e-waste disposal persist, endangering human health and the environment. It is thus necessary to develop and implement sustainable e-waste management strategies to improve environmental sustainability and support the nation's circular economy as well. Therefore, the goal of this study is to investigate how South African organisations can adopt sustainable and efficient e-waste management practices in order to address the growing e-waste challenge and close this gap. To find practical e-waste practices, this study will review e-waste management existing academic literature, organisational reports, policies, and regulations.

1.3 RESEARCH OBJECTIVES

1.3.1 Primary objectives

The main objective of this study is to conduct a desktop analysis of sustainable best practices regarding electronic waste management in South African organisations.

1.3.2 Secondary objectives

To achieve the main objectives of the study, the following secondary objectives were formulated:

- To identify the five South African organisations that implement sustainable e-waste management strategies.
- To identify sustainable e-waste management strategies for South African organisations.
- To ascertain the degree of e-waste management awareness of South African organisations.
- To provide guidelines to organisations on how to effectively manage their e-waste.
- To determine the extent to which South African organisations implement these best practices.

1.3.3 Methodological objectives

- To undertake a literature review on the nature of sustainable e-waste practices.
- To identify the research methodology that is most suitable in addressing the specified research problems and objectives of the study.
- To collect qualitative data through a desktop or documentary analysis across five organisations in South Africa on sustainable best e-waste practices.
- To analyse the qualitative data obtained from the desktop study.
- To draw conclusions and make recommendations to stakeholders regarding sustainable best e-waste practices.

1.4 RESEARCH QUESTIONS

- What are regarded as best practices in e-waste management?
- How can sustainable practices assist/contribute to the electronic waste management system in South African organisations?
- What are the impacts of improper disposal of electronic waste by South African organisations?

- What are the key hinderances for South African organisations in adopting best sustainable practices regarding electronic waste management?

1.5 SIGNIFICANCE OF STUDY

The primary goal of this study is to look into sustainable best practices for electronic waste management in South African organisations, and the findings are intended to contribute to the limited academic literature on best practices for e-waste management in the South African context, as well as recommendations for ways to educate different stakeholders about the environmental consequences of improper e-waste disposal. The findings could be critical in developing educational campaigns, informed policies, and intervention techniques that promote sustainable waste management practices, thereby contributing to environmental preservation and improved public health.

1.6 STRUCTURE OF THE RESEARCH

This study has been divided into five (5) chapters as described below

- **Chapter One**: An overview and background of the electronic waste management study have been highlighted, along with a statement of the problem, research objectives, and research questions. This chapter also contains the study's significance, conceptual definitions, the structure to be followed and a summary concludes this chapter.
- **Chapter Two**: A literature review will be conducted, where clarification of concepts will be considered, historical overview of e-waste management will be discussed, theories related to e-waste management, the hierarchy of waste management and circular economy, and the general nature of e-waste management will also be explored.
- **Chapter Three**: An outline of the research methodology will be presented, detailing the research paradigm, approach, population, sampling, and data collection methods, as well as ethics.
- **Chapter Four**: An analysis of empirical findings revealing the research results will be provided.
- **Chapter Five**: The study will conclude with a summary and evaluation of the objectives to draw up conclusions, as well as the present recommendations.

1.7 SUMMARY

This chapter of the study aimed to identify best practices for e-waste management in South Africa by addressing the common gap in the country's context. The study will review academic literature, sustainability documents, and reports to identify effective e-waste management practices, current trends, and factors challenging proper e-waste management in organisations. South Africa generates an estimated 6.2 kg of e-waste per person each year, but its recycling rate is only 12%. Despite the National Environmental Management Act and Extended Producer Responsibility regulations, compliance among South African organisations remains weak, causing environmental and health risks.

The study aims to benchmark South African corporate sustainability participation to contribute to a more cohesive national response to e-waste concerns. The research will identify five South African organisations that implement sustainable e-waste management strategies, ascertain the degree of e-waste management awareness, provide guidelines to organisations, and determine the extent to which South African organisations implement these best practices.

Having established the research context, objectives and key concepts in Chapter 1, the following chapter aims to examine the historical overview of e-waste management as well as legislative frameworks, theories related, the hierarchy of waste management, trends and the nature of e-waste management, mostly concentrating on South Africa's unique difficulties and gaps.

CHAPTER TWO
LITERATURE OVERVIEW

2.1 INTRODUCTION

According to Snyder (2019), a literature review is a methodical and critical examination of scholarly articles and other sources that are pertinent to a certain area of study. Finding trends, gaps, and contradictions in the body of information through analysis, synthesis, and evaluation helps direct future research initiatives.

This section will give a critical evaluation of the scholarly literature that has been written. In this review of the literature, important research on electronic waste management will be summarised, and theoretical viewpoints on practical e-waste management techniques will be assessed. Further exploration will be given to the definitions, history, philosophies, hierarchy, and nature of e-waste management.

2.2 DEFINITIONS AND CLARIFICATION OF KEY CONCEPTS

2.2.1 E-Waste and E-Waste Management

There is a thin line between e-waste and e-waste management. As previously mentioned, e-waste is the process of disposing electrical and electronic equipment such as computers, phones, appliances, etc. and according to Zwane and Schoeman (2025), e-waste management is the process of collecting, transporting, recycling, refurbishing, and properly disposing of e-waste in an environmentally friendly and legally acceptable manner. E-waste is made up of components such as, but not limited to, rare metals, iron, gold, silver, and other metals of considerable economic importance that can be recycled (Soesanto *et al.*, 2023). Careless discarding of these composites contributes to great environmental harm; thus, to put an end to this, sustainable practices need to be incorporated into business practices.

2.2.2 Sustainability

Sustainability and e-waste management are closely intertwined, as improper handling of electronic waste pulls down the efforts of sustainability. Thompson et al. (2017) define sustainable business practices as techniques that organisations use to meet the demands of the current generation without jeopardising their ability to meet the needs of future generations. These techniques revolve upon reducing waste output, finding new applications for resources, and recycling back into the economy to achieve a balance between the environment, society,

and economics. Sustainability is not only the responsibility of the government or environmentally conscious organisations, but it is everyone's responsibility to ensure that they practice sustainable activities daily, and it could essentially aid in achieving the Sustainable Development Goals (SDGs) and promoting a circular economy (Garg *et al.*, 2023).

2.2.3 Extended Producer Responsibility

One of the most common sustainable policy approaches is the Extended Producer Responsibility (EPR), which requires producers to be accountable for their products throughout their entire lifecycle, including the post-consumer stage. Hammoud, Massoud, Chalak, and Abiad (2025) maintain that the policy encourages organisations to improve their waste recycling processes and promote environmental concerns in electronic productions, thereby increasing management accountability and reducing environmental impact. EPR is key to a circular economy as it emphasises the gathering and processing of end-of-life products to allow recycling, reuse, repair, and remanufacturing. It is also as critical to a circular economy as it focusses on the collection and processing of end-of-life products to enable recycling, reuse, repair, and remanufacturing.

2.2.4 Circular Economy

A circular economy is an economic system in which when a product is produced, it is then recycled/turned into a valuable resource for the creation of something new. There are three design-driven principles that serve as the foundation of the circular economy, namely, cut back on waste to reduce pollution, circulate goods and supplies at their highest value, and finally, restore to nature (Garg *et al.*, 2023). It helps reduce environmental harm and resource wastage while enhancing efficiency throughout every phase of the product lifecycle.

2.3 HISTORY AND LEGAL IMPLICATIONS OF E-WASTE MANAGEMENT

Comilla (2024) states that the history of electronic waste disposal dates to the mid-eighties, when there were a series of occurrences that directly led to the legalisation of the dumping of e-waste. These incidents since then have resulted in these regulations binding to date and influencing many intergovernmental organisations such as the United Environment Program, World Bank, and World Customs Organisation, as well as regional bodies such as the European Union (EU), to have developed legal and policy frameworks that are relevant to e-waste (Serpe *et al.*, 2024). A practical example would be the introduction of the Extended Producer

Responsibility (EPR) by the European Union's Waste Electrical and Electronic Equipment (WEEE) Directive of 2003.

Legally, the Basel Convention of 1988 was one of the first international measures implemented by the United Nations (UN) to curb the export of harmful waste, including e-waste (Patil and Ramakrishna, 2020). This Convention had 186 countries sign the "Transboundary Movements of Hazardous Wastes and Their Disposal" treaty, which was meant to protect the environment by banning more especially developed countries from importing and exporting hazardous waste to developing countries.

E-waste legislation in Africa is significantly slacking, mostly due to the continent's countries being economically underdeveloped and having inefficient law enforcement, which has led to most developed countries in America, Europe, and China seeing the continent as a dumping site for their electronic waste. The Bamako Convention, in response to the failures of the Basel Convention, was entered into in 1998 by African countries to regulate the export of hazardous waste to African countries, and despite the existence of such efforts, most of the African countries remain with ineffective e-waste management and recycling systems (Serpe *et al.*, 2024).

The entrenchment of Section 24 of the Constitution of the Republic of South Africa and the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) into the South African operations signifies the country's progressive steps of having a legal instrument to address the disposal of electronic waste. There are various local policies and strategies as well that have been put in place for waste management, including e-waste management, and these include but are not limited to the following: National Waste Management Strategy (NWMS), National Policy Development Framework, National Development Plan: Vision 2030 (NDP), Waste Picker Integration Guideline for South Africa, and many more (Department of Forestry Fisheries and the Environment, 2024).

2.4 THEORIES RELATED TO E-WASTE MANAGEMENT

Several theories and frameworks underpin e-waste management, assisting policymakers, corporations, and researchers in better understanding and improving recycling, disposal, and sustainability practices. The key theories of e-waste management are as follows:

2.4.1 Stakeholder Theory

Nnadi and Mutyaba (2023) explain the stakeholder theory as a concept that explains how businesses should create value and consider the interests of not just shareholders but all other groups of individuals or organisations that can influence or are influenced by the business' operations, and these other groups include employees, customers, suppliers, government, communities, and the environment. Guo and Chen (2022) categorise stakeholders into primary and secondary stakeholders, definitive, expectant, and latent, as well as core and peripheral stakeholders. To identify and assess stakeholders, factors such as interest and influence, urgency, legitimacy, and influence, as well as methods of involvement-influence mapping and social network analysis should be explored (Guo and Chen, 2022).

As the stakeholder theory adds other stakeholders such as the broader community, local and/or national economy, governmental and non-governmental organisations, and all other groups or individuals affected by the organization's operations, the broader view of this theory is orientated towards the social responsibility of organisations (Botha et al., 2016). The theory can also be used to assess the behaviours of stakeholders involved in waste management.

2.4.2 The Game Theory

Palafox-Alcantar, Hunt and Rogers (2020) interpreted game theory as a mathematical tool used to study cooperation and conflict in interactive decision-making processes between intelligent and rational stakeholders. However, most players have limited rationality, leading to barriers to cooperation, but the game theory can improve understanding of stakeholder relationships by demonstrating interactions between shareholders, predicting negotiation outcomes, and improving stakeholder relationships.

According to Yang, Zhong and Ding (2025), the game theory provides an important framework for recycling research, allowing for the simulation of strategy dissemination and evolution within populations. It explains adaptive changes in individual behavior and predicts long-term dynamic equilibrium. Scholars use this strategy to address complicated recycling interaction difficulties, discover critical aspects for sustainable waste management, and improve resource recovery efficiency. Optimizing stakeholder cooperation tactics can also help with policy design. The rational aspect is the focus of game theory, which considers the interests of each player.

2.4.3 Theory of Planned Behaviour

According to Ahmed and Rashid (2025) the theory of planned behaviour (TPB) is a well-known framework for understanding and forecasting human behaviour, particularly environmentally conscious behaviour. It implies that for a person to engage in a certain action, it is formed by three factors: attitudes towards the behaviour, subjective norms, and perceived behavioural control. Li, Jin, Liu, Li, and Wang (2020) concur by stating that the TPB analyses psychological factors, which include attitude variables such as instrumental and experimental attitudes, environmental awareness, recycling attitudes, moral obligations, and consequence perception.

This theory can be adopted for explaining the intention and behaviour underlying e-waste management as it has been applied to diverse research areas such as intention to use renewable energy, electric cars, microplastics in beauty products, bottled water usage, life jacket usage, recycling habits, and environmentally friendly behaviours in the workplace (Ahmed and Rashid, 2025). There are three key components of this theory combined that form a desired behavioural intention, which will then lead to actual behaviour.

2.4.4 Behavioral Reasoning Theory

The Behavioural Reasoning Theory (BRT) is different and extends the theory of planned behaviour (TPB) as it is a theoretical framework that explores the relative importance of both the reasons for and the reasons against the intentions of accepting any innovation (Sahu, Padhy and Dhir, 2020). It is thus important to consider it, as it helps understand, and explains why people or organisations could choose to adopt or resist certain behaviours. According to Dhir, et al., (2021) when BRT is compared to other theories, it provides a more comprehensive account of behaviour by including context-specific arguments that assist people in justifying their actions. Sahu et al. (2020) state that the theory has four main components that are intricately linked, namely, behavioural intentions, attitude, reasons (both for and against), and values.

Values are seen as attitude accelerators because they encourage desirable behaviours such as e-waste recycling. Furthermore, values have an influence on reasons both for and against, and these reasons function as facilitators or barriers to forecasting attitude, thus reasoning helps people justify or defend their conduct (Yadav et al., 2022). As BRT offers insights into consumer resistance and motivation in sustainable activities, it could help authorities and organisations in e-waste management in developing sustainable goals like streamlining recycling logistics, offering financial incentives, and conducting awareness campaigns to

increase recycling rates. Which all are crucial for sustainable development frameworks and promoting a circular economy (Dhir *et al.*, 2021).

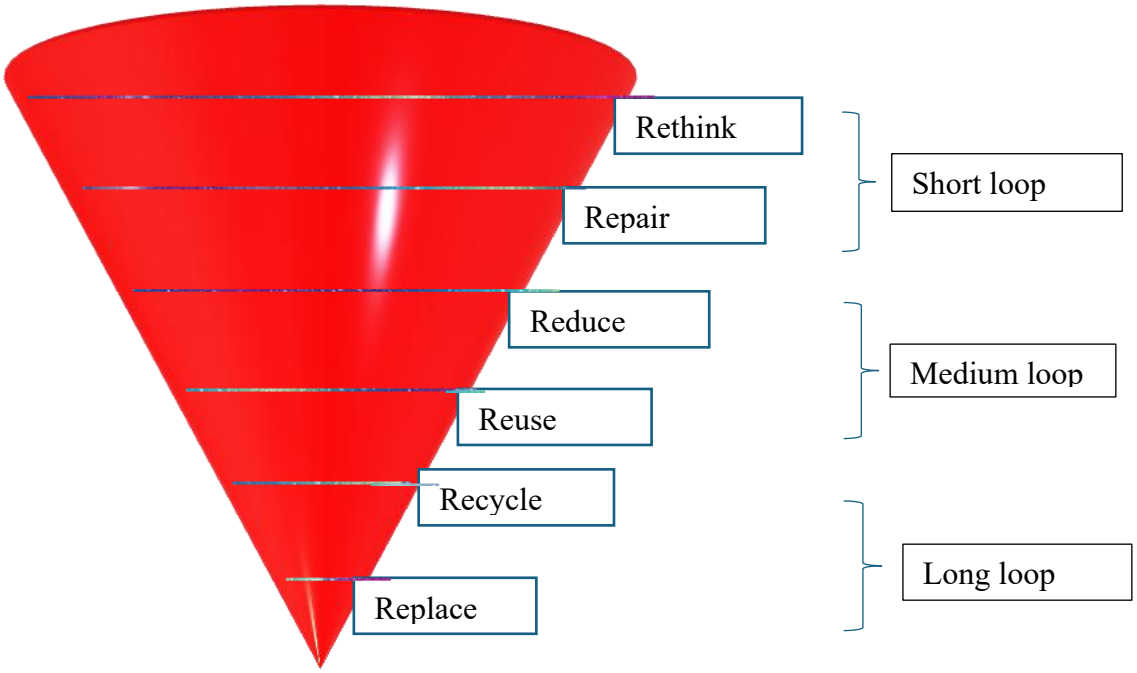
2.5 HIERARCHY OF WASTE MANAGEMENT AND CIRCULAR ECONOMY

The waste hierarchy is a concept that reflects a systematic technique of managing waste according to what is best for the environment by prioritising waste reduction, recycling, and reuse, and it has been in existence for over 40 years, founded in the United States of America by a private firm (Pires and Martinho, 2019). Meshram (2024a) identifies the 6Rs framework as a management concept that emphasises the need to minimize waste and protect the environment, offering a synergistic approach to reduce landfill waste and increase recycling efforts, leading to sustainable waste management practices and incorporates the elements (rethink, repair, reduce, reuse, recycle, and replace).

When correctly implemented, it leads to waste reduction, community engagement, and educational benefits. It also helps mitigate climate change by conserving energy and resources, reduce carbon intensive materials and it also promotes sustainability and a circular economy (Fisher, 2024). This infographic contrasts the principles of a circular economy with those of a linear economy, illustrating how sustainable design, responsible consumption, and resource recovery can mitigate environmental pollution and promote long-term value retention.

To support sustainable e-waste management, organisations should adopt the 6Rs, illustrated below, which includes the elements rethink, repair, reduce, reuse, recycle, and replace. These actions represent different levels of intervention: the short loop, focuses on immediate behavioural and technical changes, the medium loop is aimed at minimising consumption and extending product use and the long loop involves external processes to recover and restore value. Applying this framework helps organisations shift from reactive disposal to proactive sustainability, aligning operations with circular economy principles and environmental compliance. The following diagram illustrates this 6Rs strategic road map to aid material sustainability and circularity.

Figure 2.1: The 6Rs of Sustainability and Circularity



Source: Meshram (2024).

A circular economy (CE) is a sustainable approach that reduces material extraction, promotes resource and energy conservation (rethink, repair, reduce, reuse, recycle and replace), and encourages input source regeneration (Prasad, Vithanage and Borthakur, 2020). This economy embraces waste as a primary resource and is inclusive of the environment, society, governments, businesses, and academics, encouraging resilient business models and diverse forms of value capture (Palafox-Alcantar et al, 2020). It is also known as the closed loop economy as it is a system where resources and materials are kept in use for as long as possible.

Alka, Raman and Suresh (2024) reiterate that the major principles of the circular economy are the collaboration between firms and other organisations, experimentation in trial-and-error processing, and phantomization of interaction. Thus, that the lack of a shared mutual understanding between stakeholders could lead to a deadlock for the circular economy.

Understanding consumer behaviour is another critical principle to consider in the developments of a successful intervention for the circular economy to promote sustainable consumption. It is because consumers' active participation in activities such as recycling, product reuse, and repair will determine the effectiveness of this economy. Therefore, empowering consumers with information and incentives is critical for increasing engagement in circular processes (Wilson-Oshilim and Efedhoma, 2025).

Wilson-Oshilim and Efedhoma (2025) further elaborate that consumer engagement is vital in circular economy practices. This includes behaviours that support the circular economy, such as buying second-hand items, participating in sharing economies, and participating in product take-back programs. Factors influencing consumer engagement include environmental awareness, economic incentives like cost savings from second-hand purchases, and social norms and peer influence. However, the success of circular practices depends on accessible infrastructure, clear communication of the advantages of a circular economy, and alignment with consumer values.

The circular economy presents a vast number of benefits, as Kumar, Sezersan, Garza-Reyes and AL-Shboul (2019) highlighted that in the manufacturing industry it encourages stakeholder collaboration, improves business-customer alignment, and raising public awareness of public needs and expectations. A circular economy also creates more job opportunities for the local communities while creating more awareness amongst these communities as they are involved in the sustainable development practices in larger volumes.

Salmenperä et al., (2021) identified the following as barriers to the success of a circular economy:

- Economic and market-related issues such as high investment costs
- Market uncertainty
- Technological and infrastructure issues for example lack of information, lack of advanced technologies and systems
- Institutional and regulatory issues such as weak or complex legislation, taxation and subsidies
- Sociocultural factors such lack of awareness, business cultures and values as well as norms.

The waste hierarchy and circular economy should thus work together to achieve sustainability by minimising waste, saving resources, and lessening environmental impact.

2.6 NATURE OF E-WASTE MANAGEMENT

2.6.1 Key components of e-waste management

Kaushik and Herat (2020) identify various components in e-waste management, highlighting e-waste collection, sorting and segregation as a process of collecting and separating different

types of electronic waste into distinct categories based on their composition and characteristics, which constitutes as the initial and most crucial parts in e-waste management. This assesses the volume of e-waste that can be recovered prior to entering informal recycling channels. In South Africa, despite an established recycling industry with collection rates for tin-plate steel cans and paper at 63% and 52% respectively, only 11% of e-waste is collected. This indicates that most obsolete electronics are stored and never enter the waste stream, leading to poor formal collection rates and potential environmental consequences, including illegal processing (Ichikowitz and Hattingh, 2020).

Disposal is a huge player in e-waste management as it helps determine the complexity of the waste hierarchy stream (Sofian *et al.*, 2023). In the context of e-waste management, disposal is the discarding of electronic devices and there are namely two types, formal and informal disposal. Formal disposal ensures safe and minimal environmental harm of e-waste management whereas informal disposal of e-waste has negative impacts that lead to hazards risk such as the contamination of the food chain because the accumulation of toxins resulting from e-waste in agricultural lands can be consumed by the livestock (Attia, Soori and Ghaith, 2021).

Prasad, Vithanage and Borthakur (2020) identifies recycling, landfill disposal, biological treatment and advanced methods as the four main strategies that can be implemented for treating electronic waste. According to the Multi Criteria Analysis (MCA) and Applications of Life Cycle Assessment (ALCA), the best way of disposing e-waste is through recycling (Siddiqi *et al.*, 2020). The recycling of e-waste is a process to recover valuable materials in the most cautious manner to minimize environmental harm (Lok Wu, 2023). Mouton and Roux (2024) state that disposal in landfills involves burying e-waste in designated waste disposal sites by consumers and collection by informal recyclers, and it is the most widely applied methods of e-waste disposal in developing economies such as South Africa.

According to Prasad, Vithanage and Borthakur (2020), bio-metallurgy is the biological process of converting metals from ores, concentrates, and waste into soluble salts using microorganisms. Bioleaching and biosorption are two types of metal-microbe interactions. High-pressure compaction, cement solidification, thermal treatment, organic dissolution, simple acid leaching, plasma-coupled acid leaching, and substrate oxidation are among the advanced e-waste treatment technologies. These methods are environmentally friendly; however, these methods may not achieve great resource recovery rates and performance.

This diagram below illustrates the waste management system. This method, which is often referred to as waste disposal, involves organisations putting thorough plans into place to effectively manage wastes from the point of origin to the point of disposal and is illustrated as follows:

Figure 2.2: Sustainable Waste Management Life Cycle.

Source: (Khan, 2025)

The irreversible removal of data from electronic devices whilst ensuring that the information becomes completely inaccessible prior to recycling or disposal is referred to as data destruction (Bigelow and Hefner, 2024). According to Oise (2023) incorporating data destruction is essential in e-waste management, as it safeguards user privacy, mitigates potential legal risks, and supports the safe processing of obsolete electronics. Moreover, services such as certified data destruction and hardware shredding not only strengthen data protection but also provide cost-efficient strategies that can generate additional revenue opportunities within the e-waste industry (Quinto *et al.*, 2025).

2.6.2 E-waste recycling processes

According to Romuno (2021), the e-waste recycling process involves the following five steps:

- Collection: Electronic waste is gathered through designated channels such as recycling bins, drop-off programs, or collection centres.
- Storage: Once collected, the e-waste is safely stored until it is ready for further processing.

- Sorting, Dismantling, and Shredding: In this stage, devices are manually or mechanically sorted, components are dismantled, and the waste is shredded. Special items and valuable materials—like precious metals or batteries—are separated out for special handling.
- Mechanical Separation: Advanced technologies are used to separate materials based on size, weight, and magnetic or optical properties. This allows for efficient sorting of plastics, metals, and circuit materials.
- Material Recovery: Finally, the separated materials are cleaned, refined, and prepared for reuse in manufacturing new products. This step plays a crucial role in promoting a circular economy by reducing the need for virgin resources.

Weick and Ray (2023) indicate that merely 17.4% of the global e-waste produced has been collected and recycled through formal channels, resulting in 82.6% of e-waste remaining unaccounted for. This indicates that most of the e-waste, especially in Asian and African nations, is handled by the informal sector. The global norms of developed countries treating Africa as a dumping site of e-waste management, as well as the presence of appealing precious metals and materials in e-waste, iron, has most resulted informal recycling, as it is viewed as an easily accessible source of economy among local scrap dealers, dismantlers, and recyclers (Ahirwar and Tripathi, 2021; Quinto *et al.*, 2025).

2.6.3 Goals of e-waste management

One of the key goals of e-waste management is to minimise the environmental damage caused by electronic waste. E-waste management closely relates to most of the Sustainability Development Goals (SDGs) such as decent work and economic growth (SDG 8), good health and well-being (SDG 3), clean water and sanitation (SDG 6) and life below water (SDG 14) (Forti et al., 2020). These highlights how proper e-waste management aligns with SDGs to a greater extent.

The 17 Sustainable Development Goals (SDGs) are a global roadmap for building a better and more sustainable future for everybody and are shown in the figure below. Every objective has its own icon and colour, signifying important global issues including equality, poverty, health, education, and climate action.

As previously discussed, e-waste management strives to endorse the conservation of resources through a circular economy whereby valuable materials during recycling are extracted and

recovered for reuse, reducing the need for continual mining of raw materials (Kumar et al., 2025). E-waste management also seeks to create public awareness about the importance of responsible handling and disposal of obsolete electronic equipment (Zunguka, 2025).

Figure 2.3: Social Development Goals

Source: SolarAid (2025)

2.6.4 Types of e-waste best practices

Sheoran and Das Gupta (2024) discussed international best practices for e-waste management and identified the most effective practices that were adopted by certain countries. Regulation of e-waste management is one of the practices that were identified to have been adopted by Germany. The country implemented obligations to be followed by manufacturers, disposers, owners, municipalities and e-waste handlers. This regulatory system was found to be effective as it helps increase proper e-waste handling and management, which resulted in the protection of the environment. Regulation of the e-waste management system also helps to conserve resources, encourage recycling practices, and producer accountability.

Providing information raises awareness among many individuals by addressing the dangers of e-waste management and the options available for e-waste recycling (Ichikowitz and Hattingh, 2020). Sheoran and Das Gupta (2024) further outline that in Italy, producers are responsible for giving consumers information on how to dispose of their old electronic and electronic equipment (EEE) because they too are also equipped with the exact processing of e-waste by the recyclers.

2.6.5 Benefits of effective e-waste management system

E-waste is not only a source of toxic substances, but it is also a significant, valuable economic allocator for the recycling sector. Baldé et al. (2024) elaborated that in 2022, global e-waste contained 31 billion kg of metals, with 19 billion kg recoverable, with iron being the most successfully recovered, followed by zinc and lead. Precious metals were present in low concentration but projected to have a viable recovery of 300,000 kg. This shows that proper recycling of e-waste is economically beneficial as valuable materials are recoverable, lowers consumption and use of primary raw materials and enhances the circular economy (Attia, Soori and Ghaith, 2021).

Furthermore, the electronic equipment in e-waste contains valuable metals such as gold, silver, and platinum, base metals such as copper, zinc, and nickel, and rare earth minerals such as cerium, neodymium, and yttrium. These resources are useful for both industries and recycling organisations, generating more cash for the country's economy, because the concentration of these precious metals and materials is significantly more and better than mining from ores (Shahabuddin *et al.*, 2023).

Formal e-waste management reduces exposure to harmful substances, which enhances public health. Unlike informal recycling sites where toxic contamination is uncontrolled and widespread, properly regulated facilities under regulation safeguard nearby communities and employees from hazardous chemical exposure (Ádám *et al.*, 2021). The authors further state that these mechanisms also limit exposure to neurotoxic chemicals like lead and PAHs, preventing developmental damage in children and foetuses. Formal recycling also follows workplace safety regulations, doing away with dangerous manual labour in unofficial activities and enacting organised e-waste management offers long-term defence against environmental pollutants and lessens health inequalities

Environmental protection is one of the significant benefits of effective e-waste management systems. According to Rautela, Arya, Vishwakarma, Lee, Kim and Kumar (2021), proper effective e-waste management prevents dangerous contaminants like lead, mercury, and brominated flame retardants from contaminating the air, land, and water. Furthermore, formal systems preserve biodiversity and the quality of agricultural soil by reducing the discharge of heavy metals and persistent organic pollutants (POPs) into ecosystems. High-efficiency emission control technologies found in state-of-the-art facilities like Belgium's Umicore greatly lower air pollutants while recycling.

2.6.6 E-waste major impacts

The organisation eWASA (2025) identifies two major impacts of e-waste, firstly e-waste is bad for the environment and secondly human health. It drains non-renewable resources, leaks toxic chemicals into nature that later result in lead poising, mercury which can later cause permanent lung damage to one is respiratory.

According to Attia, Soori and Ghaith (2021) dumping e-waste in landfills e-waste has a negative influence on the environment. Computer waste's contaminated leachates pollute groundwater, and melting computer chips releases acids and sludge, which causes soil acidification, which harms both local ecosystems and communities. Quinto et al. (2025) further states that wildlife that consumes these contaminated plants may have internal health issues or even die from the consumption of these toxins. Scavenging animals lured to e-waste in landfills and dumpsters stand a greater risk of exposure to these dangerous compounds. E-waste contamination can destabilize the entire ecosystems, thereby lowering biodiversity and the extinction of certain species.

The second major impact of e-waste is on human health. Forti et al. (2020) attributed that people, including children living, working, and playing in informal e-waste recycling sites are at risk of being exposed to health concerns by inhaling these hazardous gases and particulate matter, through skin contact with these toxins, and eating contaminated food and water. Furthermore, vulnerable populations, including pregnant women, new-borns, and toddlers, are particularly sensitive to e-waste pollutants, which could result in obesity, asthma, and neurodevelopmental disorders. Improper e-waste disposal has also been linked to negative pregnancy outcomes (stillbirth, early birth, and low birth weight), lower lung capacity, stunted growth, and impaired cognitive development (Quinto *et al.*, 2025).

2.6.7 Challenges of e-waste management

One of the major issues of e-waste management is the absence of e-waste laws mostly in developing countries. Shahabuddin et al. (2023) indicated that the lack of e-waste legislation is a significant challenge, more especially in developing countries lacking such legislation. In 2019, 78 countries had e-waste legislation, only covering 71% of the global population. The insufficient regulations and enforcement contribute to increased illegal dumping and informal recycling, thus hindering the progress of sustainable practices.

Many countries across both developed and developing economies lack formal e-waste recycling facilities, leading to informal disposal methods, which then lead to pollution and material loss (Sheoran and Das Gupta, 2024). These facilities include collection infrastructure, sorting and pre-processing facilities such dismantling units, bins and extraction systems, hazardous waste treatment units and refurbishment and reuse centres.

Quinto et al. (2025) highlighted that e-waste management is expensive and requires significant investment to conduct large scale recycling, these include labour costs, advanced technologies and compliance costs associated with recycling. This challenge then later leads organisations and individuals involved in e-waste management resorting to cheaper, unsafe disposal methods. Collective and joint investment in recycling facilities can enhance infrastructure development and it could also reduce individual costs (Leclerc and Badami, 2020).

According to Butcon, Fortun, Mora-Garcia, Cotoron and Apdohan (2025) consumer awareness is one of the most significant issues in e-waste management. Ichikowitz and Hattingh (2020) discovered that South African consumers, to be precise in Gauteng, generally lack awareness about recycling e-waste and exhibit few pro-recycling behaviours due to inadequate infrastructure and collection methods. Additionally, scrap dealers, manufacturers, and individuals involved in the repair of the obsolete gadgets also lack knowledge about EPR, cost of e-waste, and potential risks they could be exposed to (Arya and Kumar, 2020). This significantly shows that most consumers are still unaware of the proper ways of getting rid of e-waste, thus increasing waste stockpile and improper disposal.

2.6.8 Current trends in e-waste

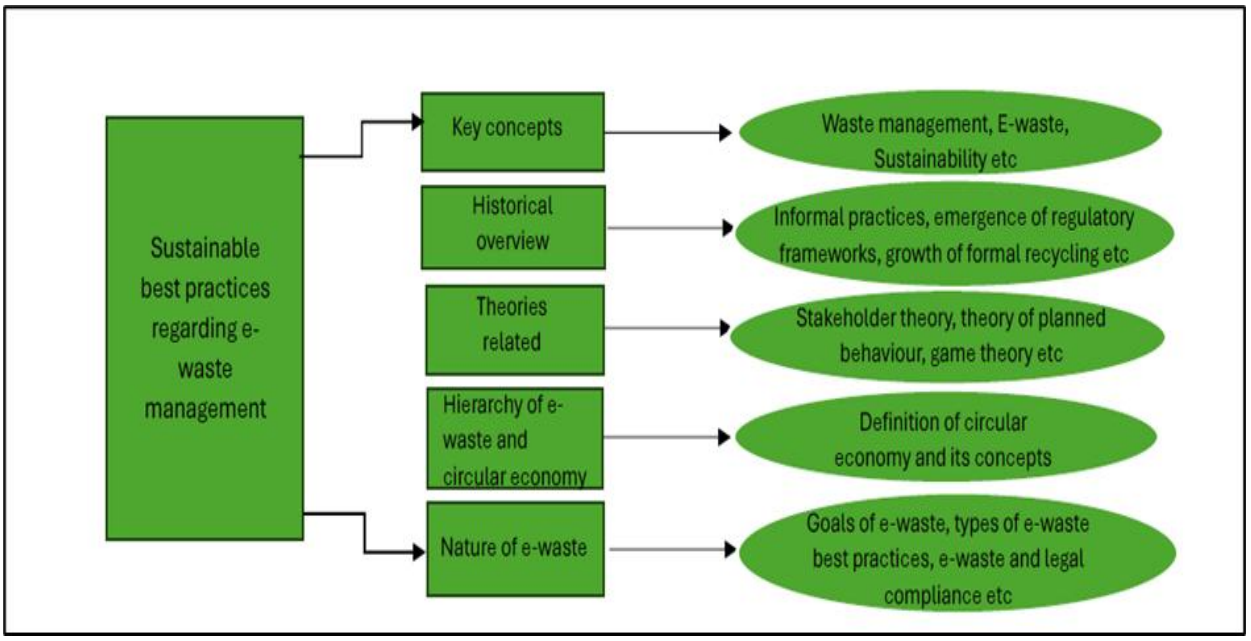
Informal recycling is becoming a trend around the world as a lot of open burning of insulated copper wires to recover copper, cyanide and acid baths of printed circuit boards (PCBs) to recover gold are being witnessed and these activities that are hazardous to the environment and human health (Hieronymi, Kahhat and William, 2012). The authors further state that the main reason for this trend is society's realisation of the market value of certain elements found in electronics such as gold. copper and steel.

Arya and Kumar (2020) indicate the legal trends in India which emphasise circular economy principles by emphasizing reuse, recycling and recovery, pushing for better eco-product design, right-to-repair laws i.e., EPR, Public-Private Partnerships (PPP) promoted to enhance infrastructure and efficiency and initiatives to develop value-added outputs from e-waste.

2.7 THEORETICAL FRAMEWORK OF THE STUDY

The theoretical framework summarizing the literature review is presented in Figure 2.4. It visually integrates the main components that were explored in this chapter: the clarification of key concepts, the historical and legal evolution of e-waste management, foundational theories, the waste hierarchy and circular economy, and the nature of current e-waste practices.

Figure 2.4: Theoretical framework summarising the literature review



Source: Researcher's Own Construction.

2. 8 SUMMARY

E-waste management is a complex process that involves collecting, transporting, recycling, refurbishing, and disposing of electronic equipment in an environmentally friendly and legally acceptable manner. It is crucial to integrate sustainable practices into business practices to reduce waste output and achieve a balance between the environment, society, and economics. E-waste management is influenced by various theories and frameworks, such as stakeholder theory, game theory, and behavioral reasoning theory. It aims to minimize environmental damage, align with the Sustainability Development Goals, and promote a circular economy by recovering valuable materials for reuse. However, challenges like lack of legislation, consumer awareness, and legal trends need to be addressed to ensure sustainable practices and proper disposal of e-waste.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

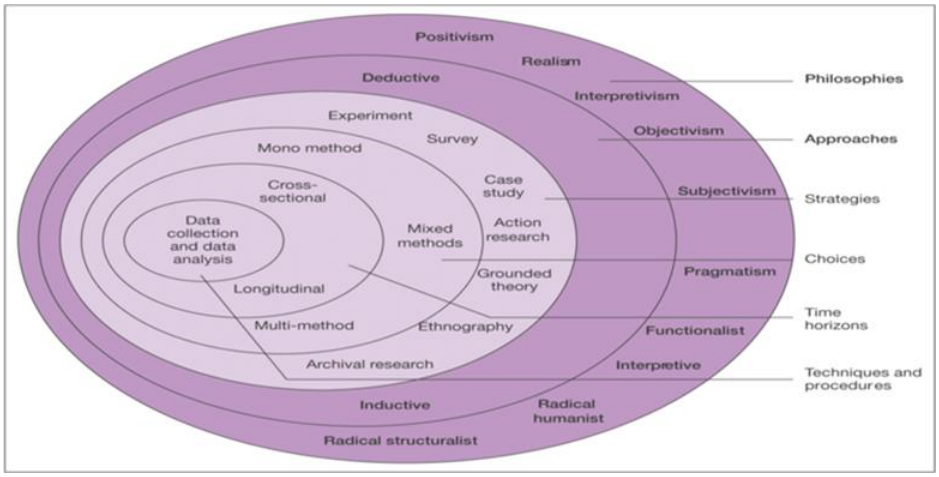
3.1 INTRODUCTION

Leavy (2022), defines the research design as a process of building a structure or a plan, for a research project and it articulates the data required, whereas on the other hand research methodology is the scientific study of research methods, examining their limitations, resources, and potential, aiming to understand the development of scientific questions and their implications (Swarooprani, 2022). This chapter will outline the research design and methodology elements to be followed in this study to identify sustainable best practices in e-waste management in South African organisations.

3.2 RESEARCH ONION: THE METHODOLOGICAL FRAMEWORK

The following graphic offers a structured and layered depiction of the research methodology landscape; it is referred to as the "research onion" because to its concentric shape. A key decision point in the process is represented by each ring, which guides researchers from intellectual foundations to actual execution.

Figure 3.1: The Research Onion



Source: Saunders, Lewis and Thornhill (2019).

Gamage (2025) offers a concise explanation of the "layers/peels" of the research onion and identifies the following research paradigms as comprising the outermost layer: positivism, interpretivism, realism, radical humanism, and radical structuralism. These are among the philosophies that impact researchers' perceptions of reality. In the approaches layer, there is a distinctive comparison between deductive reasoning, which evaluates pre-existing theories,

and inductive reasoning, which generates new theories and hypotheses based on empirical facts (Paré *et al.*, 2025). Various research methods, such as surveys, action research, grounded theory, ethnography, archival research, experiments, and case studies, are described in the strategies layer. These methods offer unique ways to problem-solving. The methodological mix options layer refers to the use of a single method, a combination of qualitative and quantitative methods, or many methods within the same paradigm.

The time horizons layer distinguishes between longitudinal studies, which track changes over time, and cross-sectional research, which collect data at one particular point in time. Fundamentally, techniques and procedures cover the practical parts of research, such as gathering and analysing data. These concentric layers work together to give researchers a thorough road map for coordinating their philosophical position with methodological rigor, guaranteeing coherence and clarity all the way through the research process (Thomas, 2023). This study will thus utilise the 'research onion' to systematically structure the research and formulate a design in accordance with the many layers of the onion, as outlined above.

3.3. RESEARCH PARADIGM

According to Ulz (2023) a research paradigm is “the framework into which the theories and practices of your discipline fit to create the research plan. This foundation guides all areas of your research plan, including the aim of the study, research question, instruments or measurements used, and analysis methods.” Ebohon, Ajayi and Ganiyu (2021) identify four common research paradigms namely:

- Positivism which believes that there is only a single method to establish the truth and objective reality.
- Interpretivism/constructivism which states that reality cannot be objectively observed from outside, rather needs to be observed from within through direct experience of people.
- Realism is the third paradigm, which relies on the idea of independence of reality from the human mind.
- Lastly the pragmatism paradigm which believes that knowledge can never be truly representative of reality.

This study employs the interpretivism/constructivism paradigm to comprehend the subjective experiences, perspectives, and practices of organisations that participate in electronic waste

management within South African organisations. Unlike positivism, which assumes a single objective reality, interpretivism understands that reality is socially created and best understood through the meaning's organisations attribute to their actions and surroundings. As this study focusses on how organisations perceive, engage with, and respond to e-waste concerns, a thorough, context-sensitive methodology is required. The interpretivist paradigm enables researchers to collect rich, qualitative data through a desktop analysis, allowing for a better understanding of the social, cultural, and institutional aspects that influence sustainable e-waste practices.

3.4 RESEARCH APPROACH

Ulz (2023), states that there are five major approaches to research: quantitative, qualitative, mixed methods of research, arts-based research and community-based participatory research (CBPR). Abuhamda and Bsharat (2021), compared the two commonly known techniques qualitative and quantitative research approaches, and highlighted that qualitative research aims to explore, understand and interpret social interactions, meanings and phenomena whereas quantitative seeks to test for hypotheses to determine the cause-and-effect relationships. This study aims to make use of qualitative research to describe accurate information and conclusions about data that will be gathered and analysed regarding the five organisation's best practices regarding e-waste. Qualitative approach helps collect rich data with descriptions (Leavy, 2022). Descriptive research will also be explored, and this form of research basically means explaining what has happened and what are the incidents (Swarooprani, 2022). The study will describe the best practices regarding e-waste management among the five selected organisations based on a desktop analysis.

3.5 RESEARCH STRATEGY AND METHODOLOGICAL CHOICE

Depending on the nature and complexity of the study, various research methods may be used. Mutsvairo (2018) describes a mono-method approach as a single data collection technique, which could make use of qualitative or quantitative, rather than combining both. Mixed-methods research, blend qualitative and quantitative procedures to gain a fuller understanding of the research problem. Qualitative approaches study meaning and experiences using instruments like interviews and observations, whereas quantitative methods test hypotheses and measure variables using numerical data and statistical analysis (Creswell and Inoue, 2025). Finally, multi-method research, which employs multiple approaches within the same paradigm,

such as conducting interviews and focus groups on a qualitative study, can also be used. Each approach has its unique advantages and is chosen depending on the research paradigm, aims, and type of data required to properly answer the research questions.

A mono-method – which is a single data collection will be used in this study, through desk research. Desk research is also commonly known as secondary research and it involves gathering information and data from existing research that has been conducted by other authors before for example books, journal articles, websites, reports and many others (Kiely, 2024). For this study, most searches will be conducted mostly on Google Scholar, Nelson Mandela University library tools such as Sabinet and EBSCO, ProQuest, ResearchGate, Academia.edu, and Google searches on sustainability and e-waste management databases.

3.6 POPULATION AND SAMPLING

According to Moyo, Lubbe and Ohei (2023), a population is any group of entities that have certain things in common, and sampling is a method which reduces the total population for the project to a number that is practically realistic and theoretical. The population of this study is all organisations in South Africa that engage in e-waste management practices and have publicly available policies and practices on the web, annual and sustainable reports. The sample for this study is five South African organisations that already have e-waste management practices in their operations, and these are namely South Group Recycling, ATS Recycling, ERA, eWaste Africa, and Circular Energy.

These organisations were chosen based on a non-probability sampling, specifically convenience sampling, which selects participants based on their accessibility, relevance to the research topic, and willingness to participate. This method is suited for qualitative research within the interpretivist paradigm, where the goal is to gather in-depth insights from information-rich examples rather than generalizing results to a larger population. Purposive sampling, which selects participants based on certain attributes or expertise, and snowball sampling, in which initial participants recommend others with comparable experience, were also possibilities to explore. However, convenience sampling is used due to practical restrictions such as time, availability, and the necessity to engage directly with organisations working in e-waste management.

3.7 TIME HORIZON

Alamgeer (2023) states that there are two types of research-time horizon, namely longitudinal research which is a study whereby data is collected from the same subjects over an extended period and cross-sectional research which is a single point of time study where data is collected from a sample at one specific moment. This study will collect data using the cross-sectional research time horizon as it will help understand the various perspectives and/or characteristics of e-waste management as published in secondary sources at a certain point in time.

3.8 DATA COLLECTION

Data collection plays a crucial role in statistical analysis of data and there are two main forms, primary data collection methods and secondary data collection methods. Ajayi (2023), identifies primary data as data that has never been collected i.e., it is original/first hand data that will be obtained by the researcher and in contrast, secondary data is pre-existing data that has been collected by other researchers. In terms of this study, both primary and secondary data will be collected. Primary data will be collected from a desktop analysis technique, from the five above mentioned organisations that participated in e-waste management and for secondary data, this study will utilise books, journals, reports, blogs and the internet searches to obtain the required information.

3.9 DATA ANALYSIS

Thematic analysis is a qualitative research technique that is used to find themes that tell narratives by organising and analysing large, complicated data sets. This process entails carefully reviewing and re-reading the recorded data, producing rigorous findings that are both informative and reliable (Dawadi, 2020). Once primary and secondary data will be extracted from the various identifies sources, thematic data analysis will be used to identify and analyse the relevant information on best e-waste practices obtained from the five organisations engaged in e-waste management.

3.10 ETHICS

Ethical practices are critical to be maintained throughout the entire research process ie, sourcing data from reliable and organisation websites (Cilliers and Viljoen, 2021). All information collected for the secondary data shall be referenced and the authors of these shall be sufficiently

acknowledged, with no information to be presented inaccurately which might result in reputational damage to any authors or organisations. A Turnitin report will be generated to highlight ethical compliance of plagiarism. Additionally, an ethics clearance form from the Department of Business Management at the Nelson Mandela University was issued.

3.11 SUMMARY

In conclusion, this research design aims to identify sustainable best practices in e-waste management in South African organisations. The research methodology involves a mono-method approach, using desk research, which involves gathering information from existing research. The population for this study is all organisations in South Africa that engage in e-waste management practices and have publicly available policies and practices on the web, annual and sustainable reports. The study will sample five South African organisations that engage in e-waste management practices and have publicly available policies and practices on the web, annual and sustainable reports.

The study will follow a cross-sectional research time horizon, collecting both primary and secondary data from various sources. Thematic analysis will be used to identify and analyse relevant information on best e-waste practices. Ethical practices will be maintained throughout the research process, sourcing data from reliable sources and ensuring proper acknowledgement of authors and organisations.

Following the establishment of the methodological framework and study design, the empirical results of a thematic analysis of five South African organisations are presented in the following chapter. These findings serve as a vital foundation for the in-depth empirical investigation that follows by highlighting important trends, contemporary practices, and eco-friendly e-waste management techniques.

CHAPTER FOUR
FINDINGS AND INTERPRETATION OF DATA

4.1 INTROCUTION

The empirical findings of this desktop study on sustainable best practices for managing electronic waste (e-waste) in South African organisations are presented in this chapter. Data was collected from five e-waste organisations namely, Circular Energy, South Group Recycling, ERA E-Waste Africa, FS E-Waste, and AST Recycling. The results offer a fact-based viewpoint on the methods used to manage e-waste today, pointing out both flaws and good practices in areas including following regulations, recycling, procurement, and disposing of e-waste

Tansel (2017) asserts that e-waste is one of the waste streams that is expanding the fastest on a global scale. This is mostly due to consumers' high demands for the newest, most advanced devices, and the speed at which technology is developing, which makes older devices outdated. In the South African context, the need for sustainable e-waste management has become increasingly prominent due to its associated health and environmental risks. Empirical findings indicate that although certain organisations are advancing in their sustainability efforts, numerous others continue to encounter substantial challenges.

4.2 EMPIRICAL FINDINGS

This chapter aims to provide a practical, evidence-driven overview of the current state of e-waste management in South Africa by providing empirical data obtained by means of a desktop analysis. To develop and advance sustainable practices across the industry, the study concludes with several data-driven suggestions that emphasise the significance of extensive legislative support, improved collaboration, and targeted technical innovation.

This chapter looks at how South African organisations are creating infrastructure, following rules, running awareness campaigns, and incorporating new technology into their e-waste management procedures. Although the results show a growing organisational commitment to sustainability, there are still significant obstacles, especially regarding funding, public involvement, and regulatory enforcement (Zhong *et al.*, 2022).

4.2.1 Demographic and biological information about the five e-waste organisations.

Table 4.1: Profile of five selected e-waste management organisations.

Organisation Name	Head Office Location	Year Established	Number of Branches	Employment Size	Key Focus Areas
South Group Recycling	Rosslyn, Akasia, Gauteng	Not specified	Multiple (Durban, Cape Town, Johannesburg)	Approx. 41 employees	Recycling of catalytic converters and electronic waste
AST Recycling	Johannesburg, Gauteng	2013	Nationwide	Not specified	E-waste, scrap catalytic converters, non-ferrous metals
ERA (E-Waste Recycling Authority)	Claremont, Cape Town, Western Cape	2018	National network	Not specified	Producer Responsibility Organisation (PRO) for WEEE
eWaste Africa	Pietermaritzburg, KwaZulu-Natal	2014	Pietermaritzburg, Pretoria, Cape Town	Approx. 20 employees	Recycling of lighting and electronic waste
Circular Energy	National footprint (registered PRO)	Not specified	Nationwide drop-off points	Not specified	EPR compliance for EEE, lighting, batteries, packaging

Source: Researcher's Own Construction.

The table above contains crucial demographic and biographical information about the five South African organisations chosen for their active involvement in electronic waste management. This contains their headquarters' locations, year of establishment, branch presence, employment size, and primary operating focus.

4.2.2 Descriptive Analysis from The E-Waste Organisations

South Group Recycling

South Group reports high recovery rates of valuable metals such as silver, copper, and gold from devices like TVs, laptops, and smartphones. Their manual dismantling and sorting process ensures that hazardous materials are safely removed before shredding and refining (South Group Recycling, 2024). By recycling e-waste, the organisation significantly reduces the need for raw material mining, which in turn conserves natural resources, prevents toxic leaching into soil and water, and lowers carbon emissions (South Group Recycling, 2024). The organisation contributes to the green economy by supporting local businesses with secure data destruction and asset recovery services, creating job opportunities in collection, dismantling, and processing, and offer buyback programs for e-waste and catalytic converters. The Group also provides collection services for large e-waste volumes, especially for businesses, and promotes reuse of functional electronics, such as repurposing for secondary uses, and donating to schools or non-profits (Muzenda, 2013).

Circular Energy

Around 50% of this organisation focuses on IT Asset Disposition (ITAD), primarily serving B2B and government clients, while 27% engage in trade-in and resale of used electronics. Circular Energy organisations in the e-waste sector have demonstrated strong empirical results through diverse business models and sustainability practices. Economically, improper disposal leads to an annual loss of on valuable raw materials like gold and copper, which circular models help recover, reducing environmental harm (Circular Energy, 2025).

Despite the growing volume of e-waste, consumer-level reuse remains limited. Organisations adopting circular practices such as selling waste residues, internal recycling, and renewable energy use experience improved revenue growth and future business prospects, although not all practices yield immediate financial benefits. For example, design strategies aimed at repairability have shown no statistically significant impact on past performance. Overall,

Circular Energy approaches are proving effective in enhancing sustainability, resource efficiency, and long-term business viability in the e-waste industry (Elroi *et al.*, 2023).

AST Recycling

AST Recycling has made measurable contributions to sustainable e-waste management across South Africa and neighbouring countries. The organisation has successfully diverted over 56,240 tons of e-waste from landfills, significantly reducing environmental pollution and supporting circular economy goals. Operating from its certified facility in Johannesburg, AST Recycling specializes in processing end-of-life electronics and scrap catalytic converters, using environmentally responsible methods (AST Recycling, 2019). Their IT Asset Disposal (ITAD) services include secure data sanitization, which ensures that reused devices are safe and free from recoverable data. AST also empowers local entrepreneurs through its buyback centre, enabling small businesses and individuals especially in underprivileged and rural areas to earn sustainable incomes by supplying recyclable materials (AST Recycling, 2019). With a presence in countries like Nigeria, Botswana, Zimbabwe, and Zambia, AST Recycling is expanding its impact regionally, promoting job creation, enterprise development, and resource recovery. These results reflect AST's commitment to the principles of reduce, reuse, and recycle, and its role in driving Africa's transition to a zero-waste future (Lema, 2024).

ERA E-Waste Africa

ERA E-waste Africa and similar organisations have contributed significantly to the continent's e-waste management efforts, though challenges remain. In 2022, ERA generated approximately 3,551 kilotons of e-waste, averaging 2.5 kg per capita, while only 25 kilotons were formally collected, highlighting a very low formal collection rate1. Most e-waste processing occurs in the informal sector, often under hazardous conditions, exposing workers to toxic substances like mercury and arsenic (ERA NPC, 2018). The EWIT Project, a collaboration between European and African cities including Johannesburg and Kisii, developed an e-waste implementation toolkit to guide safer recycling and recovery practices. This toolkit includes self-assessment tools, scenario modelling, and policy recommendations tailored to local contexts (ERA NPC, 2018). Meanwhile, the ACET report emphasises the potential of e-waste to support job creation, innovation, and circular economy development, especially if policies are strengthened to regulate transboundary e-waste movement and improve local infrastructure. Despite the economic value of recoverable materials, only a small fraction is properly

processed, underscoring the need for formalization and investment in sustainable systems (Kumar, Holuszko and Espinosa, 2017).

FS E-Waste

FS E-Waste operates in the Miscellaneous Durable Goods Merchant Wholesalers sector, focusing on the recycling and resale of electronic and electrical waste (FS E-Waste, 2024). While detailed performance metrics such as tonnage processed or environmental impact figures are not publicly disclosed, the organisation is listed in business directories like Dun & Bradstreet, which model its financials and ESG (Environmental, Social, and Governance) ranking based on industry averages. FS E-Waste is recognized for contributing to the local circular economy by handling scrap and waste materials, and its operations align with broader sustainability goals in South Africa. However, the lack of formal reporting or published empirical studies limits deeper analysis of its environmental or economic impact (Finlay and Liechti, 2008).

4.3 THEMATIC ANALYSIS OF E-WASTE MANAGAMENT PRACTICES

A review of academic literature and a thematic analysis of data from the five case study organisations revealed seven important and recurrent themes that capture the current issues and proactive efforts in modern e-waste management and will be discussed subsequently.

4.3.1 Awareness and Education Initiative

Many organisations exhibited a clear commitment to promoting awareness around e-waste issues. Notably, ERA E-Waste Africa and AST Recycling have launched educational campaigns directed at both local communities and businesses. These initiatives are designed to highlight the environmental hazards associated with informal recycling practices and educate stakeholders on the significance of responsible e-waste disposal (Adeleke *et al.*, 2021).

4.3.2 Procurement and Lifecycle Management

According to the empirical research, a substantial number of organisations do not have a defined procurement plan that includes environmental sustainability. Environmental factors, particularly the impact of electronic devices, are frequently given low importance and disregarded during the decision-making process (Elmor *et al.*, 2024). Neither of the five chosen organisations completed environmental studies during the procurement process. This is mostly due to limited budget allocation; financial constraints that prevent the purchase of

environmentally friendly devices as well as the upgrading of software and hardware to increase product lifespans.

The outcome is low uptake of recyclable electronic or energy-efficient devices across organisations, implies that the lack of green procurement policies contributes to increased electronic waste (e-waste) and represents a missed opportunity to extend the lifecycle of electronic products through sustainable choices (Bob *et al.*, 2017).

4.3.3 Collection and Recycling Infrastructure

FS E-Waste and Circular Energy have collaborated with local governments and private firms to expand their collection infrastructure. AST Recycling operates a certified facility that handles a broad spectrum of electronic devices, ensuring responsible dismantling and efficient recovery of materials in line with environmental standards. All five organisations have set up designated collection points and provide logistical assistance for the retrieval of electronic waste (Swain and Lee, 2019).

4.3.4 Awareness and Training

Most organisations do not offer structured training programmes, resulting in a heightened risk of environmental damage and inconsistent handling practices. The desktop analysis revealed a considerable gap in environmental awareness and training related to e-waste management. It has been found that environmental awareness initiatives are largely absent across organisations, thus employees often lack understanding of appropriate e-waste disposal procedures (Moyo *et al.*, 2022).

Only a few of the five organisations have reported having internal awareness campaigns or training efforts in place, with ERA eWaste taking the forefront of the five others as it conducts activities such as the 7 Days of Eco-activism for National E-waste Day Spotlight on recycling with consumer campaign and industry engagement. Lack of awareness and training results in staff members frequently demonstrates limited knowledge of environmental hazards associated with e-waste correct improper disposal methods which then undermines sustainable waste management efforts and increases the likelihood of improper disposal practices (Makhubele, 2017).

4.3.5 Recycling and Disposal Practices

Recycling and disposal methods differ widely between organisations, with larger organisations typically demonstrating more structured and regulated processes. Dutta and Goel (2021) support this notion as they state that larger organisations or formal organisations have established processes, protocols, recoverable materials, and controlled activities, whereas informal/smaller entities disassemble with less oversight, less regulation, and higher environmental/health risk. This is demonstrated by AST Recycling and ERA E-Waste Africa, which have created processes and maintain partnerships with approved recycling organisations. Smaller organisations, such as FS E-Waste, sometimes rely on informal procedures and/or keep obsolete technology without specific disposal strategies. The main conclusions are that there is a lack of consistency in recycling processes, particularly among smaller organisations, which contributes to environmental and data security problems.

Many organisations do not possess adequate infrastructure for effective e-waste recycling. Informal recycling operations are prevalent and frequently employ unsafe techniques that harm the environment. Obsolete electronic devices are often discarded without following proper disposal procedures. Some organisations neglect to return equipment to suppliers for safe and responsible disposal. The implication results to the absence of standardised recycling and disposal practices which increases the risk of environmental degradation and compromises data security (Manjengwa and Dorfling, 2019).

4.3.6 Compliance with Legislation

Compliance with South Africa's National Environmental Management Waste Act (NEMWA) and the Extended Producer Responsibility (EPR) regulations varies among organisations. Organisations like ERA e-Waste Africa and AST Recycling demonstrate strong compliance, supported by certifications and clear reporting systems. While in contrast, smaller organisations such as FS e-waste often struggle to fully meet regulatory standards due to limited resources (Shahabuddin *et al.*, 2023).

4.3.7 Technological Innovation

Technological investment in e-waste management remains limited overall, though certain cases show promising advancements. Key findings are that Circular Energy and South Group Recycling have adopted automated sorting and material recovery technologies. These innovations have led to greater operational efficiency, and a reduced environmental footprint

and technological innovation is essential for sustainable e-waste management, but it demands substantial financial investment.

Both South Group Recycling and Circular Energy have made notable strides by integrating advanced recycling systems. Circular Energy further supports sustainability by exploring circular economy practices, such as promoting the reuse and refurbishment of electronic devices (Zhong *et al.*, 2022).

4.4 CONSTRAINS OF E-WASTE MANAGEMENT

A landscape of tremendous effort and major challenges is shown by the thematic analysis of e-waste management practices that was conducted above. This section will summarise the most important systemic challenges that presently hinder the progress for managing e-waste effectively in order to move from identifying these issues to creating a future course.

Despite notable advancements, several persistent challenges collectively stifle progress of e-waste management:

- There is low public engagement – a significant portion of organisations and its consumers lack awareness of appropriate e-waste disposal practices, limiting participation in recycling initiatives.
- There are evident financial limitations - smaller organisations face ongoing funding challenges, which restrict their ability to expand operations and invest in necessary infrastructure.
- There is weak regulatory enforcement - inconsistent application of environmental regulations undermines efforts to achieve uniform compliance across the sector.
- There are data security risks - insufficient data sanitisation protocols during disposal raise serious concerns regarding privacy protection and regulatory compliance

Each constrain, however, offers a distinct call to action that goes beyond a simple list of issues. In order to provide a logical foundation for development and expansion in the future, a strategic recommendation is made for each identified challenge, based on academic literature and known best practices.

4.5 STRATEGIC IMPERATIVES FOR E-WASTE MANAGEMENT

4.5.1 Overcoming limited public participation

Lema (2024) states that awareness campaigns need to be launched to carry out nationwide educational initiatives to inform consumers and businesses about the environmental and health risks of improper e-waste disposal. This also encourages retailers to offer take-back programs and set up drop-off points for used electronics, making disposal more accessible, provide product-based incentives for consumers who return old electronics responsibly.

4.5.2 Addressing the funding constraint

According to Odeyingbo, Deubzer and Ogunmokun (2025) revised regulations designed to strengthen the recycling ecosystem by rigorously enforcing Extended Producer Responsibility (EPR), mandates that producers financially support collection and recycling systems, thereby alleviating the financial pressure on smaller and informal recyclers. Additionally, to foster Public-Private Partnerships (PPPs) collaboration between government, industry, and NGOs, should be enhanced for effectively pooling resources. Coupled with improved monitoring and enforcement, these measures aim to create a more accountable and sustainable framework for recycling.

4.5.3 Strengthening regulatory enforcement

Zhong et al. (2022) highlights that inspections should be increased and compliance notices issued to non-compliant producers. South Africa has already issued thirty-seven pre-compliance notices. The draft WEEE National Management Policy should be implemented to unify e-waste handling practices across the country and train auditors and local enforcement teams to ensure consistent application of regulations.

4.5.4 Mitigating data security

The use of certified recyclers who comply with POPIA and international standards like NIST 800-88 or DoD 5220.22M3 should be promoted, encourage both data wiping and physical destruction for sensitive devices to prevent breaches, and educate organisations that they remain responsible for data security even after handing devices to recyclers (Shahabuddin *et al.*, 2023).

4.6 COMMON AND BEST E-WASTE PRACTICES AMONG THE FIVE ORGANISATIONS

The following table provides a comparative overview of five South African e-waste organisations, summarizing their common practices and highlighting standout best practices that contribute to sustainable electronic waste management.

Table 4.2: Contrasting Standard E-Waste Operations with Value-Added Initiatives Across Selected Organisations.

Organisation	Common E-Waste Practices	Best Practices / Unique Features
AST Recycling	• Collection & recycling of e-waste • Secure data destruction • Metal recovery	• ISO 9001, 14001, 27001 certified • Community development programs • Focuses on circular economy
ERA NPC	• E-waste collection & processing • Public awareness campaigns	• Registered non-profit • Collaboration with government & industry • Promotes responsible disposal
FS E-Waste	• E-waste recycling • Secure data destruction • Collection services	• Based in Free State • Offers tailored solutions for businesses and individuals
e-Waste Africa	• Lighting waste & e-waste recycling • Collection & logistics	• Specializes in lighting waste • National footprint • Compliance with environmental regulations
South Group	• E-waste management solutions • Collection & disposal	• Offers integrated waste management • Focus on sustainability and innovation

Source: Researcher's Own Construction.

4.7 SUMMARY

The empirical evidence suggests that while South African organisations are making strides in sustainable e-waste management, significant gaps remain in awareness, infrastructure, and regulatory compliance. The empirical findings of this chapter reveal a mixed landscape of e-

waste management practices in South African organisations. While some entities are leading the way with innovative and compliant approaches, others face significant barriers to sustainability. The evidence underscores the need for strategic procurement, enhanced awareness, robust infrastructure, and stronger policy enforcement. These insights form the foundation for the recommendations presented in the next chapter. Organisations like AST Recycling and ERA e-waste Africa serve as benchmarks for best practices, demonstrating the potential for scalable and environmentally responsible e-waste solutions. Strengthening collaboration, investing in technology, and enforcing regulations are key to advancing sustainable e-waste management in South Africa.

The next chapter will provide an overview of the entire study by outlining whether or not the research objectives have been met, as well as a summary and recommendations on how to improve sustainable e-waste management within South African organisations. In addition, the study's limitations will be examined.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter seals off the research by summing up the main findings, offering conclusion and making strategic recommendations at the end. To achieve the research objectives of this study, the secondary data collected in Chapter Two will be combined with the theoretical ideas that were generated and established in Chapter Four. This is mainly because the primary objective is to address the core research questions by drawing firm conclusions about the state of sustainable e-waste management in South Africa and providing useful, fact-based recommendations for businesses, policymakers, and other stakeholders to get closer to a circular economy.

5.2 SUMMARIES OF STUDY CHAPTERS

This section offers short synopsis of fundamental insights, moving beyond a simple descriptions to highlight the critical trends that connect the entire research effort.

5.2.1 Chapter One

This chapter delved into the research aims which were mainly to identify the current e-waste practices, asses the difficulties faced and recommend long-term initiatives for sustainable e-waste management in South African organisations. The primary object of the study was to mainly promote sustainable practices that align with the environmental standards and procedures. The secondary goals included evaluating organisational awareness, disposal techniques and identifying challenges that hinder e-waste management. The chapter then gave out the structure to followed by the study which is dividing it into five chapters, an overview and background, a literature review, methodology, empirical findings analysis and the summary, conclusion and recommendations.

5.2.2 Chapter Two

Chapter two explored the secondary information that was collected mostly from journals, reports and internet sources. This chapter solely aimed at providing a theoretical framework for understanding the complexities of e-waste management and the need for an integrated and sustainable solutions. Historical information, regulations and basic foundations of e-waste management were examined in this chapter. The chapter also explored theoretical theories such

as the Game Theory, Stakeholder Theory of Planned Behaviour and Behavioural Reasoning Theory, to better understand organizational behavior and decision-making. An extensive exploration on the significance of waste management hierarchy and a circular economy, which promotes resource efficiency and product lifespan extension was discussed in detail as well. Other elements of e-waste management were also demonstrated in this chapter and these included e-waste recycling processes, goals of e-waste management, types of best practices etc.

5.2.3 Chapter Three

The third chapter used the research onion, which is a structured and layered approach to study e-waste management in South Africa. This model included layers such as positivism, interpretivism, realism, radical humanism, and radical structuralism. This chapter outlined that the approach layer compares pre-existing theories and generates new ones based on empirical facts. The strategies layer describes various research methods, while the methodological mix options layer outlines the use of a single method or multiple methods within the same paradigm. Chapter three established that the study would make use of a mono-method approach, collecting data from five South African organisations selected through convenience sampling. Thematic analysis was used to identify best e-waste practices. Ethical practices were maintained throughout the research process.

5.2.4 Chapter Four

Chapter four provided a comprehensive overview of e-waste management in South Africa, focusing on five key organisations. South Group Recycling, Circular Energy, AST Recycling, ERA E-Waste Africa, and FS E-Waste. South Group Recycling gave results that showed that it recovered valuable metals from devices, while Circular Energy focuses on IT Asset Disposition and trade-in and resale of used electronics. AST Recycling successfully diverted over 56,240 tons of e-waste from landfills, reducing environmental pollution and supporting circular economy goals. ERA E-Waste Africa contributed significantly to the continent's e-waste management efforts, but challenges remain, such as low formal collection rates and informal processing in the informal sector. FS E-Waste operates in the Miscellaneous Durable Goods Merchant Wholesalers sector, focusing on the recycling and resale of electronic and electrical waste.

Thematic analysis of e-waste management practices revealed seven key themes: awareness and education initiatives, procurement and lifecycle management, collection and recycling infrastructure, awareness and training, recycling and disposal practices, compliance with

legislation, and technological innovation. It is evident from the findings that most organisations have implemented awareness initiatives on e-waste management but however, they still lack well-defined procurement plans that involve environmental sustainability. Some also lack training of employees' programs with leads to improper handling of e-waste within organisations. Recycling and disposal methods vary between organisations, with larger firms having more structured processes and smaller ones relying on informal practices. Compliance with legislation varies among organisations, with larger firms demonstrating strong compliance. Technologically advanced measure of handling e-waste management remains low regardless of larger organisations having automated sorting and material recovery techniques.

The main concerns that were picked up were the lack of public involvement in e-waste management, restricted funds to implement proper e-waste management and data security issues. Employee training, certified recyclers, and green procurement regulations are some of the tactics that could be implemented to address these challenges. However, the most effective solutions are hindered by financial abilities.

5.3 CONCLUSION

This study affirms that e-waste is one of the most urgent environmental issues being faced globally, necessitating not only strong regulatory frameworks but also the incorporation of multi-stakeholder co-operation and the concepts of the circular economy. This was theoretically found from the imperatives that were established by the literature review, and the desktop analysis of five South African organisations namely, South Group Recycling, AST Recycling, ERA, eWaste Africa, and Circular Energy, which provided empirical proof of the diverse ways in which e-waste practices are applied in real-world situations. A number of important conclusions are drawn from the synthesis of theory and data.

Firstly, from the desktop analysis it could be identified that e-waste can be strategically reframed as a sustainable development opportunity rather than a drawback on the environment and human health. Organisations such as AST Recycling job creation programs and the recovery of valuable minerals by South Group Recycling, show the economical benefits that can be attained from e-waste management through a circular economy. Thus, e-waste awareness campaigns could be implemented nationwide to educate both individuals and organisations on mostly the advantages of e-waste management.

Subsequently, it was found in the study that mostly, organisations lacked commitment to sustainable practices, internal awareness and training. Public engagement is encouraged by recyclers' external advertising, but many organisations lack formal employee training programs and sustainable procurement rules, which leads to uneven e-waste handling and the continuation of linear consumption trends. Instead of decreasing e-waste, the industry will keep on producing it for as long as sustainability is not incorporated into end-of-life planning, product design, and procurement. Thus, organisations can implement internal e-waste management initiatives that would encourage employee participation, such as offering incentives for take-back programs and setting up drop-off points at the most accessible locations for obsolete electronics, to ensure that there is a relatively desired level of their participation.

All in all, despite the clear policy frameworks and high performing organisations, it can be concluded that there is still a noticeable implementation gap. Leading organisations like AST Recycling and ERA do demonstrate that managing e-waste in a sustainable, legal, and profitable manner is possible. This is evident by AST's diversion of more than 56,240 tonnes of e-waste and ERA's status as a formal Producer Responsibility Organisation (PRO). However, the larger picture is fragmented, with smaller organisations like FS E-Waste being hindered by low resources, reporting methods, and limited infrastructure. The difficulty, then, is not in technical expertise but rather in attaining scalability and fair access to resources and capability.

5.4 RECOMMENDATIONS FOR SUSTAINABLE ELECTRONIC WASTE MANAGEMENT IN SOUTH AFRICAN ORGANISATIONS

According to this study, improving e-waste management in South Africa necessitates a multifaceted approach. Closing the awareness gap, incorporating sustainability into procurement, building out collection infrastructure, bolstering regulatory enforcement, encouraging technical innovation, and leveraging the socioeconomic value of e-waste are all crucial areas for action. In order to guarantee consistent customer and corporate engagement, a crucial first step is addressing the knowledge gap through required organisational training, backed by industry-led public awareness campaigns and government initiatives.

Procurement policies should favour durable, repairable, and Extended Producer Responsibility (EPR)-compliant electronic products from suppliers offering clear take-back or refurbishment schemes. The National Treasury can play a leading role by embedding minimum green criteria

into public sector procurement guidelines. Expanding and formalising e-waste infrastructure is essential, especially in underserved and rural areas where informal disposal remains the order of the day. Government regulators should increase audit frequency, impose penalties on non-compliant actors, and expedite the implementation of the draft National Waste Electrical and Electronic Equipment (WEEE) Management Policy.

Regardless of the enormous problem of e-waste in South Africa, a sustainable solution is within reach. A comprehensive, cooperative strategy based on the circular economy's tenets can help South African organisations turn this environmental burden into a driver of job creation, economic expansion, and ecological preservation. Following the evidence-based tactics described in this study, the government, business community, and civil society could work together to achieve a zero-e-waste-to-landfill future.

5.5 SUMMARY

The research focuses on sustainable best practices of e-waste management in South African organisations, highlighting the urgency of the crisis and the environmental, legal, and health implications of unmanaged e-waste. This chapter summed up the main summarise of the entire study chapters which identified challenges and proposed long-term, sustainable interventions aligned with national and global environmental goals. The reviewed global and local literature on e-waste management, revealing inconsistent enforcement and fragmented organisational compliance. The study's methodological design combines qualitative and quantitative data collection, incorporating multiple sectors and certified recyclers was summarised in chapter three.

Empirical findings revealed significant variation in organisational performance and awareness, with some organisations demonstrating effective e-waste management aligned with circular economy principles. Key barriers identified include inadequate awareness, weak procurement policies, limited infrastructure, inconsistent enforcement, and insufficient public participation. The research repositions e-waste as a strategic opportunity for sustainable development, highlighting the potential for innovation in material recovery and data security management. The chapter lastly offered strategic recommendations, including enhancing awareness through mandatory employee training, embedding sustainability into procurement policies, expanding formal e-waste collection infrastructure, strengthening regulatory enforcement, and integrating informal waste pickers into the formal recycling economy.

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ANNEXURE A: LEARNING AGREEMENT

NELSON MANDELA UNIVERSITY

FACULTY OF BUSINESS AND ECONOMIC SCIENCES

LEARNING AGREEMENT BETWEEN STUDY LEADER AND POSTGRADUATE STUDENT FOR BCOM HONS MINI-TREATISE QUALIFICATIONS

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

- The General Prospectus
- Faculty of Business and Economic Sciences Prospectus
- University Code of Ethics Policy
- Policy on Intellectual Property
- Promotion of Academic Integrity and Prevention of Plagiarism

These documents are available on the Nelson Mandela University's website (http://my.mandela.ac.za/default.asp?id=308&IRCno=).

The Faculty of Business and Economic Sciences requires all postgraduate students and their study leader(s) to complete a learning agreement. Postgraduate students and their study leader(s) should discuss the issues outlined in this agreement, to have clarity and consistency regarding the conduct of the Postgraduate student and study leader. The document should be signed in each other's physical presence.

The postgraduate student and study leader should keep a copy of this learning agreement, and a copy must be sent to the module coordinator (Shelley.Farrington@mandela.ac.za).

PART A: DETAILS OF POSTGRADUATE STUDENT, STUDY LEADER(S) AND QUALIFICATION

NAME & SURNAME:	**Yvonne Xaba**
STUDENT NUMBER:	**223245909**
QUALIFICATION:	**BCom Honours in Business Management**
YEAR OF REGISTRATION:	**2025**
DEPARTMENT:	**Business Management**
STUDY LEADER:	**Prof EE Smith**

PART B: ROLES AND RESPONSIBLITIES OF THE POSTGRADUATE STUDENT AND STUDY LEADER(S)

POSTGRADUATE STUDENT:

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

The postgraduate Student accepts and undertake the following responsibilities:

DESCRIPTION	INITIAL
Complete all the required components of the academic programme as stipulated.	Y
Plan and execute the research study as agreed to with the guidance of the study leader (and co-study leader, where applicable).	Y
Ensure that the research proposal (Chapter 1-3) is submitted at the stipulated date.	Y
Adhere to the principles of accepted safety and health standards, ethical research practice as per Nelson Mandela University Code of Conduct for Researchers (IRC 404.01), Policy on Research Ethics (IRC 404.02), specific codes of the discipline (where applicable) and conventions regarding plagiarism as per Nelson Mandela Policy for the Promotion of Academic Integrity and Prevention of Plagiarism (IRC 305.04).	Y
Make regular appointments with study leader(s) to update study leaders(s) on progress or any difficulties encountered in executing the academic project as planned to ensure timeous remedial action where required.	Y
Keep written record of supervision sessions and the decisions agreed to.	Y
Submit regular outputs from the academic project to ensure effective guidance and input by study leader(s).	Y
Ensure that written work submitted has been proofread and of an acceptable academic standard.	Y
Ensure that the necessary amendments or revisions decided upon with study leader(s) are made regularly and resubmitted as agreed for further guidance.	Y
Take responsibility for the final production of the treatise for examination and final submission at the specified dates.	Y
Submit a manuscript to the study leader prior to the time of the approval of examiner reports (for purpose of awarding the doctoral degree).	Y
The postgraduate student has read all the relevant strategic and policy documents related to their relevant qualification.	Y
The postgraduate student has familiarised him- or herself with the internet-based plagiarism detection service; Turnitin software.	Y
The postgraduate student endeavours to partake in workshops and training related to the research project	Y

STUDY LEADER / CO-STUDY LEADER:

The responsibilities outlined below are reasonable expectations of academics or any other persons who are undertaking the supervision of candidates.

The study leader(s) accepts and undertake the following responsibilities:

DESCRIPTION	INITIAL
Clarify respective roles of student, study leader, and co-study leader (where relevant) to ensure that student and study leader (s) are clear about channels of communication as well as expectations. Preferably such clarification should be contained in a study leader or learning agreement	**EES**

Confer or make contact with the student regularly (minimum once a month) to provide academic guidance to ensure the development of research skills and competencies relevant to the discipline and the specific study, and to ensure adherence to university requirements and/or discipline standards.	**EES**
Monitor progress of the student and submit reports on student progress as required by the university and by relevant scholarship funding bodies.	**EES**
Keep a record of supervision sessions and provide feedback, within the timeframe agreed upon, to enable student progress.	**EES**
Study leaders must maintain an adherence to accepted safety and health standards, as well as ethical research practice as per Nelson Mandela University Code of Conduct for Researchers (IRC 404.01), Policy on Research Ethics (IRC 404.02), specific codes of the discipline (where applicable) and conventions regarding plagiarism as per Nelson Mandela Policy for the Promotion of Academic Integrity and Prevention of Plagiarism (IRC 305.04) and advise their students to maintain these standards as well.	**EES**
Provide the relevant information to the student so that the candidate submits the treatise for examination and final submission on the correct date and format.	**EES**
The study leader(s) to consult Turnitin report submitted by the student to the internet-based plagiarism detection service; Turnitin software.	**EES**

PART C: TERMS OF LEARNING AGREEMENT

FREQUENCY OF COMMUNICATION		
The contact details of the study leader(s) were provided to the postgraduate student.	**YES** ☒	**NO** ☐
Specify frequency and communication channel for meetings (i.e. telephone, email, face-to-face).	Student will keep contact with study leader(s) via e- mail or personal consultation on progress, etc. on regular basis. Reply to emails is crucial.	
In case of the appointment of a co-study leader(s), how will meetings and communication between all be organised?	N/A	
Specify who is responsible for scheduling meetings and how far in advance these meetings should be scheduled.	Study leader should schedule meetings 48 hours in advance. Student can also ask for a meeting or email query.	
Specify the procedure for changing the meeting date and time.	Notice of 24 hours should be given.	
Specify frequency and duration of meetings (approx.).	Regular contact/meetings and duration will depend on purpose of meeting/email contact and task on hand.	
Specify who will set the agenda and take notes.	N/A – Email trail could be used. If used, Teams Meeting could be recorded.	
Clarify whether there will be any expectation regarding regular email communication.	Regular email communication will be necessary.	
Indicate the availability of communication of study leader during period of research and/or ordinary leave.	The study leader(s) will only be available on e-mail during normal leave – student is informed of the dates that the study leader will take leave.	
List the roles, responsibilities of study leader, co-study leader(s) and student.	Refer to roles as indicated in EBML410 Study guide and in this learning agreement	
Comments:		

RESEARCH PLAN / TIMEFRAME		
Specify the research plan and timeframe	As per research proposal.	
Specify how changes to the research plan / timeframe will be dealt with.	Mutual agreement taking note of completion date and registration implications.	
Was the postgraduate student informed of the timeframes	**YES** ☒	**NO** ☐
Specify remedial action if schedule is not adhered to?	Student(s) need to provide acceptable reasons for not adhering to a schedule and negotiate a new time frame with the study leader. The student(s) need to know that the study leader(s) may not be able to fit in a new time schedule on short notice when the student(s) has failed to stick to the schedule. Study leader(s) will determine what action is needed to continue with studies or will recommend the discontinuation of the study.	
Comments:		

SUBMISSION OF WRITTEN MATERIAL AND FEEDBACK	
Specify how often written work should be submitted to the study leader(s).	Regular update on progress.
Specify the timeframe for feedback.	48-72 hours
Specify remedial action if feedback agreement is not adhered to?	Student(s) need to inform the study leader(s) that he/she is in disagreement/not satisfied about the feedback within 2 weeks after receiving such feedback. A discussion on the disagreements must take place. If student(s) do not implement recommendations, study leader(s) will request a full explanation of the reasons for not doing so.

ETHICS APPROVAL		
	YES	**NO**
The postgraduate student was informed that all research projects require ethical approval?	☒	☐
The postgraduate student was informed that it is his/her responsibility to apply for ethics?	☒	☐
Comments:	No formal ethics approval will be required (Only Form E will be used).	

INTELLECTUAL PROPERTY		
	YES	**NO**
The postgraduate student was informed that all intellectual property resulting from research conducted for postgraduate degrees, including all publications, is governed by the Intellectual Property Policy (IRC 401.01)	☒	☐
The student was informed that the intellectual property rights resulting from a postgraduate's research shall vest in the University	☒	☐
Comments:		

The **STUDENT** and the **STUDY LEADER** confirms that:

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

SIGNATURES:

Student: ……

Date: 22 April 2025

Study leader:

Date: 22/04/2025……

ANNEXURE B: SIGNED ETHICS E-FORM

NELSON MANDELA UNIVERSITY

FACULTY OF BUSINESS AND ECONOMIC SCIENCES

DEPARTMENT OF BUSINESS MANAGEMENT ETHICAL

CONSIDERATION FOR HONOURS TREATISE

INSTRUCTIONS

- Should be completed by study leader and student.
- Must be signed off by the student, study leader and HoD.
- Submit completed form to Ms Kim Alexander.
- Please ensure that a summary of the research methodology section of the treatise is attached to this form *(Complete Annexure A).*
- ***Please note that by following this ethics route, the study will NOT be allocated an ethics clearance number.***

SECTION A – STUDENT ACKNOWLEDGMENT

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

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

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

SECTION B – STUDENT AND RESEARCH PROJECT DETAILS

Student name & surname	**Yvonne Xaba**
Student number	**223245909**
Title of treatise	**A desktop analysis of sustainable best practices regarding electronic waste management practices in South African organisations**
Qualification	**Business Management Honours**
Department	**Business Management**
Study leader	**Prof EE Smith**

SECTION C – ETHICS CRITERIA

	(Please tick the appropriate block)	**YES**	**NO**
1.	Is there any risk of harm, embarrassment of offence, however slight or temporary, to the participant, third parties or to the communities at large?		✓
2.	Is the study based on a research population defined as 'vulnerable' in terms of age, physical characteristics and/or disease status?		✓
2.1	Are subjects/participants/respondents of your study:		
2.1.1	Children under the age of 18?		✓
2.1.2	NMU staff?		✓
2.1.3	NMU students?		✓
2.1.4	The elderly/persons over the age of 60?		✓
2.1.5	A sample from an institution (e.g. hospital/school)?		✓
2.1.6	Handicapped (e.g. mentally or physically)?		✓
3.	Does the data that will be collected require consent of an institutional authority for this study? (An institutional authority refers to an organisation that is established by government to protect vulnerable people)		✓
3.1	Are you intending to access participant data from an existing, stored repository (e.g. school, institutional or university records)?		✓
4.	Will the participant's privacy, anonymity or confidentiality be compromised?		✓
4.1	Are you administering a questionnaire/survey that:		
4.1.1	Collects sensitive/identifiable data from participants?		✓
4.1.2	Does not guarantee the anonymity of the participant?		✓
4.1.3	Does not guarantee the confidentiality of the participant and the data?		✓
4.1.4	Will offer an incentive to respondents to participate, i.e. a lucky draw or any other prize?		✓
4.1.5	Will create doubt whether sample control measures are in place?		✓
5.	Do you wish to publish any research output (i.e. article) from this study?		✓

*Please note that if **ANY** of the questions above have been answered in the affirmative **(YES)** the student will need to complete the full ethics clearance form (MEOS REC-H application) and submit it with the*

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

SECTION D – INFORMATION TO BE INCLUDED INTO THE RESEARCH REPORT

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

1. ETHICAL CONSIDERATIONS

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

1.1 Informed Consent

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

1.2 Anonymity and Confidentiality

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

1.3 Action and Competence of Researchers

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

1.4 Respect of Intellectual Property

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

1.5 Beneficence

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

1.6 Non-Maleficence

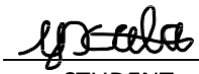
Non-maleficence makes sure that what is being done is not harmful and that harm is not done by omitting care or treatment. This study will make sure that no harm will come to anyone connected to the study. This body of work and the documents consulted will also adhere to the Protection of Personal Information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

1.7 Applying for ethical consideration

The researcher will apply for ethical consideration from the ***Department of Business Management*** (Nelson Mandela University) to have the right to research within the intended domain. The research

process, in particular data collection, may only be conducted once ethical clearance has been granted, i.e., the ethics form has been signed by the student, the study leader and the Head of Department.

SECTION E – SIGNATURES AND DATES



STUDENT

22 April 2025
DATE

STUDY LEADER

22/04/2025
DATE

HEAD OF DEPARTMENT

24 April 2025
DATE

REFERENCES

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

Creswell, J.W. & Poth, C.N. (2017). *Qualitative inquiry and research design: Choosing among five approaches*, Sage, London.

Pietilä, A. M., Nurmi, S. M., Halkoaho, A. & Kyngäs, H. (2020). Qualitative research: Ethical considerations. In *The application of content analysis in nursing science research*, Cham. Springer, 49-69.

Tripathy, J.P. (2013). Secondary Data Analysis: Ethical Issues and Challenges. *Iran Journal of Public Health*. 42(12): 1478–1479.

ANNEXURE A: BCOM HONOURS TREATISE – SUMMARY OF RESEARCH METHODOLOGY

Please provide a summary of the research design and methodology employed in the study by completing the following template.

<table>
<tr><td rowspan="2">Treatise details</td><td>Title of treatise</td></tr>
<tr><td>A desktop analysis of sustainable best practices regarding electronic waste management practices in South African organisations</td></tr>
<tr><td rowspan="4">Background to the study</td><td>Introduction and background</td></tr>
<tr><td>According to Moyo, Sadan, Lotter and Petersen (2022) electronic waste management is the systematic approach of discarding end-of-life and end-of-use electrical and electronic equipment. Zwane and Schoeman (2025) further state that e-waste also includes the collection, transportation, recycling, refurbishing, and safe disposal of e-waste in an environmentally responsible and legally compliant manner. As one of the world's fastest-growing waste sources, electronic waste management has sparked global concern about sustainable development. Sofian, Hanafiah, and Hassan (2023) assert that with the rapid technological advancements and increased consumption of electronic devices, organisations, particularly in developing countries, are under increasing pressure to manage e-waste responsibly. E-waste comprises waste components such as, but not limited to, rare metals, iron, computers, appliances, silver, and other metals of great economic value (Soesanto, Maarif, Anwar & Yurianto, 2023). Moyo et al. (2022) highlight that sustainable e-waste management is not only an environmental imperative but also a legal requirement under South Africa’s National Environmental Management Act (No. 59 of 2008) and the Extended Producer Responsibility (EPR). This desktop analysis investigates the additional research that is required to particularly embrace and execute sustainable e-waste management practices within South African organisations, with the goal of identifying common gaps, effective models, and factors impacting organisational behaviour. The study hopes that by benchmarking against global standards, it will contribute to a more cohesive and effective national response to e-waste concerns.</td></tr>
<tr><td>Problem statement</td></tr>
<tr><td>South African organisations generate a significant amount of electronic waste annually yet having low rates of recycling. Lack of awareness on the importance of sustainable e-waste management and corporate responsibility, has led to improper disposal methods of e-waste which pose environmental and health risks. Regardless of the National Environmental Management Waste Act and the Extended Producer Responsibility (EPR) regulations, South African organisations’ compliance remains inconsistent thus causing more harm to the environment’s current and future wellbeing as well as socio-economic development. There is however little literature on sustainable best practices of electronic waste management in organisations in the South African context, thus research paper aims to address the growing e-waste problem and how South African organisations can adapt effective and sustainable e-waste management practices in their operations.</td></tr>
</table>

Objectives of the study	**Primary objective**
	The primary objective of this study is to conduct a desktop or documentary analysis of sustainable best practices regarding e-waste management in South African organisations.
	Secondary objectives
	• To identify five institutions in SA regarding their sustainable e-waste best practices. • To conduct a desktop analysis regarding sustainable e-waste best practices. • To determine best sustainable e-waste practices for organisations in SA.
	Methodological objectives
	• To conduct a literature review regarding the nature of sustainable e-waste practices • To identify the research methodology that is most suitable in addressing the specified research problems and objectives of the study. • To collect qualitative data through a desktop or documentary analysis amongst five institutions in SA regarding sustainable best e-waste practices. • To analyse the qualitative data obtained from the desktop study. • To draw conclusions and make recommendations to stakeholders regarding sustainable best e-waste practices.
Research design & methodology	**Research philosophy / Paradigm (positivism, interpretivism etc.)**
	Interpretive paradigm
	Approach to theory development (inductive, deductive, abductive)
	Inductive Approach
	Purpose of study (descriptive, exploratory, comparative)
	Descriptive
	Methodological choice (mono, multi, mixed methods)
	Mono-method Research
	Research approach (quantitative, qualitative, mixed)
	Qualitative approach
	Research strategy (SLR, literature review, archival research, case study)
	Documentary analysis
	Time dimension (cross-sectional, longitudinal)
	Cross-sectional study
Data collection	**Technique and procedures (desktop study / desk research)**

	The study will make use of qualitative documents in the form of publicly available best e-waste management practices in South Africa to be found on websites and other available secondary data sources.
	Search strategy: Data inclusion criteria
	Only published secondary data best e-waste management practices of five organisations in SA and other reliable secondary data sources will be used.
	Search strategy: Sources of data (databases, websites etc.)
	Official websites of organisations regarding e-waste management practices and other reliable secondary data sources.
	Search strategy: Search terms or word strings
	e-waste management, policies, practices, sustainability
Data analysis	**Data analysis techniques (content analysis, thematic analysis)**
	To collect the primary data, the researcher will utilise documentary and thematic analysis to facilitate the examination of e-waste management policies and practices of five organisations in SA.
Trustworthiness	**Quality criteria (credibility, dependability, transferability, and confirmability)** (How will each of the aforementioned be ensured?)
	Credibility: Adoption of appropriate, well-recognised research methods. **Transferability:** Provision of background data to establish context of study and detailed description of phenomenon in question to allow comparisons to be made. **Dependability:** In-depth methodology description to allow study to be repeated for other purposes. **Confirmability:** In-depth methodological description to allow integrity of research results to be scrutinised.

REFERENCES:

Moyo, T., Sadan, Z., Lötter, A., Petersen, J., 2022. Barriers to recycling e-waste within a changing legal environment in South Africa. S Afr J Sci 118. https://doi.org/10.17159/sajs.2022/12564

Soesanto, H., Maarif, M.S., Anwar, S., Yurianto, Y., 2023. Design of sustainable electronic waste management business process transformation towards circular economy transition in Jakarta, Indonesia, in: IOP Conference Series: Earth and Environmental Science. Institute of Physics. https://doi.org/10.1088/1755- 1315/1266/1/012038

Sofian, D.D., Hanafiah, M.M., Woon, K.S., Hassan, F.M., 2023. Characteristics of consumer towards development of sustainable e-waste management in Malaysia, in: IOP Conference Series: Earth and Environmental Science. Institute of Physics. https://doi.org/10.1088/1755-1315/1167/1/012043

Zwane, M.I.I., Schoeman, T., 2025. Training waste reclaimers in repairing and refurbishing small e-waste appliances. Discover Sustainability 6. https://doi.org/10.1007/s43621-025-00857-y

ANNEXURE C: TURNITIN SUMMARY REPORT

Treatise turnitin.docx

ORIGINALITY REPORT

16%	8%	12%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Kitila, Abenezer Wakuma. "Waste Electrical and Electronic Equipment (E-Waste) Management and Disposal Methods in the City of Addis Ababa, Ethiopia", University of South Africa (South Africa) Publication	1%
2	Angel, Kubheka Nontombi. "The Role of Smart Waste Technologies Towards Improving Solid Waste Management Practices", University of Johannesburg (South Africa), 2025 Publication	1%
3	Nyakudya, Petronella. "Management of E-	1%

ANNEXURE D: GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS- USAGE DECLARATION

According to Nelson Mandela University's Institutional Position Statement on the use of Generative Artificial Intelligence (AI) (D_71_24_(2025-02-07), the following are considered recommended uses and unacceptable uses of AI by students and staff.

Recommended uses:

- Search engine
- Enhancing understanding
- Gaining insights
- Gathering information
- Clarifying concepts
- Critically evaluating information

Unacceptable uses:

- Copy and paste generated intellectual work.
- Claiming a generated product (text, image, creation) as your own.
- Generating information for assessments, projects, and assignments, unless this is explicitly instructed by the academic, who has provided clear guidelines in the form of permissions and prohibitions as to the appropriate use thereof as part of an assessment designed around the use of AI.
- Used for unfair advantage – when you are determined to deceive and do not use something in an appropriate manner.
- Making use of AI and not appropriately referencing the sources represented in the generated text, image and/or other product.
- Makes use of AI and does not ensure that the sources represented in the generated text, image and/or other product are accurate and represent the actual work of existing sources.
- Generating information via AI that may or may not represent the intellectual work of another person, people or AI and thereafter making further use of AI to disguise this information and then present it as one's own.
- When you do not follow permissions and prohibitions provided in assessment guidelines.
- When you are not transparent about its use, do not reference and acknowledge your sources.

Student declaration:

During the undertaking of preparing and writing this mini treatise,

I Yvonne Xaba with student number 223245909, declare that (please tick the appropriate circle indicating whether you have used AI or not):

✓ *I have not used AI in an unacceptable manner as described by Nelson Mandela University's Institutional Position Statement on the use of Generative Artificial Intelligence*.

I further declare that *I have used* **Copilot and ChatGPT** *in order to:*

1. Chat GPT – To generate ideas of broad areas of writing and simplified clarifications

2. To check for grammar errors and inconsistencies

3. Copilot - To construct images (figures) and tables that aligning with other authors

I *also acknowledge* that I am ultimately responsible and accountable for the contents of this mini treatise.

SIGNATURE STUDENT: _____

DATE: 16 October 2025

*[**NOTE**:* Students must declare in their mini treatise the use or not of AI and AI-assisted technologies in the process of writing their treatise by completing this declaration statement. This statement must be included as an Appendix/Annexure in their mini treatise. AI and AI-assisted technologies do not include basic tools for checking grammar, spelling, references etc. Using AI and AI-assisted technologies in their mini treatise without completing this declaration amounts to academic dishonesty. Should AI and AI-assisted technologies not have been used in the process of writing, *the appropriate circle should be ticked*. Students should note that the use of AI is detected by Turnitin and in addition to this declaration a Turnitin report is required as an Appendix/Annexure to their mini treatise.

ANNEXURE E: MENDELEY SCREENSHOT