Gordon Institute of Business Science
University of Pretoria

Exploring Disruptive Innovation, Economic Incentives, and E-Waste Management within South Africa's Private Security Industry: A Focus on Gauteng

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Declaration

I declare that this research project is my work. It is submitted in partial fulfilment of the requirements for the Master of Business Administration degree at the Gordon Institute of Business Science, University of Pretoria. It has yet to be submitted for any degree or examination at any other university. I further declare that I have obtained the necessary authorisation and consent to conduct this research.

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Abstract

Very few studies have been done on electronic waste in the private security industry around the world and in South Africa. This study was groundbreaking in this area of research. This study explored disruptive innovation, economic incentives, and e-waste management within South Africa's private security industry. Twelve executives from private security companies in Gauteng Province took part in the study, which employed an exploratory qualitative mono-method approach to examine current practices and perceptions related to e-waste management among private security companies.

The Incentive theory was used to understand the role of economic incentives in promoting sustainable e-waste management amongst private security companies within the private security industry. Five themes emerged from the data obtained from the participants using semi-structured interviews: awareness and adoption of sustainable e-waste management, economic incentives for e-waste management in the private security industry, barriers to sustainable e-waste management in the private security industry, leveraging theoretical frameworks for structured e-waste management model and lastly challenges and opportunities for disruptive innovation in e-waste management.

The findings reveal a significant gap in awareness and implementation of sustainable e-waste management practices, attributed primarily to limited understanding of existing regulations and economic incentives. Recommendations include enhancing educational initiatives to raise awareness and optimising incentive structures to promote sustainable practices within the industry. Future research should focus on longitudinal studies assessing the long-term impacts of economic incentives on e-waste management behaviours and the role of disruptive technologies in facilitating sustainable practices. This study's limitations include a limited sample size and potential biases in self-reported data, which suggest caution in generalising the findings across the broader industry.

Keywords: Disruptive Innovation, Economic Incentives, E-Waste Management, Private Security Industry, Private Security Company

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List of Acronyms

AI	Artificial Intelligence
BD	Business Development
BBBEE	Broad-Based Black Economic Empowerment
CCTV	Closed-Circuit Television Cameras
CEOs	Chief Operating Officers
e-waste	Electronic Waste
EEE	Electrical and Electronic Equipment
EoL	End-of-Life
EPR	Extended Producer Responsibility
EU	European Union
GPS	Global Positioning System
IoT	Internet of Things
ISO	International Organisation of Standards
OECD	Organisation for Economic Cooperation and Development
OEM	Original Equipment Manufacturer
PRI	Producer Responsibility Initiatives
PSC	Private Security Company
PSI	Private Security Industry
PSiRA	Private Security Industry Regulatory Authority
RRRR	Recycling, Reusing, Restoring, and Renewing
WEEE	Waste Electrical and Electronic Equipment

CHAPTER 1: Introduction to the Study

1.1 Introduction

This thesis investigated the impact of economic incentives on electronic waste (e-waste) management in South Africa's private security industry (PSI), particularly in the province of Gauteng. The central aim of this study was to examine how innovative technological advancements not only introduce uncertainty and volatility into markets but also create new opportunities and result in the production of considerable amounts of e-waste. E-waste represents a pressing global challenge escalating at an unprecedented rate, outpacing all other forms of waste. If not managed effectively, it poses considerable environmental risks that must be addressed. (Ichikowitz & Hattingh, 2020).

1.2 Context of the Study

Hsu, Wang, and Stern (2024) defined e-waste as Electrical and Electronic Equipment (EEE), with its by-product being Waste Electrical and Electronic Equipment (WEEE). Artang (2023) expounds on this definition, indicating that EEE is wide-ranging, whereas WEEE explicitly refers to electronic devices that have reached their End-of-Life (EOL) cycle. It includes various large household devices, such as fridges and washing machines, and smaller devices, such as remote controls and panic buttons (Vara et al., 2019). This research's focus was limited to security aids that assist private security companies (PSC) in fulfilling their obligations to their customers, such as crime detection systems in the form of closed-circuit television cameras (CCTV), aerial drones, and alarm systems. Data storage devices include Network Video Recorder and security communication tools such as two-way radios.

Higher supplies of EEE have been linked to the maturation of global economies (Jain et al., 2023), while adopting new technologies in these global economies will generate a comparable or more significant amount of e-waste. In support of this view, academics point to evolution's nature; individuals increasingly rely on technology to enhance and improve their livelihoods. Balde, Forti, Gray, Kuehr, and Stegmann (2017) made a striking prediction that the global production of WEEE would surpass an astounding 52.2 million tonnes (Mt) by 2021. This prediction came to fruition. However, it did so 3 years earlier with an alarming figure of 53.6 Mt in 2019 (Forti et al., 2020). According to the United Nations University, the figure is expected to reach 74.7 Mt by 2030. The rate of unaccounted WEEE from obsolete technologies in the window of 2019 was reported at

82.6% for all global combined industries (Forti et al., 2020). Its monetary value was estimated to be over 60 billion U.S. dollars from its raw materials, meaning that only 17.4 % was realised and circulated into global economies (Altvest, 2023).

E-waste has created a significant market for valuable materials that can be effectively recycled and recovered. The statistics revealed that the contemporary e-waste management strategies were fragmented globally and failed to incorporate product design, raw sourcing and manufacturing, final waste disposal and recycling, and waste management (Liebenberg, 2024). As such, it is no surprise that private security companies that supply electronic technology lack a systematic approach to safe e-waste disposal and management.

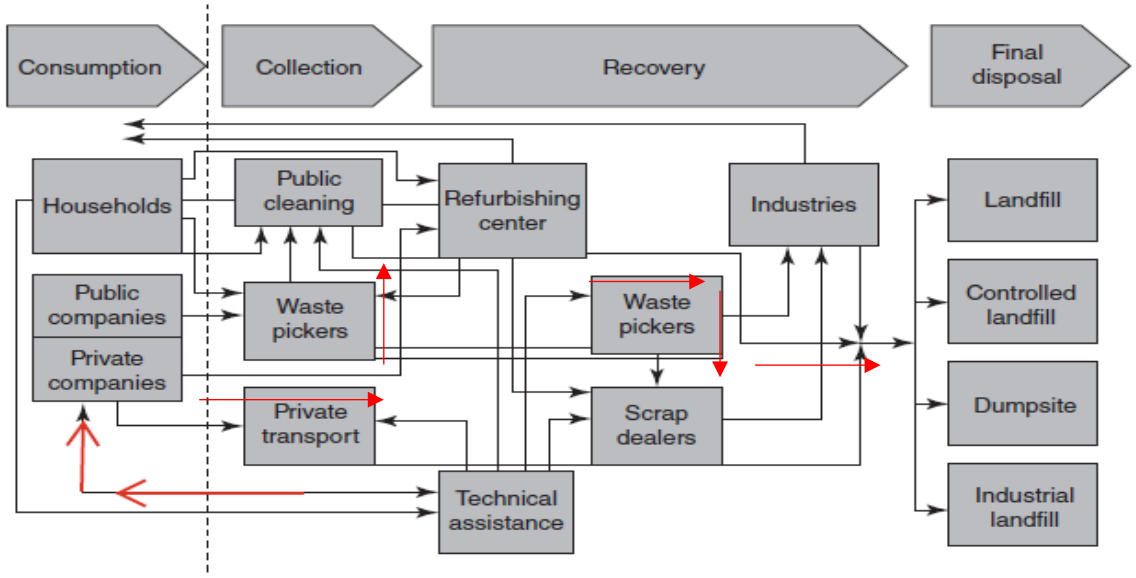

Figure 1.1: Electronic Waste Management Flowchart

Source: Holuszko et al. (2022).

Figure 1.1 shows the e-waste process from consumption to collection, recovery, and final disposal, highlighting the actors involved at each stage. The red arrow indicates the current flow of e-waste from private companies. However, it does not reflect the actual reality on the ground as it only illustrates the formal flow of collection, recovery and disposal in harmony. PSC services and provides security technology to a wide range of clients, such as hospitals, academic institutions, private businesses, households and government departments. These clients do not all follow uniform processes in the management of e-waste and, therefore, are likely to influence how PSCs conduct their business in relation to them.

1.3 Need for the Research

1.3.1 Academic and Theoretical Need for the Study

There is limited academic literature, minimal empirical data, and a lack of theoretical evidence from the PSI or health regulators regarding the PSC's e-waste management practices in South Africa. Consequently, this made the researcher assume that there were limited pro-recycling behaviours and no economic incentives to promote effective e-waste management practices. A significant amount of research has been carried out on the management of global e-waste. A more focused study was required to examine how economic incentives for pro-recycling within the PSI could foster the desired behaviours.

Furthermore, during the data collection for this research, no other information was available to identify the factors contributing to the significant obsolescence of EEE in South Africa's private security industry. Some scholars suggested that WEEE, in general, arose from "a lack of awareness of government policies and legislation such as take-back or collection schemes" (Baldé et al., 2017, p. 62). This brought questions concerning the nature of awareness, including positive and negative incentives. In contrast to this view, Krishnamoorthy et al. (2018) emphasise that the rapid proliferation of new electronic technologies, which often have limited lifespans, is a significant factor contributing to obsolescence. This trend has resulted in a considerable increase in electrical waste.

The two contradictory views regarding the cause of e-waste volumes compelled the researcher to interrogate academic theories attempting to explain this phenomenon. Two theories came to light: The Incentive and Disruption Innovation theories. The incentive theory is an economics, psychological, and behavioural science concept, suitably essential for thinking about society and societal problems (Laffont & Martimort, 2001); it conceives that people are motivated by external forces to act positively and are primarily driven by the desire for incentives whether physical (i.e., food, money) or non-physical (i.e., praise, social acknowledgement, and complements) (Hreha, 2023). It is worth noting that the discarding process of e-waste is entirely voluntary, and collectors or disposers do so of their own volition. (Holuszko, Kumar, & Espinosa., 2022).

Participation in e-waste management begins at the individual level. Understanding the motivations behind an individual's e-waste practices can illuminate broader e-waste behaviours. Utilising incentive theory, the researcher investigated whether company

executives are aware of the economic benefits of recycling e-waste and whether this awareness ensures their engagement in the value chain. Furthermore, if these executives had previously been uninformed and had since acquired this knowledge, would they have been inclined to participate? Additionally, which factors would serve as motivations for their involvement?

One view is that individuals, institutions, and businesses plan to receive incentives to avoid the consequences that may come with receiving negative incentives (Laffont & Martimort, 2001). Sappington (1991; 45) postulates that the incentive theory assumes that specific tasks and obligations are too complex or costly for the individual to perform alone; therefore, PSCs could act as catalysts or intermediaries between disposers and collectors of e-waste. Understanding Clayton Christensen's models of disruptive innovation theory (1995) was essential, as it served as a key framework for deciphering technological dynamics within the PSI (King & Baatartogtokh, 2015). One scholar suggests that lower production prices and new technology in the market cause civic and commercial sectors to substitute outdated electronic products with new technology, generating large amounts of e-waste (Jain et al., 2023).

The researcher identified academic literature indicating that smartphones are the only industry where a direct increase in WEEE of smartphone devices is linked to introducing new products suggesting a form of planned obsolescence. (Rautela et al., 2021). Other academics point to the effects of COVID-19, which introduced remote employment that required new physical and technological devices for those who could afford them. The global pandemic also propelled some product upgrades for those who wanted their old physical and technological hardware to be compatible with newer communication software for learning and working (Maes & Preston-Whyte, 2022). In this sense, disruptive innovation is reshaping the technology landscape, significantly increasing e-waste. While it may be accurate that the PSI provides a platform for disruptive, innovative technologies outpacing traditional physical technologies in the sector, validating or questioning this viewpoint is crucial.

Thus, this study's research question concerns how economic incentives motivate private security businesses in the Gauteng Province, South Africa, to change their behaviour and embrace disruptive technology while embracing sustainable practices for responsible e-waste management.

1.3.2 Business Need for the Study

The booming global private security industry was anticipated to surpass $257 billion by 2024, fuelled by an average annual growth rate of 5.8% (World Metrics, 2024). At face value, technology has disrupted the traditional way of conducting business within the private security industry, which is that of a labour-intensive physical security service provider. Private security companies in tune with changing technological disruptive times have used drones as security deterrents, artificial intelligence (AI) for data gathering and analysis, CCTV for incident management, and biometrics identification systems for improved client efficiency and security (Nanalyze, 2017). The efficient disposal of obsolete devices is a pressing concern that cannot be overlooked. However, it is crucial to recognise that not all security equipment is becoming obsolete at an alarming rate. The limited lifespan primarily impacts physical hardware, often failing to remain compatible with the rapidly evolving software landscape.

The PSI largely relies on electronic technology for its efficient operation; however, it lacks a systematic approach to safe e-waste disposal and management (Liebenberg, 2024). The PSI is experiencing rapid growth and is the second-fastest growing industry in South Africa after mining, valued at over R50 billion (Altvest, 2023). The industry's speedy growth aggravates poor e-waste management practices, as vast amounts of EEE are discarded without proper management.

Forti et al. (2017) observed that the rapid supply of such technology significantly contributed to the e-waste lockstep crisis in myriad ways. First, through short product lifespans, some products do not reach the EOL cycle and will be disrupted by the introduction of newer technologies and, therefore, become obsolete in the hands of the consumer, who may or may not know what to do with the outdated devices. Secondly, some consumers may not be disposing of obsolete devices because of a lack of knowledge of the pull economic incentives, which could be positive in the form of tax benefits, grants and subsidies, cash rewards, and trade-in discounts. It could also be a lack of negative incentives through fines or penalties compelling them to act with impunity (Forti et al., 2017).

The regulatory authority responsible for overseeing the South African private security industry is the Private Security Industry Regulatory Authority (PSiRA), which is mandated to ensure the overall compliance of all registered security companies and security guards. According to PSiRA (2020), there has been a significant increase in electronic detection security supplied by security companies to end-user consumers. However,

diligently searching through PSIRA's website and comprehensively reviewing PSIRA's annual reports since its establishment in 2001 exposed a striking absence of references to key terms such as 'e-waste', 'waste management', 'WEEE', 'recycle', 'reuse' and 'environmental health'. The absence of tangible policies and procedures explicitly addressing e-waste management within PSiRA's regulatory framework suggests that registered PSCs may not be informed about the potential benefits and dangers of improperly handling WEEE.

Exploring economic incentives in e-waste management lays a foundation for business and academic discourses on sustainable and effective e-waste practices within the PSI. The researcher did this by focusing on PSCs' awareness and technical barriers, i.e., enquiring about knowledge of e-waste recycling processes, logistical and financial ability to participate in the e-waste life cycle, and technological advancements' role in their business. The researcher assumed that PSCs were more likely to consider e-waste recycling when offered economic incentives such as monetary rewards.

The spread of e-waste has inadvertently created a market for valuable materials which can be effectively recycled and recovered if fully capitalised upon and invested in. Without a determined attempt to tap into the PSI's e-waste, this prospect will always present itself as a missed business opportunity, with the potential to generate revenue remaining immaterialised. This research aims to help business practitioners, policymakers, and industry stakeholders promote sustainable economic growth in the industry using exploratory methods.

1.4 Research Assumptions and Objectives

The research examined the significant role that economic incentives could play in the management of e-waste in the PSI in Gauteng, South Africa, guided by several key assumptions.

Assumption A: There is a significant lack of awareness regarding the economic and environmental benefits of e-waste, which results in a notable absence of formal e-waste policies among private security companies.

Assumption B: Ineffective e-waste management in the PSI stems from multiple factors, including limited awareness of sustainable e-waste practices, a deficiency in economic incentives like tax breaks and subsidies to promote proper disposal, and existing regulatory gaps in government policies and industry frameworks.

Assumption C: Implementing positive economic incentives (i.e., monetary rewards and tax benefits) will enhance e-waste collection and recycling rates more effectively than punitive measures.

The assumptions addressed the first part of the leading research question, which focuses on how economic incentives affect motivation for participation in South Africa's private security industry.

Building on these assumptions, the study sets four specific objectives:

1. **Identify Economic Incentives for E-Waste Managemen**t: Explores existing economic incentives and their suitability in the face of rapid technological advancements led by disruptive innovation.

2. Investigate Barriers to E-Waste Management: Analyse the primary challenges that hinder effective e-waste gathering, processing, and discarding, with particular emphasis on awareness, technical limitations, and regulatory gaps within the private security industry.

3. Design a Framework for Sustainable E-Waste Management: A comprehensive model informed by incentive theory to promote responsible WEEE management, address regulatory gaps, and formulate incentives suited to conditions unique to South Africa's private security companies.

4. Contribute to Policy and Practice: Provide actionable recommendations for policymakers, regulators, and private security companies to enhance e-waste management and making an academic contribution in scholarly discussions regarding sustainable approaches to e-waste management.

The objectives outlined above clearly emphasize the second part of the research question, which addresses the impact of technological innovation on WEEE capacity and whether there is a direct relationship between the two. Additionally, these objectives explored the related sub-questions regarding the design of a framework that South African private security companies could implement to enhance participation in e-waste recycling and reap economic benefits. Table 1.1 outlines the alignment of the assumptions and objectives of the study.

Table 1.1: Assumptions and Objectives

Assumption	Objectives	Alignment
A: Private security companies lack formal e-waste policies and, as a result, fail to recognise the economic and environmental value of e-waste.	**Objective 2**: Investigate barriers to e-waste management (e.g., lack of awareness, policy gaps).	The assumption highlights the lack of policies addressed by exploring barriers.
B: Poor e-waste management is caused by a lack of awareness, insufficient incentives, and regulatory gaps	**Objective 1**: Identify economic incentives to motivate sustainable e-waste practices.	The assumption identifies insufficient incentives, which is addressed by exploring incentives.
	Objective 2: Examine barriers to e-waste management (e.g., lack of awareness, policy gaps).	The assumption highlights regulatory gaps and lack of awareness, which are addressed here.
C: Positive economic incentives are more effective than punitive measures in improving e-waste collection.	**Objective 1**: Explore economic incentives to motivate e-waste management.	The assumption emphasises the need for positive incentives, which is the focus of this objective.
	Objective 3: Design a framework for sustainable e-waste management, incorporating economic incentives.	The assumption supports the development of a framework that leverages positive incentives.
General Goal: Improve e-waste management in the PSI.	**Objective 4**: Contribute to policy and practice by providing recommendations for stakeholders.	The overarching goal is addressed by offering practical solutions and policy recommendations.

1.5 Research Problem

There is a rapid increase in the use of EEE with a limited life span, leading to obsolesce as technology advances in the PSI, ultimately resulting in WEEE. "Electronic waste … is one of the fastest outdated matters in the field of solid waste" (Awasthi et al., 2022, p.

1). It contains valuable metals, and when processed systematically, it is estimated that $91 billion could be generated annually (Baldé et al., 2024). South Africa generated over 400 kilotons of e-waste from EEE in 2019, with a potential value of R280 million. Only 13.8% of this value was recovered (Hodgkinson & Schoeman, 2018; Moyo et al., 2022). This highlights a significant missed opportunity for economic growth in the general recycling industry, which could support South Africa's gross domestic product. Other benefits also include a clean environment, as some e-waste contains dangerous pollutants which pose a risk to humans and animals.

This research explored economic incentives in the management of electronic waste within South Africa's private security industry. It aimed to provide practical solutions to change current practices, promote innovative sustainability, and uncover the hidden economic opportunities that lie in waste electrical and electronic equipment in the industry through recycling, reusing, restoring, and renewing (RRRR)This research explored economic incentives in e-waste management within South Africa's private security industry. It aimed to provide practical solutions to change current practices, promote innovative sustainability, and uncover the hidden economic opportunities that lie in e-waste in the industry through recycling, reusing, restoring, and renewing (RRRR).

1.6 Research Setting

The research was conducted in Gauteng. According to the PSiRA 2022/23 Annual Report, Gauteng has the highest number of registered security service providers in South Africa, totalling 6,110. This figure constitutes 40% of all registered security businesses across the nation. In comparison, Kwa-Zulu Natal has 2,675 registered providers, while the Northern Cape reports the fewest, with only 255 registered PSCs.

The significant presence of PSCs in Gauteng renders it a pertinent location for investigating industry dynamics related to electronic waste and disruptive technology. Furthermore, as of 31 March 2023, Gauteng recorded an overwhelming total of 1,025,820 registered security officers, compared to 536,851 in Kwa-Zulu Natal and 29,575 in the Northern Cape (PSiRA, 2023). The substantial number of private security service providers in Gauteng indicates an urgent demand for enhanced security measures among residents and businesses within the province.

1.7 Research Approach

The researcher conducted a pilot study involving two individuals to evaluate the effectiveness of a semi-structured interview guide per the recommendations of Dayanand and Chaudhary (2024) and Gill et al. (2008). Subsequently, the researcher collected data from 12 participants through online semi-structured interviews. The researcher intended to gather data from 20 participants. However, many executives from security companies declined to participate. Some cited a lack of knowledge about e-waste, while others expressed concerns that taking part could imply guilt or indicate they were unaware of a potentially criminal issue. An online tool, Read AI, was used for real-time transcription from voice to text, which was catalogued and transferred to another AI tool called Atlas.ti for thematic analysis.

The researcher adopted an interpretivist philosophy highlighting the importance of creative problem-solving in managing WEEE, particularly in light of disruptive innovation (Alharahsheh & Pius, 2020). This approach underscores the value of diverse perspectives among executives in private security companies. The researcher conducted a comprehensive qualitative data analysis through an inductive methodology, carefully filtering out irrelevant information (Ranasinghe & Perera, 2022).

1.8 Report Outline

Chapter 1 explored electronic waste (e-waste) and its importance for business and academia, highlighting the need for effective management and the economic potential in recovery. It discussed the context of Gauteng South Africa and identified missed opportunities for the PSI. It outlined research objectives which included goals and policy recommendations aligned with e-waste challenges. It also included the research approach and outline of subsequent chapters for this research.

Chapter 2 presents the Literature Review, which encompasses the definition and global trends in e-waste generation. It explores theories that explain the e-waste phenomenon, specifically through the lens of incentive and disruptive innovation theory. Additionally, the chapter examines existing South African policies and assesses their effectiveness within the PSI. It discusses the economic incentives available and the barriers to implementing such practices.

Chapter 3 is the research question and sub-questions that the researcher aspired to answer in this research. It consists of one main question and three sub-questions.

Chapter 4: Methodology and Research Design. This chapter outlines the qualitative research design and its rationale, including the data collection method and participant recruitment. It also explains the data analysis process, including transcription and thematic analysis. Ethical considerations are addressed, including how ethical issues were managed and the study's limitations.

Chapter 5 delves into the analysis of research findings, focusing on the demographic details of the participants involved in the study. It highlights the key themes from in-depth interviews, providing a rich narrative of their experiences. The findings are systematically organized into thematic categories, allowing a clearer understanding of the overarching trends. Additionally, the chapter identifies specific barriers participants face, exploring their implications for practical applications in the field. This comprehensive examination sheds light on the challenges encountered and offers valuable insights for practitioners seeking to navigate these obstacles effectively.

Chapter 6 focuses on the Interpretation of Findings, analysing results in relation to existing literature and theoretical frameworks. It explores the dynamics between positive incentives and punitive measures and their effects on stakeholder behaviour in e-waste management. It includes policy recommendations designed to improve e-waste management practices and enhance stakeholder engagement, addressing gaps identified in the findings for a more sustainable approach.

Chapter 7 concludes the research by summarising key findings and insights. It examines the implications for the private security industry in managing electronic waste (e-waste) effectively and discusses how firms can implement sustainable practices to protect sensitive data. Additionally, it outlines future research directions and highlights areas that require further investigation. These recommendations aim to improve understanding of e-waste challenges and opportunities, ultimately fostering better strategies for both the security sector and environmental sustainability.

CHAPTER 2: Literature Review

2.1 Introduction

The literature review served as a crucial methodological framework that systematically bound the introductory elements of research. It served as an epistemological unifying structure, effectively aligning the research topic, problem statement, objectives, and research questions. Its importance was undeniable; it was key to establishing the credibility and authenticity of this research report.

The literature on exploring economic incentives, disruptive innovation, and e-waste management in South Africa's Gauteng province focused on the private security industry (PSI) within the context of the e-waste space. This study aims to comprehensively examine the factors influencing the behaviour of private security companies and to identify effective incentives that promote responsible e-waste management practices.

A thematic exploration approach was deemed ideal to achieve this objective. Snyder (2019) emphasises the importance of moving away from outdated literature review methods, which may suffer from a lack of thoroughness and consistency. Thus, the researcher aimed to address these concerns by employing the thematic literature review. This method was a preference for academics to systematically identify and analyse trends and patterns across various forms of academic writing, research reports, journals, conferences, and numerous other studies by categorising the literature into distinct themes (Hecker & Kalpokas, 2025). Table 2.1 below shows three themes that the thematic literature review systematically generated.

Table 2.1: Themes for the Literature Review

Theme 1: Economic Incentive for Sustainable E-Waste Management
Theme 2: Disruptive Innovation in the Private Security Industry
Theme 3: Effective E-Waste Management in Technological Transition

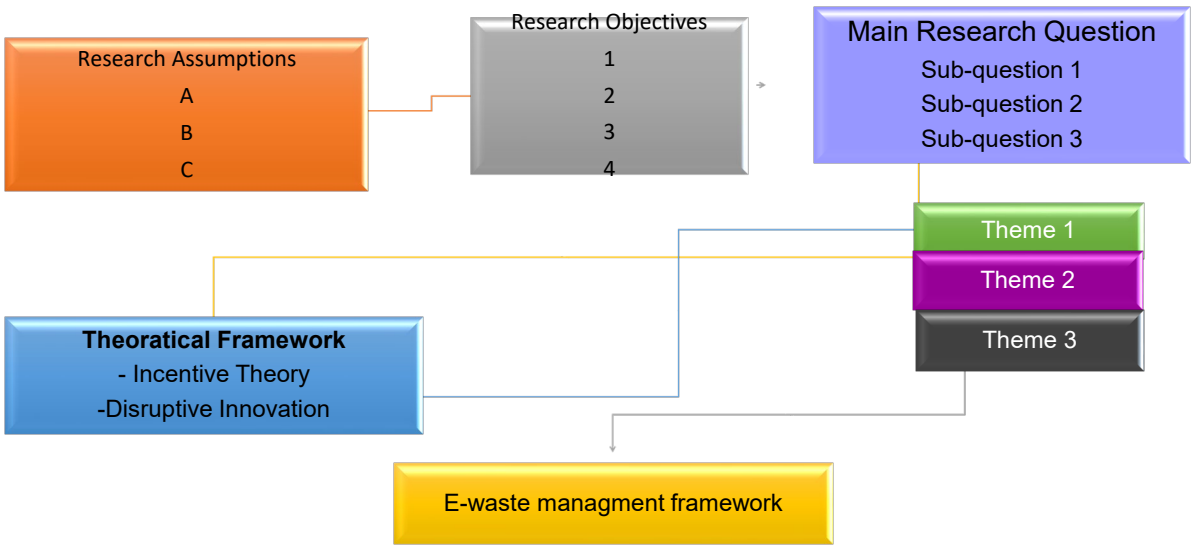

Figure 2.1: Literature Review Sequential Flow

Figure 2.1 illustrates the sequential flow of the thematic literature review. It highlights how the research was driven by specific assumptions and objectives, which informed the development of the research questions. These questions identified three key themes, all of which were explained through the theoretical frameworks of incentive theory and a subordinate disruptive innovation theory. These frameworks will assist in developing an e-waste management framework for the PSI.

2.1.1 Operational Definitions of Terms

The academic examination of this thesis began by introducing the comprehensive concept of the PSI and its components as a preliminary epistemological foundation of this study since it centred on the actors within this industry and their participation in e-waste management, as outlined in Chapter 1.

2.2 Private Security Industry

As with most definitions, the researcher could not find any universally accepted consensus on what constitutes a PSI, let alone its actors, due to its complexity and the differing legislative requirements of participation from country to country. Confined within the dictates of scholarly discourse, the terms' private security sector, ' 'non-state funded security actors, ' and security sector' were employed synonymously when referring to the PSI excluding private military services (Backgrounder, 2024). Individuals in the security sector defined by the Geneva Centre for Democratic Control of Armed Forces (2015)

were also excluded in this study's definition to maintain conceptual fidelity and consistency.

Private security companies are, by nature, reclusive, so it was no surprise that the researcher did not find credible information sources about the state of private security worldwide due to the sensitive nature of their work. The searcher specifically limited the definition of a private security company in South Africa to the one provided by PSiRA (2001). This Act defines the PSI as a legitimate tool for individual and corporate self-protection, pivotal in combating crime through proactive measures and effective incident management that uphold law and order within the Republic of South Africa (PSiRA, 2023a). Thus, the same Act outlines that a private security company denotes any statutory entity registered with PSiRA that delivers security services for remuneration.

As stated in Chapter 1, the data obtained from PSiRA is distinctly limited to the number of registered private security companies and their employees, providing no details on the use of technologies. Recognising a significant lack of data was crucial, even among European advanced economies. Their regions' private security industry conditions are strikingly similar to those on the African continent, although European countries typically offer slightly more comprehensive data. For example, Estonia's 2016 findings suggest that their PSCs rely heavily on physical security labour, with over 43% of the workforce dedicated to it, while security technologies occupy nearly 30% (Light et al., 2022). This striking revelation underscores that technological advancements have not eliminated or replaced the necessity for physical security.

Continuing with the Estonia example, it is worth noting that the latter is a member of the European Union (EU), which enacted public WEEE legislation as early as 2003; however, available literature indicates that the rates of recycling, reusing, restoring, and renewing (RRRR) in the last five years within the country and the EU have not shown any significant changes (European Union, 2024). Scholars point to several factors as contributing to this issue, primarily highlighting the lack of awareness among end users about EEE.

In a recent study, Artang (2023) highlights the growing awareness surrounding e-waste regulations among various stakeholders as the sole cause of the increase in e-waste volumes. However, Liebenberg (2024) argues that this awareness has not translated into action, as many individuals and private companies, such as those that one may find in South Africa operating within the private security industry, continue to neglect a

systematic and responsible approach to e-waste disposal. This troubling trend suggests that the issue goes deeper than mere lack of information

The researcher observed that one factor in South Africa that possibly deterred participation in e-waste practices in the PSI was that the country had developed stringent laws, such as the Protection of Personal Information Act, for handling physical security devices that contained sensitive data (Evolution PR & Galix, 2024). Gauteng-based PSCs had to pass that hurdle to contribute to and benefit from the e-waste recycling sector.

Shevchenko et al. (2019) pointed out that understanding clients' behaviour in these private security businesses was sacrosanct in the e-waste ecosystem. They posited that the latter was the driving force behind the demand for electronic products and a potential barrier to proper e-waste management by not voluntarily disposing of their WEEE. The researchers argued that voluntary disposal at a mutually acceptable fee would have benefited both parties and tapped into the monetary potential of e-waste mentioned in Chapter 1. Since PSCs were by definition and design profit-driven, it was suggested that financial incentives could have helped encourage e-waste recycling by overcoming the general lack of interest when there was more to gain in the form of access to new supplier markets through their clients and consumer markets through e-waste recyclers.

2.3 Understanding Electronic Waste

The concept of e-waste has sparked vibrant scholarly discussions, standing out for its clarity and practicality, unlike the earlier, more abstract idea of PSI. This lively engagement highlighted the importance and relevance of understanding e-waste in today's world. However, it is still inconceivable to pin e-waste to one definition or compress it to a comprehensive list of products because electronic parts constantly evolve, including traditional electronics that could not qualify as e-waste (Meidl, 2023). It is essential to understand EEE and how it is transformed into e-waste. Baldé et al. (2024) define EEE as all products with a circuit board or electrical parts fitted with a battery or power supply. By Meidl's (2023) definition of e-waste, the researcher interpreted this term to encompass all unwanted, non-functional, and obsolete electronic devices that are approaching or have reached their EOL, which are destined for recycling, reusing, restoring, and renewing (RRRR).

Meidl (2023), along with Thakur and Kumar (2021), Shahabuddin et al. (2022), and Yu et al. (2022), agree that WEEE comes from various electronic devices. This includes

computers, electric vehicle batteries, solar panels, GPS devices, security scanners, mining cooling and power supplies, household items such as electric stoves, refrigerators, phones, video games, televisions, and health and medical monitoring and imaging equipment.

The researcher limited the understanding by excluding small electronic units of all the recyclable metals found in e-waste. This clarification in an academic context is essential, as e-waste is broad and encompasses all discarded electronics.

Consumers often lack awareness of best practices for disposing of outdated devices. Second, a scarcity of incentives, both positive and negative, hinders responsible disposal behaviours (Baldé et al., 2017). Although security companies primarily focus on safeguarding data on electronic devices, the literature suggests that their role could also include managing e-waste logistics to transport discarded electronics to recycling centres (Kaur et al., 2022). The potential source of e-waste is shown below in Figure 2.2.

The researcher opted for the position that PSCs catered to all the identified e-waste generators as per Figure 2.2, albeit utilising security technologies at differing life cycle levels. The significance of disruptive innovation theory is evident in the researcher's perspective that contributors to e-waste can be categorised as established industries. Therefore, emerging newer technologies would threaten these established industry players with radical market changes, leading to business model and operational process transformations (Csernatoni & Martins, 2023). In other words, not all contributors to e-waste may embrace these changes. A pertinent example in the South African market is government departments that decommission technology and retain it in storage until it has lost its economic viability because of stringent legislation for the disposal of government equipment.

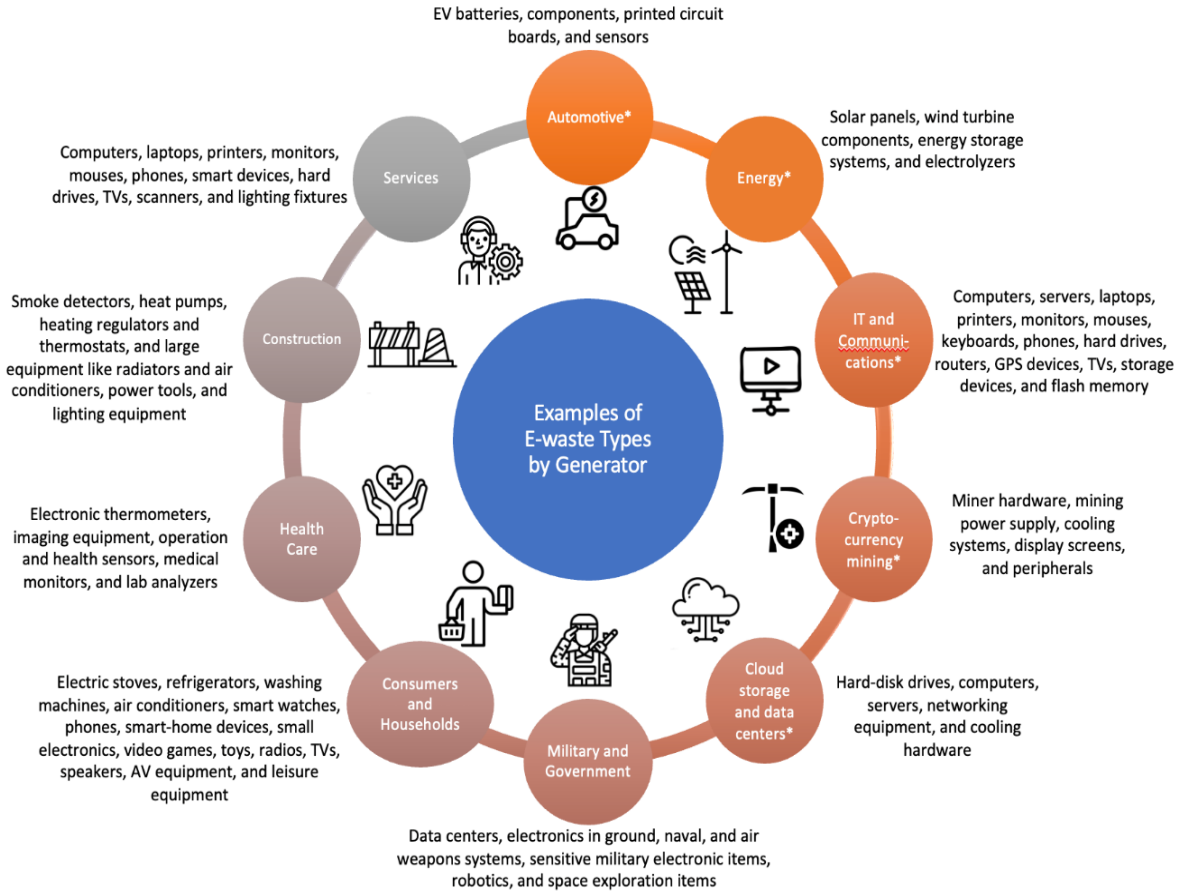

Figure 2.2: Examples of E-waste Types by Generator

Source: Meidl (2023).

2.3.1 E-Waste Lifecycle

Baldé et al. (2024) claim that rapid technological disruptions in the last decade have increased technology consumption, which has shortened the lifecycles of existing EEE, worsened by insufficient options to repair EEE or adequately recycle it due to limited e-waste management infrastructure. From 2010 to 2022, global electronic waste (e-waste) production increased notably, rising from 62 billion kilograms to 96 billion kilograms. Projections indicate that this figure could reach over 130 billion kilograms by the early 2030s. In 2022, Europe led e-waste production, generating 17.6 billion kilograms, followed closely by Oceania at 16.1 billion kilograms and the Americas at 14.1 billion kilograms. These regions together accounted for over 70% of the entire WEEE produced during this period (Baldé et al., 2024).

Nell et al. (2022) state that South Africa generated 416 Kilotons (Kt) of e-waste in 2019. This was the most recent official figure from reliable literature journals with peer reviews published by an arm of the country's government. Worth noting from the report was that

it did not detail the recycling figures as "data [from] the waste sector is generally poor" (Nell et al., 2022, p. 52). As mentioned before, e-waste stands apart from other types of general waste in that it contains many intertwined components, including metals, plastics, and glass. These devices may also hide toxic chemicals released during recycling or disposal. As a result, disposing of and recycling WEEE presents dangers to recyclers and disposers alike (Rautela et al., 2021).

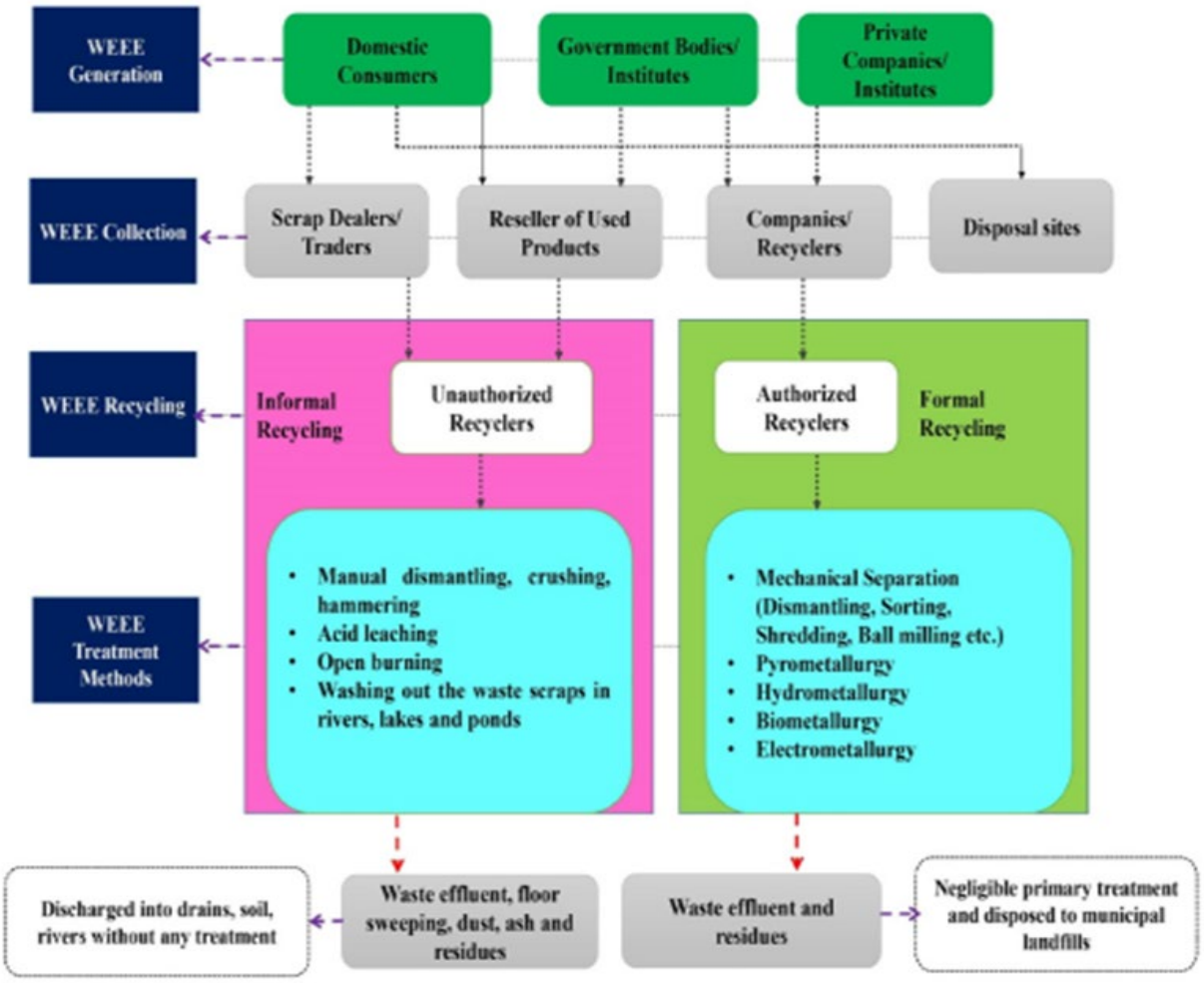

Figure 2.3: Informal and Informal E-waste Cycles

Source: Rautela et al. (2021).

Per Figure 2.3, formal WEEE recycling involves scientific and mechanical e-waste processing to recover valuables by authorised recyclers. Unsurprisingly, the literature review revealed that a handful of formal e-waste recycling centres operate worldwide, such as the Rönnskär smelters, Japan's Kosaka recycling and Austria's Kayser recycling (Rautela et al., 2021). Informal WEEE recycling is the backyard unscientific and manual method of extracting valuable resources from e-waste conducted by unskilled people without proper protective equipment, exposing themselves to the dangers of e-waste

mentioned above. Forti et al. (2020) reported that approximately 82.6% of all global e-waste was recycled informally. This indicates that South African companies were likely involved in informal recycling practices.

E-waste mainly comes from businesses (such as hospitals and government agencies), equipment manufacturers, and households. It is suggested that consumer behaviour significantly impacts e-waste management, as individuals have a dual function of user and owner of electronic devices, and their lack of participation can hinder recycling management efforts (Yafen & Shevchenko, 2021). E-waste accumulates due to a high volume of discarded EEE and underdeveloped collection and recycling systems (Baldé et al., 2024). Rapid technological advancements often lead to the premature disposal of devices, increasing global e-waste (Yafen & Shevchenko, 2021). In South Africa's PSI, companies generate e-waste from equipment like CCTVs, sensors, and alarm systems during their operations. This was supported by data that revealed that "most of South Africa's e-waste volumes is [stored] or [illegally] disposed of in landfills owing to a lack of formal take-back schemes and consumer awareness" (Mohieli, 2022, p. 29). This gives the informal recycling sector in Africa a pivotal function in managing WEEE and waste in general.

Recent studies by Forti et al. (2020), Debnath et al. (2019), and Alghazo et al. (2018) posit that existing literature on electronic waste relies on government involvement and specific policies by certain continental bodies. Khumalo (2021) argues that such an approach has neglected the broadened understanding of the entire value chain. Specific research on e-waste disposal and management behaviour within the private sector has yet to receive significant academic attention.

2.3.2 E-Waste Global Legislative Frameworks

There was a strong need for a synchronised, world and regional approach to e-waste legislative frameworks, monitoring, and compliance mechanisms because countries in Africa possess the least comprehensive e-waste legislation of all continents. This is despite reports that, in 2019, 71% of the global human population was protected by a form of legislation that covered the latter (Maes & Preston-Whyte, 2022). Table 2.2 shows the global regulatory landscape governing e-waste:

Table 2.2: Global Legislation on E-Waste

Key International Framework	Purpose	Amendments
Basel Convention	Directly addresses e-waste as hazardous to minimise health and environmental risks from global waste trading by controlling how it's moved and disposed of.	1992: amended to include harsher controls on e-waste requiring prior informed consent for its transboundary movements
Bamako Convention	Bans hazardous waste importation into Africa and regulates its movement within the continent.	In 1991, twelve nations negotiated 1998: Implemented and ratified by 23 nations.
Organisation for Economic Cooperation and Development (OECD) Decision on Transboundary Movements of Wastes	Encourages the responsible trade of select waste types among OECD countries, safeguarding the environment for future generations.	Agreed upon in 2024 and Effective changes due 2025
EU's Waste Electrical and Electronic Equipment Directive	EEE producers should be accountable for their products' entire lifecycle, including collection, recycling, and disposal.	Amended in March 2024
Extended Producer Responsibility (EPR) laws	Mandates manufacturers to manage the EOL phase of their products	Amended in 2020

Key International Framework	Purpose	Amendments
International Electronical Commission standard 63395	Focuses on e-waste at the source, provides the guidelines for recovering products and components from e-waste effectively	To be published in 2024

Source: Maes and Preston-Whyte (2022).

2.3.3 Sustainable E-Waste Management for the Private Security Industry

E-waste management has become a global challenge because of its negative impact on human health and the environment (Yafen & Shevchenko, 2021). Maes and Preston-Whyte (2022) posit that global WEEE management systems are fragmented; they do not integrate product design, sourcing, production, consumption, and RRRR into a consistent strategy. There was generally no indication of any sustainable e-waste management in the PSI and among PSCs in South Africa. It must be noted, however, that South Africa or Africa alone is not the only one affected by this; other European and American countries also do not have sustainable WEEE management practices (Rautela et al., 2021).

The global outlook on e-waste indicated that the volume of e-waste inputs was poorly managed internationally (Ichikowitz & Hattingh, 2020). This highlighted the inability of the PSiRA to take proactive measures, as it remained inactive and silent regarding WEEE management in the PSI. Several searches through literature and published works on WEEE management within the PSI generally yielded no substantial information, confirming that the topic was still largely absent in the global discourse. If any efforts were underway, they seemed to have happened at the individual PSC level, insufficient to attract significant academic interest.

Baldé et al. (2024) stated that the management process of e-waste essentially began when the owner discarded it. The discarded electronic waste began an informal or formal recycling journey, typically involving collection, storage, and pre-treatment (dismantling, shredding, sorting, or cleaning). It moved on to processing for repairing, reusing, recycling, or recovering other valuable materials. Yafen and Shevchenko (2021) believe

that each country, industry, and organisation has its own logistical methods of disposing of waste. Researchers suggest that in South Africa, the recycling process of e-waste is not financially viable, particularly for small and medium companies whose primary responsibility is physical security and not recycling (Holuszko, Kumar, & Espinosa., 2022). The researcher proposed that to effectively encourage sustainable e-waste management by PSCs, a comprehensive awareness and e-waste education program designed by PSiRA for the industry stakeholders was needed.

2.4 The Incentive Theory

According to Cherry (2023), Incentive theory is a study within the broader theory of motivation stipulating that planned or unplanned behaviours are provoked or stimulated by exogamous motivations or reinforcements, not internal forces. Behaviours are, therefore, influenced or reinforced by external factors, and actors are not driven to act by internal states, such as acting aggressively due to anger. The same author further suggested that actors are propelled into action by what Skinner (1953) termed environmental events such as deprivation, satiation, and aversive stimulation. This contrasts with traditional motivation theories such as Maslow's hierarchy of needs and Hertzberg's two-factor theory (Robbins & Judge, 2023), which suggests that individuals are thrust into action by internal or intrinsic motivation forces.

The United Nations Development Programme (2006) defined motivation as a key measurement of the ability of individuals, organisations, and societies to perform functions, address challenges, and set and achieve goals. Therefore, incentives and incentive systems play a central role in enhancing capacities and concerting such enhanced capacities into better behaviour and performance.

According to Buchan (2000), an incentive has two sides: On the positive side, it serves as a form of reward or payment, which can be monetary or non-monetary. On the negative side, it may act as a punishment or result in the loss of perceived or actual benefits. In this instance, the researcher adopted the definition position that, by design, incentives are intended to achieve specific, measurable behavioural changes regardless of the side. (Liu & Liu, 2022). This was supported by the reviewed literature of Shevchenko et al. (2019), which stated that an effective incentive system in e-waste management would increase consumer participation rates in the disposal of WEEE, thus unlocking its economic potential.

An investigation by Ichikowitz and Hattingh (2020) explored the perceptions of general EEE consumers' behaviour and found that they did not know about its hazardous nature and economic value. It also revealed that underdeveloped collection mechanisms and infrastructure positively influenced low pro-recycling behaviours. Their research suggested that incentive models would only be effective to the extent that the consumers, manufacturers, suppliers, and distributors of electronic technology were aware of.

2.4.1 Types of Economic Incentives Encouraging Sustainable E-Waste Management

One model within the broader framework of incentive theory involves two primary actors who engage in a 'contractual' agreement. In this context, one actor is designated as the incentive giver, while the other is the incentive recipient (Bernhold & Wiesweg, 2021). The term 'contractual' is used because the relationship remains intact as long as both parties continue to fulfil their respective roles of giving and receiving. Positive or negative incentives can further influence the giver and receiver.

2.4.2 Positive Economic Incentives

According to the literature available from Smith (2024), regulations surrounding electronic waste carry both positive and negative implications for collectors seeking to recycle, reuse, restore, and renew these materials. However, most researchers contend that e-waste policies implemented worldwide have predominantly positive effects and are therefore categorised as beneficial incentives. In support of this perspective, the United Nations International Telecommunication Union (2024) notes that 61 out of the 81 countries worldwide that have implemented Extended Producer Responsibility (EPR) laws to increase awareness and promote effective management of e-waste among producers and consumers have experienced improved collection and recycling rates.

Recent literature highlights that implementing a levy system is an effective strategy for ensuring the sustainability of the Extended Producer Responsibility (EPR) program. This system involves levying fees from producers and importers of Electrical and Electronic Equipment (EEE), which are then allocated to support the operations of WEEE recyclers. These operations encompass the collection, recycling, and environmentally sustainable disposal of e-waste (Global Environment Facility, 2021)

The EPR framework represents a strategic policy approach that assigns producers significant economic and material responsibilities for managing old consumer

electronics. In this context, the government acts as the incentive provider, offering benefits to encourage the prevention of e-waste at the source. Consequently, the incentive recipient, typically an original equipment manufacturer (OEM), becomes ‘contractually’ obligated to create environmentally friendly products that align with the recycling and material management objectives the government sets (Gaur et al., 2023). Data from the Chile, Colombia, and Peru governments, which have implemented similar EPR laws, indicate improvements in e-waste recycling and disposal rates, contributing to developing a yet-to-be-evaluated sustainable ecosystem (Forti et al., 2020).

2.4.2.1 Monetary Incentives

In India, monetary incentives were provided by the government as a reward for private businesses participating in e-waste recycling programs under the green economic incentive system (Sajid et al., 2022). The Chinese government has implemented various incentives, including financial subsidies, to enhance the standardisation of e-waste recycling. Research conducted by Wang and Huo (2023) indicates that these subsidy policies have bolstered the overall e-waste system's capacity to manage the RRRR of used EEE. Additionally, they have strengthened the competitiveness of formal collectors, leading to the gradual withdrawal of unqualified WEEE collectors from the market. It is important to recognise that although the subsidy fund proved adequate in a financially stable country like China, it was ultimately unsustainable and would require ongoing adjustments (Wang & Huo, 2023). This situation raises concerns about the appropriateness of such incentives within the context of South Africa’s sluggish developing economy if it would maintain a similar financial model given the difficulty that developed and better performing global economies struggle to contain.

Another form of monetary incentive instrumental in encouraging e-waste management is take-back systems, a social norm in many countries such as the Maldives. In these systems, consumers can exchange EEE products at their end-of-life cycle in exchange for an item of equal determined value in-store or receive a voucher for future use (Ministry of Finance Republic of Maldives, 2024). The researcher observed a similar scheme in practice in Singapore during the compilation of this thesis.

Shan et al. (2021) boldly suggested that the take-back policy dominated all the other economic incentives and that the monetary value it produced exerted a greater influence on the reduction of illegal WEEE disposal. However, what academics if favour of this approach neglect to clarify its required implementation rate for it to have a meaningful social and business impact.

The researcher noted that weak enforcement of regulations could significantly diminish public awareness and complicate e-waste management in many countries (Almulhim, 2022). Implementing environmental public awareness campaigns is a crucial incentive for improving e-waste management by encouraging individuals who may not recognise the value of correctly disposing of WEE or may be reluctant to take the necessary steps to drop it off at designated collection sites.

Academics who make similar remarks suggest that it is vital to enhance consumers' environmental awareness over time through financial incentives (Shi, Chen, and Verter, 2023). It is envisaged that raising awareness among consumers and manufacturers of electrical and electronic equipment (EEE) would empower them to make informed decisions about management strategies that mitigate the environmental impact of e-waste.

2.4.2.2 Negative Economic Incentives

Academics favouring punitive measures to curb e-waste believe that the threat of monetary penalties for improper disposal, such as carbon tax, environmental compensation, and legal fines, is more effective than positive rewards (Wang & Huo, 2023). They also cite an example of sustainability in China's financial subsidy. Yafen and Shevchenko (2021) believe that concurrently employing rewards and punitive economic incentives could achieve desired long-term sustainable effects, effectively personifying the 'carrot and stick' approach.

Forti et al. (2020) and McCann et al. (2015) delineate three prevalent models for financing and managing e-waste and the associated incentives for each stakeholder involved. The first model is predicated on the EPR model, wherein an upfront fee is collected and held in trust. This fee becomes accessible upon the return of products manufactured by OEMs. However, this approach is limited to products launched within a specified timeframe or lifespan, beyond which the fee is ineffective. This financial mechanism underscores a collective commitment to product responsibility within society.

The second model emphasises the role of consumers and end-users, who bear the primary responsibility for the disposal of e-waste. Under this framework, consumers must manage their e-waste and pay for its collection and recycling services. The third model directs responsibility toward distributors, mandating them to cover the costs of e-waste collection and recycling in relation to their product sales and market share. For example,

distributors of security systems, such as private security firms operating in Gauteng, would assume the distributor role and must establish relationships with OEMs to receive compensation for collected e-waste, mirroring the first model's structure. The distinguishing factor in this scenario is that the funds held in trust originate from the distributors rather than the OEMs, based on the assumption that the OEM has a reimbursement solution available.

It is crucial to recognise that these intricate financial models impose a significant burden on consumers and society at large. This burden may act as a deterrent, potentially dissuading individuals from engaging in recycling efforts or from purchasing costly EEE, particularly when faced with the additional expenses associated with transporting substantial quantities of e-waste to secure discounts or exchange value, a factor considered for further investigation in this study.

2.4.2.3 The Impact of Positive Incentives

Sajid et al. (2022) identified that monetary incentives undermine intrinsic motivation as an external intervention and that attitude and environmental concerns/awareness are the requirements of WEEE recycling practices. Caring for the environment is a big motivator for e-waste management practices. Therefore, Sajid et al. (2022) recommend that policymakers raise consumer and manufacturers' awareness about how inappropriate disposal of e-waste harms the environment. This would likely motivate consumers to participate in e-waste recycling.

In favour of positive incentives, Shevchenko et al. (2019) argue that the monetary values of legislating reward incentives are meagre compared to those of negative incentives such as promotion, monitoring, and evaluation. This would suggest that the government should not spend more money on promoting and developing legislation that encourages e-waste practices among consumers. Instead, they should direct more money towards positive incentives through tax rebates and e-waste collection grants. This argument, though solid, overlooks the intermediary role the PSI could play by partnering with the government in the e-waste ecosystem and acting as its first e-waste responder.

2.4.2.4 The Impact of Negative Incentives

The researcher assumed that private security companies in Gauteng were generators of EEE and distributors to their consumers. Most did not have signed distribution agreements with the OEM from whom they purchased the equipment. This limits them to resellers burdened with an extended producer responsibility they cannot afford to

carry. Hence, additional legislation could do the opposite of its design by inadvertently inhibiting electronic WEEE recycling opportunities and access to new markets for various industries that might benefit from the frugal innovation of private security companies. Limited research into the WEEE recycling sector supported this view: "Frequent regulatory changes create legislative uncertainty" (Nell et al., 2022, p. 52). The role of disruptive innovation was evident here in that newer technologies are introduced quicker than legislation is formulated and promulgated, leaving legislators in a perpetual catch-up mode.

The literature above shows that various factors influence the success and maturity of e-waste recycling systems. Different countries have developed varying comprehensive frameworks to analyse these systems, considering elements like financial structures, positive economic incentives, and the legislative environment to shape e-waste recycling system designs according to their means (Forti et al., 2020). It is suggested that adopting blanket international regulatory measures such as the OEM EPR system may prove to be problematic.

2.4.3 Future Studies on E-Waste Incentives for the PSI

Andeobu et al. (2023) posit that a focus on economic incentives for improving e-waste collection rates should concentrate primarily on recycling schemes. They argue that collection issues are the cornerstone behaviour that incentive theories should strive to answer. Following this principle, conveying such responsibilities to consumers and suppliers in South Africa's private security industry could provide the necessary push or pull to manage electronic waste at its endpoint. This could, in theory, encourage innovative, environmentally conscious appliance designs by private security businesses. For example, PSI in the country could encourage their suppliers, who are OEMs, to design modular cameras. These cameras would have components that can be easily removed and updated at the end of their lifecycle. Additionally, PSI could incentivise OEMs to facilitate the return of decommissioned equipment in exchange for financial compensation, helping them meet their extended producer responsibilities.

The researcher considered arguments for and against increasing regulation to further the ambitions of developing a sustainable ecosystem to minimise resource inputs and manage outputs, which would be counterproductive (Moyo et al., 2022). A dominant view from the literature was that the current incentive systems based on punishment rather than reward lack a shared vision that accounts for exogamous socio-economics. The more significant quantities of WEEE remained dormant in the PSI, consumer

households, and, most notably, government sectors, which are sometimes responsible for compliance legislation (Ichikowitz & Hattingh, 2020).

Academics support a cost-sharing incentive system. However, they recognise that the system's effectiveness depends on the industry type and is likely to differ between rural and urban areas (Shevchenko et al., 2019). Implementing specific cost-sharing models can be challenging in regions of a province like Gauteng, which encompasses developed and underdeveloped settlements. Future research should explore the various cost-sharing models applicable to security equipment and the differing regions.

The complexity of this issue arises from the fact that private security companies are regulated to charge varying labour rates in different regions, even within the same province, as outlined by the PSiRA price guideline (PSiRA, 2024). Companies would ultimately be compelled to incur extra costs by investing in securing e-waste data and disposal solutions, creating negative perceptions about the stakeholders' incentives and responsibilities. The researcher noted that such a cost would be passed on to the consumer. For companies to remain financially stable, they would remain non-compliant with any proposed legislation. Future research should, thus, focus on users of security systems and their willingness and intention to participate in e-waste management.

2.5 Disruptive Innovation Theory

Christensen et al. (2015) define disruptive innovation as a product or service that initially underperforms in established markets but ultimately transforms them by focusing on new or underserved customer segments. Oroszi (2020) highlights that disruptive technology opens avenues for new products, making previously inaccessible technology available to low-income markets. Several factors drive disruption, including cost, quality, customer needs, regulations, and available resources (Millar et al., 2018).

The researcher aligned with academics who possess intrinsic knowledge of global trends in the private and public sectors. They observed a consistent cycle of phasing out outdated electronic goods in favour of the latest technological advancements, leading to a significant increase in e-waste generation (Jain et al., 2023). The rapid integration of technologies is expected to worsen the e-waste crisis through several steps. Short product lifespans result in many devices not reaching the end-of-life cycle; instead, they become outdated due to newer technologies before their time in planned and unplanned obsolescence.

2.5.1 Disruptive Innovation in the South African PSI

The South African PSI forgoes the opportunity to benefit from the dormant e-waste they may have commissioned to their clients. PSCs could serve as a vital catalyst for enhancing effective management practices of WEEE by using their existing infrastructure and client relationships to create new business opportunities (Jain et al., 2023). For example, these entities could serve as intermediaries for Original Equipment Manufacturers (OEMs) and oversee take-back programs that facilitate the return of obsolete technology by consumers for safe disposal or recycling. Worth noting, though, is that such a model would require OEM to comply with EPR regulations, educate consumers about e-waste, and also collaborate with recycling facilities (Kaur, Atiq & Gautam, 2022).

Dzimba and Van der Poll (2022) endorse this perspective, arguing that South African markets possess the dynamic socio-economic conditions necessary to foster the development of disruptive innovations. According to the authors, these markets help companies use their strengths to find new opportunities, especially in overlooked areas such as waste. This can give them a competitive advantage through innovation. Caluza (2022) believes that PSI is being transformed by AI, the Internet of Things (IoT) and machine learning, forcing it to rethink its outdated practices.

Security equipment such as CCTV systems are now enhanced with AI capabilities, unlocking new functionalities and altering CCTV's role for security clients. Other important disruptive security technologies include ground robotics and aerial drones. What was unclear in the literature review was the extent to which these disruptive innovations contributed to the generation of e-waste.

However, these technological tools still require human support. When they detect anomalies, they alert their human counterpart (the security officer) and send a signal to the security officer, who then assesses the situation and responds to address the identified issue. While disruptive security technologies offer radical solutions to the PSI's challenges, they also present challenges and security threats that require cautious adoption and usage.

2.5.2 Challenges Associated with Disruptive Innovation

In advanced economies such as Singapore, that are highly digitalised and rely on the latest hardware technologies to run the city, the researcher observed that improper disposal of EEE is forbidden. The increase in illegal e-waste importation and disposal is

said to be closely linked to lower labour costs, weak enforcement of environmental rules and cheaper processing fees. However, it is unclear if these observations apply to all countries with the opposite market conditions i.e. higher labour cost such as Singapore. On the one hand, it is worth noting that it is difficult to measure the accurate volume of WEEE globally since there are limited literature sources on the quantities of functional EEE in circulation and the volume imported and exported in between countries let alone specific industry. On the other hand, discarded electrical or electronic devices can be notoriously difficult to trace despite them being non-biodegradable (Kim & Lee, 2022).

The use of disruptive security technologies presents both significant opportunities and challenges. These include serious threats to privacy, ethical considerations, and vulnerabilities that can lead to increased risks over time (Marin-Marian & Claudiu-Vasile, 2024). The rapid advancement of the IoT through internet-connected devices, cloud computing, and the capability to process abundant data within seconds offers numerous opportunities for innovation and productivity. However, this advancement also exposes governments, businesses, and private individuals to complex cybersecurity threats that can easily bypass traditional security protocols. Such vulnerabilities can undermine the reputation of private security companies (Paul, 2024).

Caluza (2022) believes that IoT technology in the PSI will likely lead to job losses; however, it will not eliminate the need for on-site security personnel. Instead, it will transform how security officers perform their duties, lessening their repetitive responsibilities and making them more efficient, as they would ease their working conditions by reducing, if not eliminating, patrols' endless hours of patrols and eye-straining monitor screens (Caluza, 2022).

2.6 Conclusion

The literature review has provided a comprehensive exploration of the key themes central to this study: economic incentives, disruptive innovation, and e-waste management within the private security industry (PSI) in South Africa’s Gauteng province. The thematic approach adopted in this chapter has systematically identified and analysed trends, patterns, and gaps in the existing body of knowledge, offering a robust foundation for the research.

The review highlighted the critical role of economic incentives in driving sustainable e-waste management practices, emphasising both positive and negative incentives as tools to influence behaviour. While monetary rewards, take-back systems, and

awareness campaigns have shown promise in encouraging responsible e-waste disposal, punitive measures such as fines and taxes also play a significant role in shaping compliance. However, the effectiveness of these incentives is contingent on awareness, infrastructure, and the socio-economic context, particularly in developing economies like South Africa.

Disruptive innovation emerged as a transformative force within the PSI, with technologies such as AI, IoT, and robotics reshaping traditional security practices. While these innovations offer opportunities for efficiency and new business models, they also contribute to the growing e-waste challenge. The rapid obsolescence of electronic devices, coupled with inadequate recycling infrastructure, underscores the need for innovative solutions that balance technological advancement with sustainable waste management.

The review also revealed significant gaps in the literature, particularly regarding the role of the PSI in e-waste management. Despite the industry's potential to act as an intermediary in the e-waste ecosystem, there is limited research on how private security companies can leverage their infrastructure and client relationships to promote sustainable practices. Furthermore, the absence of literature concerning electronic waste in South Africa's Gauteng province considered Africa's economic hub warrants the need for further investigation and policy development.

In conclusion, this chapter has laid the groundwork for understanding the interplay between economic incentives, disruptive innovation, and the management of electronic waste in the PSI. Peer reviewed literature points towards designer incentive systems, fostering awareness, and integrating sustainable practices into the industry's operations. Future research should focus on exploring cost-sharing models, evaluating the impact of disruptive technologies on e-waste generation, and identifying strategies to enhance the PSI's role in the broader e-waste management ecosystem.

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CHAPTER 3: Research Questions

3.1 Introduction

Chapter 3 builds on the literature review from Chapter 2, which highlights critical gaps in understanding how economic incentives can drive behavioural change among PSCs in Gauteng, South Africa, toward sustainable e-waste management. It emphasises the transformative role of disruptive innovation in the PSI and addresses the challenges of integrating new technologies responsibly. The main research question and sub-questions aim to explore the effectiveness of economic incentives and the development of a practical framework for the private security industry.

3.2 Central Research Question

This study seeks to contribute academic literature to the discourse on responsible waste electrical and electronic equipment management for policymakers and industry stakeholders. This was the reasoning behind the main research question, which is:

To what extent can economic incentives motivate private security businesses in the Gauteng Province, South Africa, to change their behaviour to adopt sustainable e-waste management practices?

This central question seeks to evaluate how efficient economic incentives are in driving behavioural change among PSCs. It focuses on whether financial rewards, such as subsidies, tax rebates, or take-back systems, can be effective motivative factors. The question also explores the interplay between economic incentives and disruptive innovation, examining how these factors can collectively influence the PSI's transition towards more sustainable practices. By addressing this question, the study aims to identify the conditions under which economic incentives can be most effective and how they can be integrated with technological advancements to achieve long-term sustainability.

3.3 Research Sub-Questions

1. **What kind of incentives cause the desired outcome for e waste management?**

This sub-question delves into the types of incentives, both positive (e.g., financial rewards, tax benefits) and negative (e.g., fines, penalties), that could encourage PSCs to adopt sustainable e-waste management practices. It also explores the role of legislative frameworks, such as EPR laws, in shaping these incentives. The question aims to identify which incentives are most effective in the South African context and how they can be tailored to address the unique challenges faced by the country's PSI.

2. **What barriers hinder private security businesses' participation in sustainable e-waste management?**

This sub-question examines the obstacles that prevent PSCs from engaging in sustainable e-waste management. These barriers may include financial constraints, lack of awareness, inadequate infrastructure, and regulatory challenges. By identifying these barriers, this paper intends to provide enlightenment of the challenges faced by private security companies and propose solutions to overcome them.

3. **How can incentive and disruptive innovation theories be leveraged to design a working framework that stimulates responsible WEEE management within the private security Industry?**

This sub-question explores the potential for integrating incentive and disruptive innovation theories to develop a practical framework for sustainable e-waste management in the PSI. It investigates how these theories can be applied to create a system that encourages PSCs to adopt new technologies while managing e-waste responsibly. The question also considers the role of collaboration between stakeholders in designing and implementing this framework, including government, PSCs, and recycling facilities.

3.4 Conclusion

The research questions were informed by incentive and disruptive innovation theories, which provided a robust theoretical framework for understanding the factors that drive behavioural change and technological adoption. The research questions are designed to generate actionable and practical solutions. By identifying the most effective incentives and addressing the barriers to e-waste management, the study strived to provide recommendations for improvements within the PSI. Additionally, the focus on disruptive innovation highlights the potential for new technologies to transform the industry and create new opportunities.

CHAPTER 4: Research Design and Methodology

4.1 Introduction

This research used qualitative research to explore the complex dynamics of economic incentives and the role of disruptive innovations in e-waste management within the private security industry in the Gauteng Province of South Africa. As noted in the first chapter, a qualitative approach was employed to effectively shed light on the real-world understandings and experiences of individuals working in the PSI. This chapter further discusses the reasoning behind the chosen methodology and its significance.

4.2 Research Design

Researchers synonymously use research design and methodology (Sumbl & Khanam, 2023). Research methodology refers to researchers' qualitative or quantitative processes for describing, reviewing, interpreting, and forecasting phenomena (Goundar, 2012). According to Saunders and Lewis (2018), phenomenology is an approach to exploring people's everyday experiences; such experiences would be cumbersome to illustrate using numbers in quantitative methods. Thus, the qualitative research methodology was followed as it typically uses interviews, observations, document analysis, surveys and case studies. This research used semi-structured interviews. Figure 4.1 below illustrates the researcher's research framework.

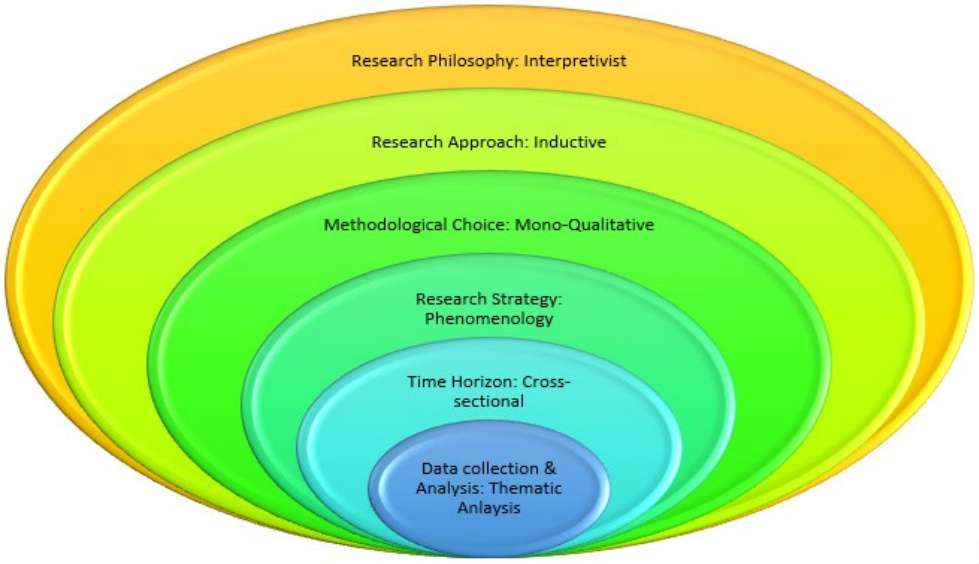

Figure 4.1: Research Framework

Source: Saunders and Lewis (2018).

Figure 4.1 shows the research onion adapted from Saunders and Lewis's (2018) framework. It visually represents the essential components of this study's research design, which guided the researcher through all phases of the robust research methodology. The interconnected layers of the research onion illustrate how each decision influenced the others.

4.2.1 Philosophy

This research employed an interpretivist philosophy to explore the complex dynamics influencing private security companies in South Africa. Interpretivism offers an in-depth examination of how individuals and organisations construct meanings within their environments rather than seeking generalised patterns across broader populations (Creswell, 2014). By adopting this approach, the study aimed to develop a nuanced understanding of the events within its specific context, contributing new insights to the little existing literature and data.

4.2.2 Approach Selected

An inductive approach was used to develop a grounded theory. The Inductive approach is a method for examining qualitative data that follows a clear process based on specific objectives (Ranasinghe & Perera, 2022). Data was meticulously coded to identify patterns and themes from the information collected for better interpretation. The questionnaire was given to interviewees in a manner that aligned with one of the three themes provided in Chapter 1. Worth noting was that some answers to a question were so broad that they overlapped into multiple themes. The researcher used an inductive approach to simplify raw data into comprehensive summaries. This method linked the research objectives to the findings and created a theme about the patterns in the data.

4.2.3 Methodological Choice

The methodological choice selected for this was a qualitative mono-method research design. As Melnikovas (2018) suggests, this approach is suitable for collecting extensive descriptive data and addressing the main research question and the subsequent sub-questions, which require descriptive answers to understand the e-waste phenomenon. Using this mono-method qualitative approach also provided a more focused and consistent research strategy, allowing for in-depth exploration of what motivates PSCs while simplifying the design and implementation process by avoiding the complexities of integrating mixed methods (Ojebode et al., 2018).

4.2.4 Strategy

Semi-structured interviews were conducted with private security companies' executives to delve deeply into integrities of overall WEEE understanding within the PSI. Semi-structured interviews are often considered more effective than other interview types because they allow researchers to collect detailed information from the participants without losing focus on the research topic (Ruslin et al., 2022). These interviews primarily employ open-ended questions, facilitating rich and detailed conversational exchanges.

Research indicates that open-ended questions enable participants to provide a broad range of answers, thereby enhancing the richness of the data collected (Hyman & Sierra, 2016). Using this approach, the researcher uncovered new insights into the nature of economic incentives and how individuals experienced them, challenging the researcher's initial assumptions. Such information would likely not have been revealed through the more rigid structure of formal interviews or questionnaires.

4.2.5 Time Horizon

A cross-sectional research design was selected for this study to examine non-participatory corporate behaviour while ensuring objectivity in the research process. In the semi-structured interviews, the researcher deliberately chose not to display prior knowledge about e-waste to encourage participants to express their genuine opinions. When responding to questions, the researcher provided brief and concise answers to avoid imposing any particular viewpoints or steering the participants' responses toward a predetermined conclusion. This approach allowed for efficient data collection within a short timeframe, eliminating the need for follow-up studies. Consequently, it was expected to produce results more rapidly and cost-effectively than other research designs (Zangirolami-Raimundo et al., 2018).

4.3 Research Methodology

4.3.1 Population and Unit of Analysis

The target population for this research were the executives of private security companies in Gauteng, who, in this study, were considered the final decision-makers and responsible for the organisation strategy of their companies. The initial step involved collecting information about the company, such as its turnover and employee count, to assess how well the executive understood their organisation and respective authority

levels. Each executive was approached individually based on the premise that shifts in their behaviour would result in corresponding organisational changes. The research examined the practices, policies, and responses to economic incentives related to e-waste management at various company levels.

4.3.2 Sampling Method and Size

Non-probability sampling was the chosen technique for this research owing to its sample population not needing to represent the entire population of South Africa's PSI, as is the case with probability sampling methods (Saunders & Lewis, 2018). It is essential to acknowledge that this technique was selected despite the existence of PSiRA statistics, which provide details on the number of registered PSCs in the country, as indicated in the research setting in Chapter 1. At face value these statistics suggest that probability testing would have been the ideal approach. However, academics suggest that probability testing is incompatible with qualitative research methodologies due to the statistical calculations it necessitates (Saunders & Lewis, 2018).

The researcher employed a purposive sampling technique within the non-probability sampling framework as they had specific insights into which company types would be most suitable for the study. For instance, the researcher selected small, medium, and large companies based on prior knowledge.

The snowball method was utilised within the framework of non-probability sampling. However, it was not heavily relied upon in cases where it was apparent that the referring party had little insight into e-waste practices. It was assumed that their referral would likely be similarly uninformed. Furthermore, some questions directed to interviewees sought to determine their awareness of other private security companies engaged in e-waste management. The snowball method is time-consuming at first, but it provides a good platform for establishing rapport and good communication with the participants (Mahin et al., 2017). One of the benefits was that the researcher developed some familiarity with the participants through acquaintance with other participants.

The researcher aimed to conduct a total of 20 semi-structured interviews. Saturation and diminishing returns can occur in most qualitative studies with a relatively small number of interviews. Saunders and Lewis (2016) initially suggested that this number could range from five to twenty-two. However, later studies revised it to between 12 and 20, depending on the intricacy of the topic and the diversity of the participants' experiences (Saunders & Lewis, 2018). The researcher believed a sample of 12 interviews was sufficient to achieve saturation and draw meaningful conclusions without overextending

resources. The findings in the next chapter were vindication of diminishing returns that the researcher anticipated after the 6th interview.

4.4 Measurement Instrument

The study employed semi-structured interviews to gather participant data (Appendix C: Semi-structured interview guide). Information requested included company demographics, e-waste management practice, the knowledge of economic incentives associated with waste management, perceived barriers to participation, and overall knowledge of e-waste regulations and environmental concerns. Participants who indicated to the researcher that they lacked e-waste policies or operational procedures were not exempted from inquiries about e-waste policies and existing incentives. This was based on the premise that such participants were likely to benefit from existing e waste practices in one way or another even if they were not fully aware of that benefit considering that the informal sector plays a critical role in the South African context.

4.5 Pilot Study

A pilot study checks if a research project is feasible and decides whether to move forward and how to do so (Dayanand & Chaudhary, 2024). Testing the interview guide with a few participants is helpful before collecting data (Gill et al., 2008). This testing helped the researcher see if the guide was clear and could answer the research questions. The pilot test showed that changes were needed in the interview guide.

Each pilot interview lasted between 40 and 60 minutes and included two participants. This number was enough to offer helpful feedback about the interview process and identify issues with the guide. At the start of the pilot interviews, the two participants received details about the study. The researcher explained ethical principles, including informed consent, voluntary participation, anonymity, and confidentiality. This set clear expectations about the interview process and findings. By providing this information upfront, participants are likelier to be honest, feel comfortable, and build trust with the researcher, leading to smoother interviews.

It was important for the researcher to ensure that the ReadAI was working correctly at the beginning of each interview. Participants were encouraged to share their experiences fully without interruptions. At the end of the interviews, the researcher appreciated the participants for their participation and asked if they wanted to add

anything else. This allowed participants to cover issues not discussed during the interview, often leading to new insights. Participants also received a debrief at the end (Gill et al., 2008). All interviews were recorded, transcribed, and stored using ReadAI to reduce bias and keep a permanent record of the interviews.

4.6 Data Collection Procedure

The researcher first initiated the data collection from participants by telephonically calling the individuals from their personal network to enquire about their availability for an academic interview. Appendix A is the sample of the email sent to Participants who expressed interest. Participants who expressed willingness were emailed by the researcher, which contained a consent form and a list of questions the researcher intended to ask.

It is worth noting that the participants were informed that the interview guide was a guide and that the questions would not be asked in any sequential order. Once they understood this, a formal link was shared via email to the participants' preferred email addresses.

Email was used to send a video and audio Google Meet link assigned to a given date and time for the interview. The interviewees were informed that the meeting would be recorded once consent was expressly given verbally or in the signed consent form. Data was collected using what academics refer to as “synchronous Voice over Internet Protocol (VOIP)” (Saunders and Lewis, 2018, p.167) using the Google Meet conferencing tool and Read AI for real-time transcription of the interview.

4.7 Analysis Approach

The data collected in this study followed a thematic analysis approach. This approach was used to analyse qualitative data to identify recurring themes and/or underlying meanings and patterns in a data set collected through interviews (Riger & Sigurvinsdottir, 2016). By systematically coding and categorising the interview transcripts, key themes related to economic incentives, e-waste management practices, and the influence of disruptive innovation were identified and further explored.

4.8 Quality Controls

4.9 Limitations

Qualitative research methodology as a research tool has its fair share of limitations and weaknesses. The primary limitation of any qualitative research is its inability to wholistically cover the behavioural dynamics of individual actors within the cross-sectional time zone, especially among private security executives. Given that these individuals also functioned as consumers outside of their professional roles, a mixed-methods approach could have offered a more insightful perspective on the behaviour of PSC executives compared to the snapshot provided by this qualitative study.

The limited timeframe for this research hampered the ability to observe the e-waste management behaviours of primary stakeholders over an extended period, thereby hindering a more thorough analysis of how these behaviours might evolve in response to innovative technologies. This issue was compounded by a reliance on personal networks and the snowball approach, which did not gain the anticipated traction and resulted in the completion of only 12 semi-structured interviews.

The qualitative research findings did not provide definitive conclusions; instead, they offered sufficient information to aid in informed decision-making (Goundar, 2012). Qualitative data is subjective and originates in specific settings therefore it was challenging to apply out-dated reliability and validity standards. This is a significant source of criticism in qualitative research. The settings, conditions, interactions, and events studied could not be fully replicated confidently, and generalisations to broader contexts were limited. Qualitative studies are prone to bias, meaning that the perspectives of both the participants and the researcher can influence the findings.

Accessing information in a qualitative study may also be constrained by data confidentiality, concerns within private security companies, and unforeseen obstacles in securing participant cooperation. For instance, before the interviews were scheduled, participants asked for upfront questions they were to be asked, giving themselves time to prepare responses that they thought the interviewer wanted to hear.

Additionally, the limited scope of the Gauteng-based case restricted the generalisability of its findings to other regions due to unique contextual factors and the small sample size, which represented only a fraction of the broader PSI. Since the researcher had access to the statistical numbers of registered security companies, probability testing

would have produced better generalisability. The snowball sampling method proved ineffective when a referring participant had no knowledge of e-waste or policies related to it in the private security industry.

4.10 Ethical Considerations

4.10.1 Permission

The Research Ethics Committee of the University of Pretoria granted written permission to conduct this study (Gordon Institute of Business Science, University of Pretoria, 2023). See Appendix D for the approval received to commence data collection. An informed consent form was also provided for each recipient the researcher interviewed (Appendix B: Informed Consent form).

4.10.2 Confidentiality and Privacy

Confidentiality relates to the shared understanding between the participant and the researcher, promising the scrupulous administration of sensitive data and ultimately relying on trust (Bos, 2020). The dignity and autonomy of the subjects were the ethical foundation for respecting the privacy of the participants who had entrusted their private information to the researcher. Therefore, it is incumbent upon the researcher not to disclose the shared information with third parties without the subject's free and informed consent (Institute for Work & Health Privacy Committee, 2020).

Maintaining privacy and confidentiality was vital to protecting participants from harm and cultivating trust, thereby enhancing the overall quality of the research. Participation in any study was entirely voluntary. Participants retained the right to discontinue the interview at any time or to decline to answer particular questions, even after providing their consent. The researcher emphasised that opting out of the study at any moment would not lead to any harm or intimidation. This ethical principle is universally recognised as a crucial research prerequisite.

4.10.3 Validity and Reliability

In qualitative research, checking for validity and reliability helps the researcher to reduce biasness. If researchers do not assess these factors, it becomes hard to understand how measurement errors affect the theories being studied. Khalid (2024) explains that reliability and validity are important for judging research quality. Reliability

measures consistency, while validity measures accuracy. Working with qualitative data allowed the researcher to focus on trustworthiness, dependability, transferability, and credibility.

4.11 Conclusion

This chapter detailed the research design and methodology employed to explore the complex dynamics of economic incentives and disruptive innovation in e-waste management within the private security industry (PSI) in Gauteng, South Africa. A qualitative research approach was adopted, utilizing semi-structured interviews to gather in-depth insights from executives of private security companies. The interpretivist philosophy and inductive approach allowed for a nuanced understanding of the participants' experiences and perspectives, aligning with the study's objectives.

The methodological choice of a qualitative mono-method design ensured a focused and consistent research strategy. The use of purposive and snowball sampling techniques facilitated access to key participants, although the sample size was limited to 12 interviews due to saturation and resource constraints. Data collection was conducted via synchronous Voice over Internet Protocol (VoIP) using Google Meet, with real-time transcription provided by ReadAI, ensuring accuracy and reducing bias.

Thematic analysis was employed to identify recurring patterns and themes, offering valuable insights into the research questions. However, the study faced limitations, including the subjective nature of qualitative data, potential biases, and challenges in generalizing findings beyond the Gauteng context. Despite these limitations, the research adhered to ethical principles, ensuring confidentiality, privacy, and voluntary participation, as approved by the University of Pretoria's Research Ethics Committee.

In conclusion, the methodology provided a robust framework for exploring the research questions, offering a foundation for understanding the role of economic incentives and disruptive innovation in e-waste management within the PSI. The findings, while context-specific, provide industry knowledge to the broader discourse on e-waste practices and highlight areas for future research, particularly in expanding the sample size and exploring mixed-methods approaches for greater generalizability

CHAPTER 5: Findings of the Study

5.1 Introduction

This study investigated the impact of economic incentives on managing WEEE (e-waste) within the PSI. In this chapter, we will delve into the findings derived from the research, which are organised according to the key themes identified throughout the study. By exploring factors such as regulatory compliance, cost-benefit analysis, and sustainable practices, we aim to comprehensively understand how financial motivations can influence e-waste management strategies in PSI. Th e analysis will highlight the potential benefits of implementing effective economic incentives and the challenges faced by the industry in adopting these practices.

The investigation focused on the **main research question**:

To what extent can economic incentives motivate private security businesses in the Gauteng Province, South Africa, to change their behaviour to adopt sustainable e-waste management practices?

The study looked into the following three **Research Sub-Questions** to answer the main research question:

1. What incentives could motivate the adoption of e-waste management practices in the private security industry?

2. What barriers hinder private security businesses' participation in sustainable e-waste management?

3. How can incentive and disruptive innovation theories be leveraged to design a working framework that stimulates responsible WEEE management within the private security sector?

The findings are presented through a thematic analysis, facilitating a systematic understanding of how participants responded. By categorising responses into sub-themes, this method is more effective at understanding how economic incentives, industry-specific issues, and theoretical concepts serve as barriers and facilitators of e-waste management practices (Braun & Clarke, 2006). The themes in this chapter serve as guides for understanding the efficacy of existing approaches, challenges inhibiting

active engagement, and possibilities for further active sustainable changes in the private security sector.

5.2 Overview of the Sample

5.2.1 Relevance of the Sample

Table 5.1 is the participant profile summarising the business activities and e-waste management workforce within companies conversing on e-waste management. The data makes it possible to understand these companies' geographical distribution, workforce structure, and financial capabilities, which reveal the differences in resources, operational scope, and sustainable e-waste management practices.

Table 5.1: Participant Profile

Participant ID	Main Office Location	Additional operational sites	Permanent Employees	Temporary Employees	Annual Turnover (Estimate)
Participant 1	Gauteng	Not provided	8	As needed	Not provided
Participant 2	Gauteng	No additional office	8	As needed	R1 million
Participant 3	Gauteng & Western Cape	Gauteng & Western Cape	35	Not provided	R24 million
Participant 4	Gauteng	Not provided	+/-50	As needed	+/- R50 million
Participant 5	Gauteng	Not provided	300 – 400	Not provided	Not provided Estimated R1 Million for IT only
Participant 6	Gauteng	KwaZulu Natal, Western Cape, Free State	80	20%	R50 million

Participant ID	Main Office Location	Additional operational sites	Permanent Employees	Temporary Employees	Annual Turnover (Estimate)
Participant 7	Gauteng	Mpumalanga, Western Cape, Eastern Cape	37	Not provided	R40 million
Participant 8	Gauteng	North-West & Limpopo	254	Not provided	R41 million
Participant 9	Gauteng	Mpumalanga Eastern Cape North West	10	Not provided	R9-10 million
Participant 10	Gauteng	Free State	30	As needed	R5 million
Participant 11	Gauteng	No additional office	5	Not provided	R5 million
Participant 12	Gauteng	Mpumalanga North-West	Not provided	Not provided	R12 million

All 12 participants had their main office in Gauteng, except for Participant 3, who had dual offices in Johannesburg, Gauteng, and Cape Town, Western Cape. The majority operate in multiple provinces, including Mpumalanga, North-West, Eastern Cape, KwaZulu Natal, and Free State. Regarding the employee numbers, the permanent employees range from 5 to 400, with the largest workforce being Participant 5 (300-400) and the smallest workforce: Participant 11, with five employees. It is worth noting that Participant 12 indicated that they work with a consortium of companies they render services to, which employ over 3500 security personnel. The annual turnover ranges from R50 million for Participant 6 and lowest for Participants 2 and 5, with about R1 million each. Worth noting is that the turnover figures included all security services that the participant's companies rendered and were not limited to security-related aids that the researcher referred to in Chapter 2 when limiting the definition of what constitutes e-waste.

5.2.2 Adequacy of the Sample

The study identified 125 codes, with 108 unique to the study. See Appendix E for the data. Figure 5.1 below provides the progression of the codes in the saturation curve. During the first eight interviews, there were 102 codes, with a further 14 codes in interviews 9–10 and less than 10 codes in interviews 11–12. Although complete saturation was not achieved, this was adequate for the study and also aligns with the design for the qualitative study, where the range is 5–25 interviews (Saunders et al., 2016) as well as the range for saturation, which is 9–17 interviews (Hennink & Kaiser, 2019).

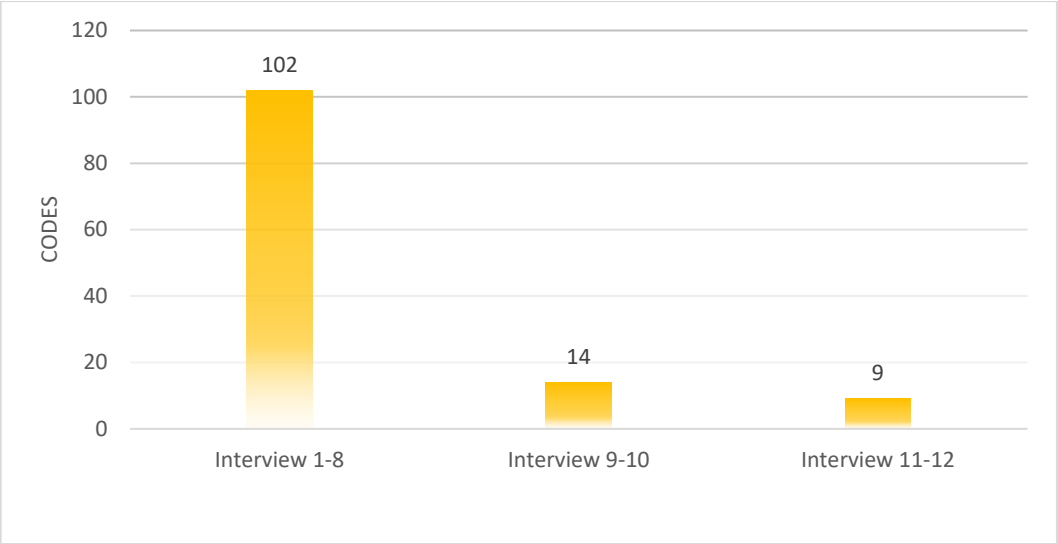

Figure 5.1: Progression of Codes Develop (Saturation Curve)

5.2.3 Relevance of the Empirical Data

Figure 5.2 is a word cloud containing important terms from participant interviews capturing e-waste management in the private security industry. According to Smit and Scherman (2021), word frequency graphic representation in word clouds is valuable for context. The findings illustrated in the word cloud confirm that economic, legal, and operational factors influence the private security industry's e-waste management. The conversations centred on **costs**, **incentives,** and **compliance**, where **technology** and **awareness** seem to start having an impact. Still, problems concerning budgetary constraints, the application of laws, and participation in the systematic recycling processes are difficult.

Figure 5.2: Word Cloud

5.3 Awareness and Adoption of E-Waste Management

The selected theme set out to assess levels of awareness, policies, practices, and regulatory compliance on the management of e-waste in the private security industry. Analysing how companies deal with, manage, and perceive their electronic waste helps gauge their commitment to sustainability and the appropriate disposal practices. The investigation covered three key aspects: understanding and generating e-waste, e-waste management policies and disposal practices, and awareness and compliance with e-waste regulations (see Table 5.2).

Table 5.2: Awareness and Adoption of E-Waste Management

Codes	Subthemes	Theme
• Initial limited awareness • Eco-friendly E-waste disposal • Participation in E-Waste programs • Agreement with E-Waste understanding	Understanding and Generation of E-Waste	Awareness and Adoption of Sustainable E-Waste Management

Codes	Subthemes	Theme
• Client-based e-waste policy compliance and optimisation of leftover material • Engagement with E-waste companies and equipment suppliers • Lack of formal policy • Lack of formal disposal or recycling planning • Return to supplier for repairs	E-Waste Management Policies and Disposal Practices	Awareness and Adoption of E-Waste Management
• Lack of awareness of e-waste regulations • No participation in e-waste training • Unawareness of e-waste awareness programs • Exposure to waste management training • Formalisation of e-waste disposal procedures	Awareness and Compliance with E-Waste Regulations	

5.3.1 Understanding and Generation of E-Waste

The analysis indicates different degrees of awareness and involvement in e-waste practices. Some participants are initially learning the management practices, while others have started enrolling in active or structured e-waste programs. Participant 2 had an inclination of what e-waste was but confused it with digital data; the response given when asked to provide an understanding of the latter was, *"What I understand is that it's… a database whereby it needs to be protected or if ever a client doesn't want any anymore… it can be crushed."* (Participant 2)

Participant 1, on the one hand, stated, "Honestly, I was not familiar with this e-waste management practice, but I've done my bit of research around it" (Participant 1). This meant that while they did not possess prior knowledge of e-waste management, they were actively pursuing knowledge in that field. On the other hand, Participant 8 responded more directly to the question and explained e-waste management as *"An environmentally friendly way of disposing or discarding of electronic, unusable electronic equipment."* (Participant 8) Showing a clear understanding of the subject matter. Though not offering a theoretical understanding, Participant 10 showed some knowledge of the subject matter, stating, "*I currently participate in e-waste programs"* (Participant 10).

5.3.2 E-Waste Management Policies and Disposal Practices

Findings from the study suggest that there is little uniformity towards e-waste management policies, as companies appear to adopt and implement varied disposal practices. Participant 6 outlines how leftover electronic materials from installations are utilised in other projects so that no resources are wasted: *"We take it, and we use it. To other installations, so whatever is left."* (Participant 6) However, some of this leftover equipment is also informally given to company employees for personal use: *"As I said [some], I give it to the technicians. Because they might be doing private jobs during one weekend, so I allow them to do private jobs."* (Participant 6)

As is the case with the upgrading of technologies and the disposal of any unused equipment, actions are taken based on convenience and operational requirements instead of formally established policies. Like Participant 6, Participant 4 described in detail their practice: *"If we see that the client maybe operates on a large basis, but they don't have a server. They use a basic computer. Then we offer them the server… then we discard the computer itself."* (Participant 4)

The methods employed to dispose of electronic waste frequently adopt a reactive rather than a proactive approach. This reliance on external providers and waste collection services often overshadows the establishment of robust internal policies and procedures for effective e-waste management. As a result, organisations may react to disposal needs instead of anticipating and planning for sustainable practices that align with environmental responsibilities. This was the case for one participant who stated that *"Companies and suppliers, e-waste companies that collect such equipment and suppliers that actually reach out to us give us the option to dispose of the equipment."* (Participant 4)

Participant 9 attributes the reactive nature of their organisation to the lack of e-waste policy formulation that promotes pro-active recycling and collection, stating that in their company, e-waste disposal is *"done on a case-by-case basis. There's no policy per se. You take the stuff; you keep the stuff in storage*" (Participant 9)

Those taking a proactive stance in the e-waste value chain state that some pieces of technology are better suited for supplier take-back schemes or refurbishment programs. They suggest that their sister private security companies could benefit if they participated in incentives such as a product return policy. An example was made on a small but important technological device such as a switch. *"Typically, with the switch(s) that will go back to the supplier, the switches that we use… come with a lifetime warranty on it, [in case of damage], they will then be swapped out or repaired and then sent back to us*." (Participant 7)

5.3.3 Awareness and Compliance with E-Waste Regulations

The insights show little engagement and knowledge of participation in the private security sector's e-waste marketing regulations and training programs. While some individuals have interacted with waste management activities through Business Development processes, most participants do not recognise structured training exercises or formal e-waste policies, although they exist.

Participant 7 admits that they lack knowledge of existing e-waste regulatory structures for South Africa: *"Am I aware of any e-waste regulations in South Africa? No. Nothing. I don't know of such things. Not even if you look at it… at the security expo.*" (Participant 7) In the same way, Participant 6 confirms a lack of information, adding to the already cited standard gap in awareness. *"No. I'm not aware of that.*" (Participant 6)

Participant 10, drawing from their extensive knowledge of the Enterprise Supplier Development program, offers a unique perspective on waste management. They emphasise that effective waste management is not merely an operational necessity but also a critical component of sustainable business practices. They state, "*In 2017, I participated in a program called Enterprise Supplier Development. Part of that spoke to waste management. With ISO 9001, you write out your process on how you perform every different function"* (Participant 10)

Participant 11, like Participant 10, also provides extensive knowledge of e-waste practices but further indicates that they comply with PSiRA as a regulatory authority and the South African Health Products Regulatory Authority. They also issue disposal

certification to clients once they have decommissioned a security detection device due to the sensitive nature of the products they supply to their clients. They state that *"we issue a certificate saying that we have decommissioned the machine, meaning that we cannot use the [X-ray] machine… South Africa is very, very sensitive, and they're very clear when coming to the rules and regulations of radiation that are very strict coming to that"* (Participant 11)

In summary, Figure 5.3 provides the thematic map of the awareness and adoption of E-Waste Management.

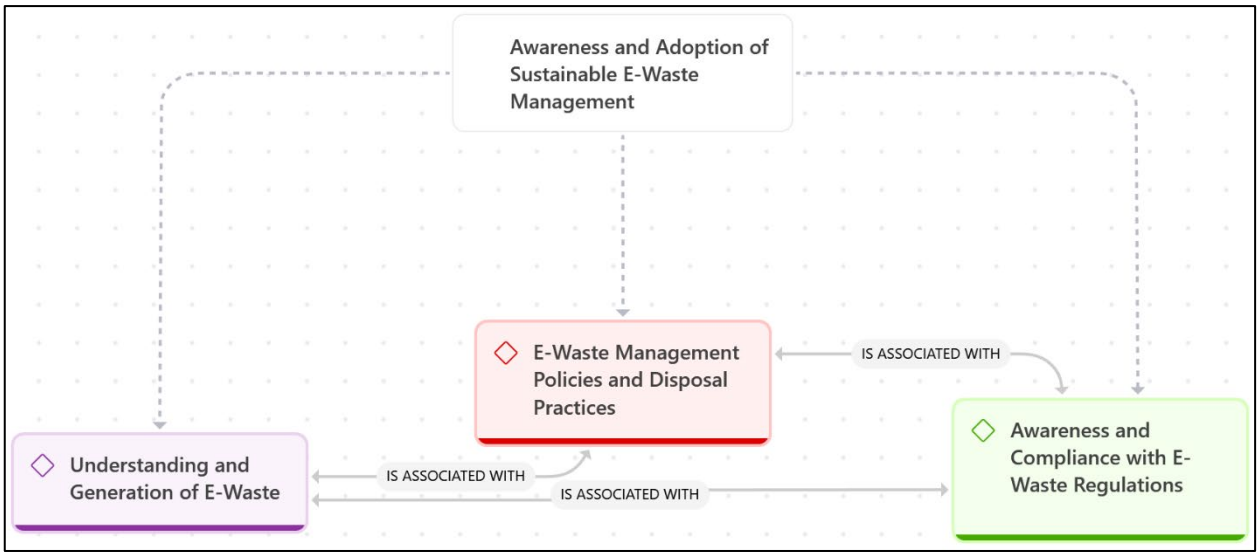

Figure 5.3: Awareness and Adoption of E-Waste Management

5.4 The Role of Economic Incentives in Driving E-Waste Management and Technological Adoption in the Private Security Industry

Originating from the primary research question, which can be recapped as follows: **To what extent can economic incentives motivate private security businesses in the Gauteng Province, South Africa, to change their behaviour to adopt sustainable e-waste management practices?**

This study analysed the relationship between economic incentives and the adoption of sustainable practices related to electronic waste by private security companies together with disruptive technology. It examined the factors that enable or inhibit engagement in

sustainable initiatives and how incentive and disruptive innovation theories can be integrated toward a coherent strategy for responsible WEEE management.

This theme examines monetary and non-monetary motivators that drive firms to practise WEEE management. It also assesses whether or not economic incentives affect involvement in organised e-waste programs. The findings are presented in Table 5.3 as a thematic analysis, which depicts codes, subthemes, and themes to show the organisation of the information obtained from the study.

Table 5.3: Economic Incentives for E-Waste Management in Private Security

Codes	Subthemes	Themes
• Perceived insufficient economic incentives relative to the workload • Lack of awareness of economic incentives • No utilisation of economic incentives	Recognition and Utilisation of Economic Incentives in E-Waste Management	Economic Incentives for E-Waste Management in Private Security
• Regulatory fines as a compliance incentive • Need for regulatory oversight in e-waste management • Recycling should be positioned as a valuable process • Incentives foster a sense of responsibility • Perceived ineffectiveness of fines	Perceived Effectiveness of Incentives	

Codes	Subthemes	Themes
• Policy-linked incentives • Rewards-based incentives • Regulation-drive incentives • Strict enforcement • Incentives must outweigh costs	Optimising Economic Incentive Systems for Sustainable E-Waste Practices	Economic Incentives for E-Waste Management in Private Security

5.4.1 Recognition and Utilisation of Economic Incentives in E-Waste Management

The findings reveal that very few know the economic incentives within e-waste management in the private security sector. Even though economic incentives may motivate e-waste initiatives, most participants had limited knowledge of the set contextual incentives and, if they did know, deemed them as insufficient. Participant 1, for instance, shares some of the relevant issues affecting the handling of e-waste from a practical standpoint: *"Honestly, that money is not enough. I look at the amount of work that is needed to do this thing. Normally when you come here, you come with two or three guys to help him load it in the truck."* (Participant 1)

Participant 2 stated there is a lack of awareness and uncertainty in their understanding of any incentives one could avail of: *"No, honestly, I don't know. Except for the ones you alluded to earlier, which is the money that you are [paid] for the cables."* (Participant 2). Participant 3 shared the sentiment and stated: *"I'm not aware of any government incentives for business"* (Participant 3)

Furthermore, many participants indicated they have never taken advantage of any available economic incentives to promote e-waste management. This fact highlights a clear disconnect between the financial support offered and the engagement from private security companies. The lack of participation raises important questions about the accessibility and awareness of these programs and the potential barriers that may prevent individuals from utilising these resources effectively. In response to knowledge of economic incentives, participants responded:

"No." (Participant 2)

"We haven't come across that." (Participant 5)

"No, I haven't." (Participant 8)

"*No, nothing*" (Participant 6). Worth noting about this participant is that during the interview, they indicated that they had recently been made aware of -e-waste recyclers and were willing to participate in e-waste management the following year.

The responses highlighted here emphasise the theme of non-engagement in the context of business dynamism. This phenomenon may stem from two primary factors: The perceived absence of tangible value that could be obtained from these incentives or a general lack of awareness regarding their potential benefits. Such sentiments reflect a crucial gap in understanding the strategic importance of active participation in incentive programs, ultimately hindering overall business growth.

5.4.2 Perceived Effectiveness of Existing Incentives

The analysis reveals that executives in the private security industry have differing opinions on the feasibility of enhancing e-waste management through implementing incentives. Some participants argue that negative incentives, such as financial penalties, motivate compliance more effectively than positive ones. For example, Participant 2 emphasised the potential of regulatory fines as a compliance motivator, stating, *"They will work because [private security companies] do not want to be fined."* (Participant 2) In contrast, Participant 12 appears to hold a different perspective by questioning the actual collection and effectiveness of the fines, stating, *"I've yet to come across anyone who has said to me that I've received a fine from the municipality for [illegal] dumping... so fines are ineffective."* (Participant 12)

Participant 2 holds a dual view on the incentive matter, contracting earlier sentiments of punitive incentives. They state that because companies are profit-driven, incentives in line with monetary rewards for immediate or long-term success would equally be effective; they believe that "*money is the main thing…* [because *private security] companies, they've got a problem in terms of the cash flow"* (Participant 2)

Participant 3, in support of this view, proposes "*that If you can enhance profits through incentives, you will likely get more participation"* (Participant 3). Participant 9 further states that positive incentives like a tax rebate system *"could be… the difference between [long] life and closing the doors of a company"* (Participant 9)

In addition, people's perspectives towards e-waste recycling practices and their given value seem to be shifting. Participant 12 notes a particular change in e-waste recycling: "It's *not seen as a mediocre process of me collecting waste."* (Participant 12) Structurally, incentives are believed to foster compliance and motivate willingness to act responsibly. The same participant further stated, "*Fines is just a mere formality, a scaring tactic that never gets implemented."* (Participant 12)

A different view during interviews that neither condones nor condemns the different types of incentives suggested that incentives for complying with the regulations must be combined with awareness of effectiveness. These participants argued that institutional backing is more fundamental. Participant 11 hints at how 'regulatory capture' may be helpful and states: "*If PSiRA can have a [e-waste] department, then we'll be on the right track."* (Participant 11)

5.4.3 Optimising Economic Incentive Systems for E-Waste

Information collected points towards restructuring incentives to motivate the private security industry to manage e-waste more sustainably. Participants noted that policies and the provision of funds can improve participation in accountable disposal practices. Participant 6 remarked and underscored, "*I think to create a policy, number one, okay. Number two, create an incentive."* (Participant 6)

Responsible disposal as a transactional incentive was also brought up to include the idea that individuals or businesses are rewarded directly for responsible disposal. Participant 2 mentions a system that can work through the use of gift cards: *"Maybe they give you something like a gift card. So, each time you go there and go to dispose of it, they load it on your card.*" (Participant 2)

Beyond the driving force of business opportunities, notable gaps in employment existed that affected individuals with lower earnings. These challenges not only impacted livelihoods but also highlighted the need for targeted support and solutions. Participant 5 points out that e-waste collection is a viable source of income for the less privileged populations in society: *"Because there are other people who do not have employment or are low earners. Some will use that as their source of income, going door to door, collecting those things, making sure they get those things recycling or stuff like that."* (Participant 5)

Participant 1 expressed optimism about future regulatory frameworks potentially incorporating incentives as a key component of compliance measures for e-waste

management. They expressed: *"I assume that when that regulation is implemented, it will include the incentives*." (Participant 1)

Participant 8 argued that compliance is automated across the entire industry due to stringent regulation enforcement, making participation in formal systems compulsory. "*Nobody can trade without PSIRA because every single tender, be it private, private or public sector or any quotation in this industry, needs to be PSiRA compliant. So, basically, the stick eventually becomes the rule."* (Participant 8)

To increase participation in programs that maintain sustainable electronic waste management, there has to be some real monetary advantage that exceeds the expenses incurred while complying with the requirements. Participant 3 expresses this worry: "*Incentive has got to exceed the cost of doing that."* (Participant 3) Participant 9, in concurrence, states that *"if the incentives of disposing are much higher than retaining the devices, then I think that would become an incentive enough"* (Participant 9)

Figure 5.4 provides the thematic map for the economic incentives for E-Waste Management in private security.

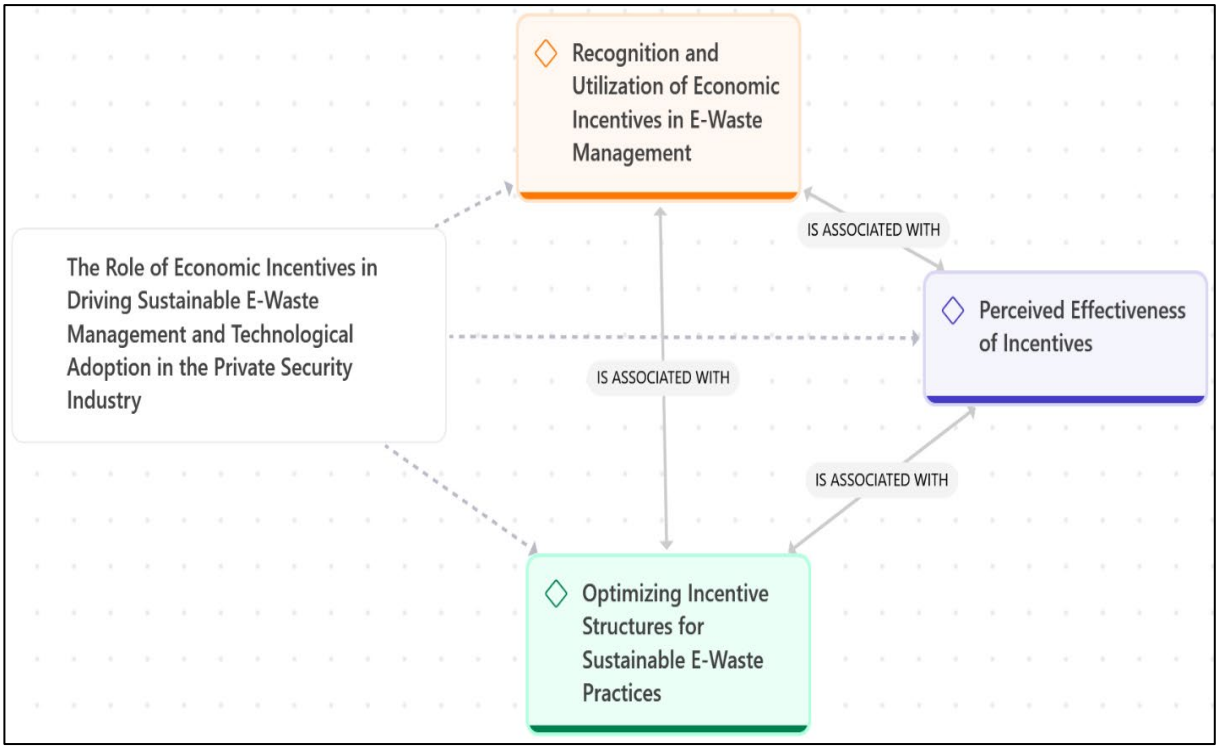

Figure 5.4: Economic Incentives for E-Waste Management

5.5 Barriers to E-Waste Management in the Private Security Industry

What key barriers hinder private security businesses' participation in sustainable e-waste management?

This theme examines challenges that hinder private security businesses from participating in sustainable e-waste management, focusing on operational, financial, logistical, and regulatory barriers that may limit participation (Table 5.4).

Table 5.4: Barriers to Sustainable E-Waste Management in the Private Security Industry

Codes	Subthemes	Themes
• Limited knowledge • Lack of business innovation • Weak regulatory enforcement • Subversive compliance	Operational Challenges in E-Waste Collection and Disposal	Barriers to Sustainable E-Waste Management in the Private Security Industry
• Hesitancy to pay for e-waste management services • Long-term cost of workplace hazards • Financial Strain	Financial Barriers	
• Loss of oversight due to dispersed workforce • Consumer mindset and convenience preference • Lack of structured e-waste collection routes	Logistical Constraints	

Codes	Subthemes	Themes
• Policy misalignment • Lack of awareness of regulatory barriers • Unclassified E-waste policies • Resource constraints in regulation	Regulatory and Compliance Challenges	Barriers to Sustainable E-Waste Management in the Private Security Industry

5.5.1 Operational Challenges in E-Waste Collection and Disposal

The research accentuates some specific challenges, such as a lack of information, ineffective guidelines, lack of industry innovation, and regulatory loopholes within the compliance framework that private security companies struggle with when disposing of e-waste. A key issue rests on the ignorance and lack of training surrounding e-waste. As a result, businesses especially struggle with evaluating, storing, and disposing of electronic equipment. Participant 4 sheds valuable insight on this issue: *"From us, it will be mostly a matter of limitation in terms of knowledge on how not knowing what you have in your hands and not knowing what you're disposing of."* (Participant 4)

In addition to the existing knowledge gaps of WEEE and internal challenges, shortcomings in general health and environmental regulatory enforcement significantly contribute to the worsening of the problem. These deficiencies hinder the effectiveness of oversight, allowing issues to persist and escalate unchecked. Participant 11 articulates the challenge, stating, *"[PSiRA] the regulator doesn't have teeth"* (Participant 11)

The insufficient understanding of regulatory frameworks significantly hinders progress in e-waste management practices. This gap in knowledge stifles innovation and limits stakeholders' awareness of how emerging disruptive technologies can influence and reshape these regulations. Participant 6 encapsulates this sentiment by stating, *"I don't think people are coming with a business idea"* (Participant 6)

Participant 8 raised a concern about subversive compliance, where companies exploit regulatory loopholes to appear compliant with sustainability initiatives while not genuinely

engaging in them. This practice undermines true environmental responsibility, as these companies may meet legal standards but lack a real commitment to sustainability. This highlights questions about the effectiveness of current regulations in promoting authentic environmental stewardship.: "*The penalty system is not harsh enough that previously advantaged companies are finding ways around. For example, previously, when BEE* [Broad-Based Black Economic Empowerment (BBBEE)] *was introduced, those companies tended to go to coloured and Indian CEOs and management."* (Participant 8)

5.5.2 Financial Barriers to E-Waste Management

The findings indicated that financial constraints hinder participation in e-waste management best practices. The expense of supervising, regulating, and managing electronic waste renders compliance an economic issue for businesses rather than an operational one. Participant 3 quotes the potential expense incurred for outsourcing e-waste management. *"Something like that to be outsourced where you can properly track and manage it. You may need to end up having to pay for something like that."* (Participant 3)

Recycling electronic waste, although often constrained by immediate financial challenges, offers substantial benefits that can alleviate various long-term risks related to environmental damage and resource depletion. As Participant 4 noted, the management of e-waste involves a significant opportunity cost in terms of financial investments, the potential loss of valuable materials and the environmental repercussions of improper disposal. They emphasised, "*If we don't recycle, it will also create a more dangerous environment for the employees, causing future hazards for the employees."* (Participant 4)

Participant 2 highlighted the multifaceted effects of changing the e-waste policy, stating that e-waste management is an added financial obligation: *"So, it ran back to my first point to say it affects our finances."* (Participant 2)

5.5.3 Logistical Challenges to E-Waste Management

The analysis reveals that logistical challenges hinder businesses' effective management and disposal of e-waste. These challenges stem from various factors, including regional fragmentation, variations in consumer purchasing behaviour, and the insufficient availability of active collection services. As a result, participating in responsible e-waste disposal programs becomes a complex and often daunting task for organisations, ultimately impeding their ability to do so.

The mammoth challenge that participants confront is the inability to effectively track and monitor how e-waste is disposed of across various locations. This oversight can lead to serious consequences for the environment and health. Participant 3 explains this problem in the following manner: *"Where you... have employees scattered across the country on different sites, you do lose oversight and control as a business."* (Participant 3). Resulting in disjunction of implementing disposal programmes.

Another access point is customer psychology and their choice of convenience, which impacts the level of interest in e-waste recycling. Participant 12 describes this: *"South Africans are huge consumers, and they have a mindset of convenience."* (Participant 12). Regardless of such issues, some companies do make efforts to enhance their collection of e-waste, albeit in a rather opportunistic manner, using existing transport routes.

Participant 10, for instance, takes a more flexible stance in stating, *"Why not? If my vehicle was going from Randburg to Wynberg, loaded with the stuff I had collected, and I have three clients on the route I can help, I would definitely pick it up."* (Participant 10)

5.5.4 Regulatory and Compliance Challenges

The findings revealed several regulatory challenges that restrict effective participation in managing e-waste. These challenges include policy misalignment, lack of awareness, weak regulatory enforcement, and financial constraints within regulatory bodies. A significant concern is the misalignment of policies within a particular sector, which always leads to an unsupportive business environment. Participant 4 underlines the issues that stem from poorly crafted policies, saying, *"If the policies clash or they do not benefit both parties in any manner, then it can create a more hostile environment to participate in such industries."* (Participant 4)

Insufficient knowledge threatens the efficacy of regulations, apart from misaligning policies. Participant 10 illuminates this problem with the following statement: *"There needs to be much more awareness."* (Participant 10) Participant 5 clarified the problem as the lack of well-defined policies within the organisation. He stipulated, *"In terms of our policies within the company, that was not yet classified"* (Participant 5)

Another significant reason for non-compliance can be attributed to the insufficient budget allocated to the organisation responsible for carrying out this function. Without adequate funding, the agency struggles to implement necessary programs, hire qualified personnel, and maintain essential resources. This financial limitation often hampers their

ability to effectively monitor and enforce regulations, leading to a disconnect between the intended objectives and the actual outcomes. Participant 11 poses a challenge to the other limitation of the regulator: "*Like I'm saying, the regulators. What's stopping them? Is it because they don't know of the money? Is it that they don't have the trucks to go and deliver the stuff? I think it's because of lack of money as well, can contribute to that.*" (Participant 11)

Figure 5.5 provides the thematic map of the barriers to sustainable E-Waste Management in the Private Security Industry.

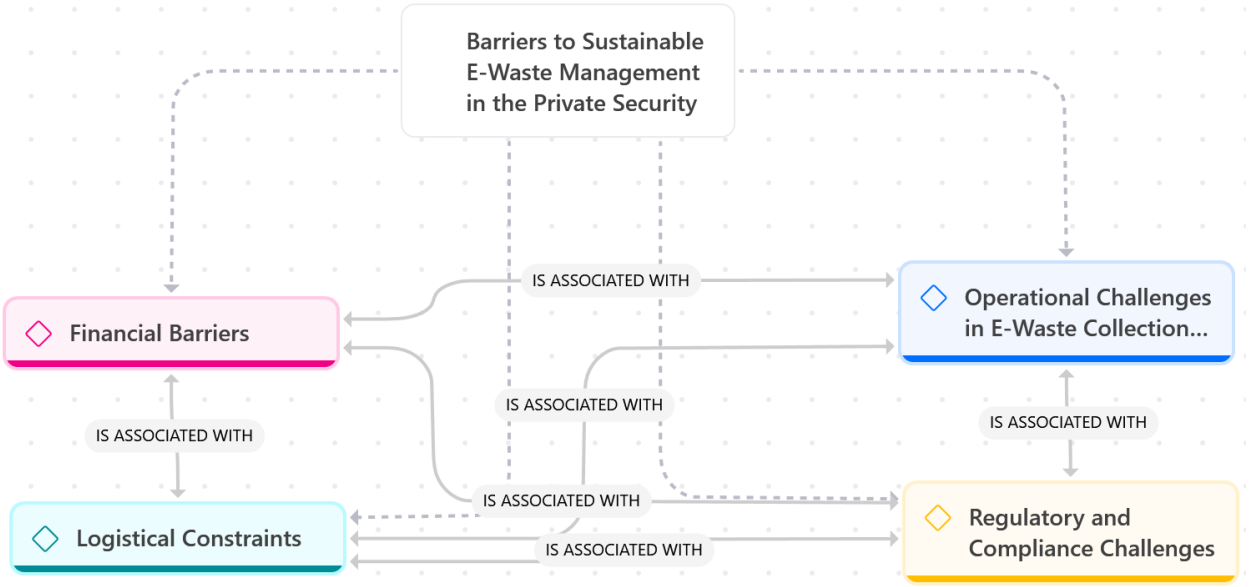

Figure 5.5: Barriers to Sustainable E-Waste Management in the Private Security Industry

5.6 Leveraging Theoretical Frameworks for a Structured E-Waste Management Model

How can incentive and disruptive innovation theories be leveraged to design a working framework that stimulates responsible WEEE management within the private security sector?

The theme focuses on disruptive innovation as strategic interventions to better manage electronic waste within the private security industry. It analyses the ways companies can be motivated and directed towards more environmentally sound practices through policies, incentive systems, and suggestions made at the industry level (Table 5.5).

Table 5.5: Leveraging Theoretical Frameworks for a Structured E-Waste Management Model

Codes	Subthemes	Themes
• Incentivising behavioural change through formalisation • Economic thrust to improve participation • Regulatory compliance and behavioural Influence • Awareness, education, and intrinsic motivation	Application of Disruptive Innovation in E-Waste Management	Leveraging Theoretical Frameworks for a Structured E-Waste Management Model
• Tax incentive • Manufacturer-based incentives • Enhancing collaboration • Mandatory e-waste management in projects and tenders • Expectation of incentives for carbon reduction	Strategies for Encouraging Sustainable E-Waste Practices	

5.6.1 Strategies for Encouraging Sustainable E-Waste Practices

The findings notably did not support the notion that disruptive innovation had a substantial impact on the PSI; rather, it mainly contributed to the establishment of a market for informal recyclers. A crucial element of these findings was the emphasis on economic incentives, which outlined several strategies for optimising incentive structures, including tax rebates and manufacturer incentives, discounts, partnerships and collaborations, and compulsory procurement policies.

One approach with promise is using tax incentives to drive compliance. Participant 6 suggested financial rewards being given to those organisations who implement policies for responsible waste management: "*You can create tax incentives... like maybe go to IT companies and say, or distributors of this equipment to say, if you show me that you are following a waste policy, we will give you a tax rebate of 1% or 2%*." (Participant 6)

Another approach aligned with low cost includes discounting by the manufacturers, which rewards businesses for responsible disposition of the e-waste. Participant 5 argued that electronic waste could be returned to manufacturers in exchange for new products at a discounted price: *"Whenever you take it back to the manufacturer, there is a discount given as a form of incentive. Yes, that would help, and it won't cost anyone much. Thus, I think that would motivate people."* (Participant 5)

Collaborative business relationships within the e-waste sector can also increase productivity and optimise waste management without any financial motivation. Participant 4 discussed how e-waste companies should work together to address the collection and disposal of e-waste better: *"Perhaps if e-waste companies could forge more cooperative agreements, there would be more collaboration."* (Participant 4)

Addressing sustainable e-waste management by enforcing compliance through procurement policies is possible. In general, procurement for tenders and large projects may be an excellent opportunity to foster participation and accountability for appropriate e-waste disposal. Participant 10 pointed out that if compliance with e-waste disposal were an obligatory procurement component above a certain economic threshold, firms would be compelled to be more responsible. In their words:

"By making that a compulsory requirement, you then force the contractors or whoever is involved in the project to engage in proper e-waste management." (Participant 10)

In contrast, Participant 12 noted a severe deficiency regarding current procurement practices related to e-waste policies, persisting that such policies are seldom part of the tender documents: *"I am yet to find a tender that requires a company to supply the e-waste policy."* (Participant 12)

5.7 Disruptive Innovation in E-Waste Management

The study identifies several critical issues which could be opportunities for responsive electronic waste solutions within the private security sector. Insights gathered from participants reveal issues such as knowledge gaps, informal recycling innovations,

regulatory inefficiencies, and economic disincentives that hinder proper disposal. These findings correspond with the subthemes of knowledge deficits and informal innovation, regulatory barriers and compliance challenges, as well as economic and structural weaknesses in e-waste management (Table 5.6).

Table 5.6: Challenges and Opportunities for Disruptive Innovation in E-Waste Management

Codes	Subthemes	Themes
• Lack of awareness and informal e-waste disposal • Township tech hubs as disruptors	Knowledge Gaps and Informal Innovation in E-Waste Management	Challenges and Opportunities for Disruptive Innovation in E-Waste Management
• Strict regulation prompting alternative methods • Handling hazardous e-waste as a disruptive challenge	Regulatory Barriers and Compliance Challenges	
• Fragmented accountability • Perceived lack of economic incentives • Ineffective fines vs. positive incentives	Economic and Structural Weaknesses in E-Waste Management	

5.7.1 Knowledge Gaps and Informal Innovation in E-Waste Management

The poorly regulated disposal of e-waste in the private security industry creates challenges for properly disposing of obsolete electronic devices. Many businesses operate without knowledge of e-waste management, leaving the decision to dispose of electronic waste in ad hoc or informal methods. This lack of standardisation poses a challenge for businesses. However, it is an opportunity for new disruptive innovations

that seek to change the business method, provide economic benefits, and enforce compliance through policies.

The insights from the participants point to the absence of clear guidelines, thus leaving the private security sector unsure of how to handle obsolete electronic equipment. Participant 2 remarked, *"We never know what to do with them because I've got plenty of them here. We were not well informed in terms of what to do with the old stuff… we just destroy them or put them in a bin."* (Participant 2)

While many institutions may have policies related to electronic waste management practised in daily operations, the absence of clearly defined guidelines often leads to unstructured and inefficient handling of this waste. Without explicit protocols, employees might lack the knowledge or direction needed to dispose of or recycle electronic devices properly, resulting in inconsistent practices and missed opportunities that come with effective e-waste collection. This ambiguity can hinder the institution's sustainability efforts and create potential legal and environmental risks associated with improper disposal.

One Participant noted, "*There is no standard or really classified policy that says this is how we dispose of those. Usually, what we do if the site has ended and then there is some of our equipment from the sites is we just collect them and store them in the storeroom*." (Participant 5)

An important aspect of the industry problem is the fragmented accountability for electronic waste disposal. Private security companies supplying security detection equipment do not manage their products' end-of-life and instead pass that responsibility onto the customers. *"We supply electronic devices needed within the security industry…The end user is responsible for disposing of what they have procured. That becomes their responsibility"* (Participant 12)

Unlike major recycling companies, which collect bulk electronics for export and only focus on processing high-value metals, informal recyclers in townships extract and creatively innovate on electronic waste. Participant 8 described the ingenuity of local recyclers, stating, *"Inside the township itself, there's a little electronic shop where youngsters take apart these electronic goodies and rebuild other stuff…they strip it for PC boards" (*Participant 8)

In addition to dismantling electronic devices, grassroots recyclers effectively divert waste from landfills since many discarded items can be recovered and refurbished. As

described by Participant 8, *"I donate it to them… if these individuals manage to recover and reuse 50% of whatever I give them, then that's 50% less going to waste"* (Participant 8)

5.7.2 Regulatory Barriers and Compliance Challenges

Policies are supposed to support appropriate e-waste management; however, overly rigid policies often restrain rather than aid. Long approval periods, poor enforcement, and weak sanctions give rise to a system where businesses and people prefer to dodge the formal system instead of using it. This inefficiency is well articulated by Participant 11 as follows:

"The regulator will tell you, 'We only have four or five people… We're forced to apply, but we can't wait five months. We install the machine now." (Participant 11)

As with many approaches to compliance, the legal regulatory framework seems to rely heavily on fines and penalties to encourage compliance with legislation, but this approach is almost irrelevant. In situations where enforcement and control mechanisms are ineffective, people and enterprises do not feel the need to engage in any activity other than it is economically beneficial. As Participant 12 noted: *"Fines are not very effective in this country… Our community just doesn't care. But if you're offering people money, they would really start acting.*" (Participant 12)

For many companies, holding onto obsolete electronic devices ties up valuable resources and becomes a significant financial burden. These products are seldom repurposed or recycled since no financially compelling reasons exist to collect e-waste or implement trade-in programs. Participant 5 outlined this economic wasteful activity as follows: *"It's not economical to store it because we don't have any incentive out of storing it."* (Participant 5)

5.8 Additional Findings E-Waste Management Practices

One approach to encouraging proper e-waste disposal is through policy-driven strategies that formalise informal waste collection efforts. Some participants noted that the government has been slow to recognise the challenges of informal e-waste disposal and emphasised the need for structured interventions. As Participant 1 explained: *"I think the government is only now becoming aware of the inconveniences that are being caused by this informal waste. The government needs to come up with a program to incubate [and provide] proper training* (Participant 1)

Financial incentives significantly influence one's involvement in e-waste management initiatives. For a few individuals, waste disposal is ecologically and socio-economically important. Participant 1 drew attention to this view, pointing out the role played by informal waste pickers in the system. *"It's more of an economic issue. I do not want to say these guys are not playing a role. They do play a role.*" (Participant 1)

While financial incentives can encourage voluntary participation, regulatory enforcement remains critical in ensuring industry-wide compliance. Participant 8 illustrated how mandatory compliance can drive behavioural change, citing the example of security industry regulations. *"Now nobody can trade without PSiRA because every single tender, be it private or public sector or any quotation in this industry, needs to be PSiRA compliant. So, basically, the stick eventually becomes the rule."* (Participant 8)

However, some businesses do not practice ethical responsibility for the sake of it, as many operate in compliance with specific external controls, as Participant 10 further explained: *"Part of your tender or bidding process speaks to how you would get rid of the salvage you would take out of a site."* (Participant 10) Moreover, many businesses fail to comply except when they have no option, as Participant 12 has noted: *"We generally don't like compliance."* (Participant 12)

Cost factor still occupy a notable barrier for some aspiring to participate in responsible e-waste practice despite various businesses claiming its importance. Participant 3 noted that financial incentives must justify participation on some level, asserting: "I*ncentive has got to exceed the cost of doing that."* (Participant 3) Similarly, Participant 10 pointed out that many businesses only adhere due to some procurement requirement and not at their own will: *"In order to comply, we had to then engage and register ourselves with these e-waste suppliers and show proof that we have that in place.*" (Participant 10)

5.9 Conclusion

The diverse participant profile, primarily based in Gauteng, reveals various operational capacities, workforce sizes, and annual turnover figures. The differences in these parameters underscore the varying capabilities of companies to engage in effective e-waste management practices. The most prominent participant reported a workforce of 300-400 employees and an estimated turnover of R50 million. In contrast, the most minor participant had only five employees and an estimated turnover of R5 million, illustrating substantial resource disparity among the companies involved.

The interviews resulted in 125 codes and 108 unique findings about e-waste management, highlighting a complex situation. Additional interviews may be less valuable, indicating the importance of the insights already gathered. Analysis shows that economic, legal, and operational factors significantly impact how Private security companies manage e-waste. While awareness is increasing, challenges like budget constraints and regulatory compliance remain.

Many companies lack a full understanding of e-waste issues, emphasising the need for better education and incentives for sustainable practices. Developing effective e-waste management policies is crucial, and future research should focus on raising awareness and ensuring compliance with regulations. Key challenges include financial constraints, as recycling has immediate costs but long-term benefits. Non-recycling can harm employee health and waste resources. Logistical issues complicate management due to regional differences and inadequate collection services.

Consumer preferences for convenience reduce engagement in recycling. Participants suggest that regulatory challenges, such as weak enforcement, also hinder progress. There is a pressing requirement for engaging awareness programmes that can articulate policies clearly to promote compliance and e-waste management. Using end users and customer behavioural insights will be essential to address these challenges.

CHAPTER 6: Discussion of Findings

6.1 Introduction

This chapter aimed to create a comprehensive connection between the key findings of this study and the existing literature discussed in Chapter 2 to enhance and enrich the current understanding of three critical areas: economic incentives, disruptive innovation, and targeted e-waste management practices. This alignment not only reinforces the relevance of the analysis of the key findings but also contributes to the broader dialogue in these fields, highlighting their interconnections and implications for future research and practice. The research questions established the framework for discussing the role of economic incentives in managing e-waste within the PSI.

6.2 Central Research Question

Primary research question

> To what extent can economic incentives motivate private security businesses in the Gauteng Province, South Africa, to change their behaviour to adopt sustainable e-waste management practices?

The main research question examined how economic incentives could motivate private security companies to navigate responsible e-waste practices amidst disruptive technology. The exploration of this research question commenced with an analysis of economic incentive, emphasising their perceived effectiveness and the influence newer technologies had the process. Economic incentives are rooted in incentive theory, which provides the theoretical framework for this study.

6.2.1 Awareness of E-Waste Management

According to Bald et al. (2017) and Artang (2023), there is a general widespread lack of awareness concerning various aspects of e-waste, including the proper methods for disposal, the critical importance of responsible e-waste management, and the positive and negative economic incentives available. This lack of awareness also extends to existing government policies, legislation, and take-back schemes, which have resulted in notably poor participation in e-waste management initiatives among private security

companies. This study's findings revealed a significant lack of awareness regarding best practices for EEE that have reached EOL.

This deficiency diminishes understanding of the potential value gained from processing outdated devices. Consequently, there is a weak motivation to explore and utilise economic incentives related to e-waste management.

The PSI has shown interesting findings; notably, PSCs unaware of best practices for e-waste value extraction and recycling still contribute indirectly to the value chain through informal recycling. They are also inclined to store their WEEE for future use and to prevent any health risks that it may pose. Participant 3 stated that they had "a clear understanding of technical things...technical knowledge that if you remove this, you can put it separately", referring to the essential striping of a computer.

According to Rautela et al. (2021), e-waste poses a serious risk throughout its life cycle. Participant 5 expressed concerns that align with this perspective, suggesting that the health risks associated with storing obsolete security equipment in a working environment include the potential for infections. Participant 5 stated, "Some of these [electronic] equipment [have] glasses, steel and so on, and the more we keep them there, they can catch things like rust, and then we do have cleaners that have to clean those places, and then that can have some infection." (Participant 5)

Participant 11 also adds to the knowledge of the hazardous nature of e-waste, indicating that security detection with X-ray capabilities contains highly dangerous electromagnetic radiation, mainly when the devices are unused or serviced for a prolonged period. They state that the female gender is more exposed to this danger, and continuous exposure can lead to complications with their reproductive capabilities. This is contrary to the view of some academics, such as Ichikowitz and Hattingh (2020), who proposed that individuals have little knowledge of the health dangers of e-waste.

Although PSCs may not be fully aware of the recycling, reusing, restoring, and renewing (RRRR) model of e-waste management, they still possess a general understanding of the necessary actions to take with such equipment to prevent injury and protect the environment, albeit the working environment. Worth noting is that this finding was in line with Mohieli (2022), who noted that most e-waste in South Africa is either stored away indefinitely or illegally disposed of in landfills.

An intriguing aspect of awareness discussed in the literature review and in this study is conscious avoidance. According to Liebenberg (2024), although individuals and private

companies know e-waste regulations, they often lack a systematic approach to safe e-waste disposal. For example, Participant 6 mentioned collaborating with an e-waste recycling company to meet specific accreditation requirements, enhancing their chances of winning tenders. Other participants approached this issue from a different angle, noting that their awareness of e-waste disposal is influenced by the size and type of electronic equipment they need to discard.

Participant 5 stated that they do not participate in e-waste recycling problems because "the amount of e-waste we're having currently is not yet a problem to us." (Participant 5). This supports the findings of Light et al. (2022), which indicated that private security companies rely on physical security personnel for manual labour. Participant 5 remarked that their primary focus is on physical guarding, which causes them to view the accumulation of electronic waste as a lesser immediate concern, as it does not pertain to their core business functions.

These findings reveal that the level of awareness executives of private security companies possess exists but does not extend to the concept of opportunity cost. This awareness is also influenced by the costs of recycling small amounts of materials, particularly the logistical support required, such as transportation to and from a recycling facility.

6.2.2 Awareness of the Value of E-waste

Research into the current state of recycling practices highlights a troubling trend concerning the awareness of the economic value of electronic waste among private security companies in South Africa. It is important to note that the PSI is not exempt from this issue, as available data suggests that over 86% of all generated e-waste remains unutilised (Hodgkinson & Schoeman, 2018; Moyo et al., 2022).

The data suggests that some companies are significantly underutilising the potential financial benefits of collecting and recycling WEEE. The remainder of PSC are not capitalising on this valuable resource. Considerable amounts of discarded electronic devices, remain dormant at clients of PSCs as well as within facilities rented or owned. The cause for those storing their obsolete security aids is associated with scepticism by private security companies, who are of the view that they are not receiving 'fair value' for their products.

Research findings by Participant 4 illustrate this when they state, "At times we might be throwing away extremely valuable old e-waste equipment without knowing it, and then

some e-waste companies might try to take advantage of that…limitation in terms of knowledge [of us] not knowing what you have in [our] hands and not knowing what [we are] disposing of" (Participant 4)

Participant 12 highlights the importance of understanding which items possess real market value, especially regarding components found in EEE. For instance, they point out a commonly overlooked detail: "When you carefully examine a motherboard from a PC, [you'll discover an intriguing feature] the processor includes a gold chip, [expertly designed] for heat reduction" (Participant 12). This subtle yet valuable insight showcases the hidden worth embedded in technology that many people might not recognise.

Other Participants allude to the actual value to be extracted from e-waste; Participant 7 states that "I don't think [South Africa's private security industry is] an industry whereby if you've got e-waste, it's profitable by itself" (Participant 7). This suggests that companies may find it economically impractical to participate in e-waste management, as the costs associated with recycling could exceed the financial benefits of extracting valuable materials.

Participant 3 aligns with Participant 7, indicating that, from a logistical perspective, initiating in-house electronic waste management can be prohibitively expensive. As a result, PSCs may find it necessary to outsource this task to ensure proper tracking and management. However, this outsourcing incurs additional costs, which can lead to hesitance among businesses to proceed unless the incentives offered exceed the associated expenses. This participant further suggested that the size of the electronic product mattered in the industry in relation to the perception of the value. They attribute this to "a learned behaviour over time that those kinds of items don't matter" (Participant 3).

Almulhim (2022) emphasised that the weak enforcement of e-waste regulations significantly affected consumer awareness and complicated the overall e-waste management in various countries. Consequently, well-structured public awareness campaigns that centre around the discarding process will have a meaningful impact (Balde et al., 2024)

These initiatives encouraged consumers to recognise the significance of fostering a greater understanding of the hazards of incorrect discarding and the benefits of recycling electronic devices responsibly. Shevchenko et al. (2019) suggested that implementing an effective incentive system in e-waste management can significantly boost consumer participation in the disposal of WEEE, thereby unlocking its economic potential.

Academics who make similar remarks suggest that it is vital to enhance consumers' environmental awareness over time through financial incentives (Shi et al., 2023).

6.2.3 Perceived Effectiveness of Incentives

According to the findings in Chapter 5, there was a significant lack of consensus regarding the effectiveness of positive and negative incentives. Participant 2 believes that negative financial incentives "will work because private security companies do not want to be fined." Participant 12 disagreed with the effectiveness of fines in driving responsible e-waste behaviour amongst PSCs because they were not aware of PSCs that had been fined for illegal dumping; therefore, "fines are ineffective." Worth noting from this sentiment is that over 80% of global EEE is recycled informally (Forti et al., 2020); therefore, enforcement of fines would be applicable when formal e-waste recyclers become the norm and not the exception.

Research by Forti et al. (2017) and Shevchenko et al. (2019) presents compelling evidence of the effectiveness of negative economic incentives in promoting compliance among individuals and organisations. These studies argue that negative incentives, such as fines or penalties, can be more effective than positive incentives, such as rewards or bonuses, in deterring behaviours that may be harmful to individuals or society as a whole. The authors highlight that negative consequences evoke a stronger motivational response, prompting individuals to reconsider their actions to avoid penalties. This suggests that, when designing policies to change behaviour, the potential for negative economic repercussions may be a more powerful motivator than the allure of positive rewards.

By emphasising the importance of compliance and the potential harm of non-compliance, these findings suggest that future research should take a closer look at the role of negative incentives in shaping corporate behaviour in the private security industry. In disagreeing with this view, Khumalo (2021) argues that such an approach would undermine efforts to expand the value chain of WEEE.

The literature on e-waste indicates that economic incentives can encourage consumers to engage in desirable recycling behaviours (Wang & Huo, 2023). Financial incentives often lead to greater compliance and cultivate a sense of responsibility among consumers. Participant 1 supported this view: "It will encourage a sense of responsibility." This statement underscores the idea that financial rewards influence actions and foster a more profound commitment to accountability.

One must acknowledge that PSCs primarily operate on a profit-driven model, suggesting that both financial incentives and punitive measures, such as fines, can be practical tools for promoting responsible e waste practice in the long term. Research sharing a similar view argues that economic incentives related to e-waste positively and negatively affected consumers looking to reuse, recycle, repurpose, or restore these materials (Smith, 2024). Participant 2 emphasised this point by stating that "money is the main thing," highlighting the importance of financial considerations guiding PSCs in decision-making regarding e-waste management.

Participant 3 emphasised this viewpoint, stating that "you can enhance profits through incentives" in the context of strategies for boosting e-waste recycling. However, research by Sajid et al. (2022) revealed that monetary incentives might not be as effective in tackling e-waste challenges within the private security industry as initially assumed. Their findings indicated that financial incentives could inadvertently detract from the overarching goal of responsible e-waste management. On the basis that when the latter is perceived as an external intervention, such incentives could diminish the intrinsic motivation to prioritise environmental sustainability.

The study revealed a significant limitation regarding private security companies' motivation for responsible e-waste management. Their commitment to sustainable disposal and recycling practices substantially declined when financial incentives were removed. This finding suggests that relying solely on monetary rewards may not be sufficient to ensure ongoing engagement in responsible e-waste management. This indicates a need for alternative strategies to encourage sustainable practices.

This underscores the necessity for a more comprehensive approach that integrates financial considerations while nurturing a more profound commitment to sustainable resource optimisation practices within the sector (Moyo et al., 2022). Participant 12 emphasised the importance of intrinsic motivation at an individual level, stating that "It doesn't come down to the value of money," but to the principle of recycling overall. They suggested that intrinsic rewards can coincide with monetary rewards based on the consumer's awareness of the value of goods. Participants who ascribe to this principle state that practising e-waste management is "a moral thing… to ensure that that waste does not pollute or hinder the next generations." (Participant 7)

Shan et al. (2021) contend that while monetary incentives have played a significant role in reducing the illegal disposal of e-waste, the successful enforcement and implementation of policies and regulations are critical to realising the full potential of both

positive and negative economic incentives. Such enforcement could lead to meaningful business or social impacts amongst PSCs. Strong institutions that enforce these regulations and policies are essential for these regulations to be effective.

As highlighted by Participant 11, establishing a dedicated e-waste department within PSiRA would signify that the organisation is "on the right track." This initiative would provide essential support and help steer efforts towards a more sustainable approach. With the regulatory body playing the crucial role in enforcement, just as it does with general industry compliance. Participant 8 emphasised this point by stating, "Nobody can trade without PSiRA because every single tender, be it in the private or public sector, or any quotation in this industry, needs to be PSiRA compliant. Therefore, the enforcement becomes the standard" (Participant 8).

6.2.4 Optimising Economic Incentive Systems for Sustainable E-Waste Practices

The literature review in Chapter 2 illuminated the intricate relationship between EPR programs, as examined by Smith (2024), and the economic incentives designed to bolster the effectiveness of e-waste management interventions. EPR fundamentally shifts the financial burden of e-waste disposal from the government to manufacturers, compelling these polluters to assume responsibility for their products' EOL management. In nearly 61 countries, adopting EPR programs yielded predominantly positive outcomes, transforming the landscape of e-waste management. These incentives proved advantageous, significantly raising awareness about e-waste issues and motivating manufacturers and consumers to engage in more effective management practices.

The findings emphasised robust policies' critical importance in strengthening these incentive systems. Participant 6 emphasised that effective, sustainable e-waste practices require an integrated approach combining "…*policy*" and "*incentives*." In agreement, Participant 1 elaborated that "… *when regulation is implemented, it will include incentives*," suggesting that a comprehensive framework is essential for promoting long-term environmental stewardship in e-waste management.

Different countries have developed various frameworks to enhance their incentive systems for e-waste recycling, incorporating various financial structures and legislative measures (Forti et al., 2020). Despite these efforts, universal e-waste legislation does not exist; what proves effective in one nation may present significant challenges in

another due to varying cultural, economic, and infrastructural contexts. This idea was echoed by Participant 2, who highlighted that implementing a gift card system could effectively motivate PSCs to recycle their e-waste within the PSI, "*each time you visit to dispose of your electronic waste, they load the points onto your card*," suggesting that this approach not only incentivises responsible disposal but also fosters a sense of reward and community engagement in recycling efforts.

As highlighted by Participant 3, the key takeaway is that the incentives for disposing of e-waste should "…*exceed the cost*" of keeping them. Participant 9 suggested this by saying, "If *the incentives of disposing are much higher than retaining the devices, then I think that would become an incentive enough."* In other words, a well-structured incentive programme in the PSI could encourage more PSCs to participate in responsible disposal practices, leading to better resource management and environmental sustainability.

6.2.5 The Role of Disruptive Innovation

The findings revealed no consistent phasing out of older technological devices in favour of newer ones in the private security industry, as Jaine et al. (2023) suggested. Instead, most private security companies actively try to retain existing physical technologies and extend their usefulness. Some keep their EEE for prolonged periods because it contains economic value that can be extracted later. Participant 7 articulates this: "Because *the law is silent on lifespan, you as a supplier of this equipment, you have the prerogative, and the client has the prerogative of purchasing."* (Participant 7)

Private security companies in Gauteng do not benefit from the rapid development of the IoT, as alluded to by Caluza (2022), who suggested that society was at the stage where outdated practices of storing WEEE would change. Since the process of disposal of e-waste is voluntary, many end users store it because they can. Participant 11 indicated that one of their clients had over 1500 obsolete security X-ray detection machines in storage: *"90% of those machines have been there for more than 20 years."*

Recent research findings suggest that private security companies cannot leverage the socioeconomic market conditions that promote disruptive innovation, as Dzimba and Van der Poll (2022) indicated. Instead, Gauteng's PSI is motivated by external factors beyond traditional economic incentives. Yafen and Shevchenko (2021) highlight that while economic incentives can enhance consumer participation in e-waste collection and recycling efforts, relying solely on these incentives proves inadequate.

Participant 7 indicated that their incentive is to keep their security devices for a prolonged period because they are unaware of other forms of incentives. They have *"no choice but to really bleed the asset."* (Participant 7) What this participant overlooks is; that they are actually driven by an external financial incentive in that they receive payment from a client who continues to use the device.

Financial incentives must be paired with various supportive strategies to foster meaningful engagement. These include targeted educational campaigns designed to raise awareness about the negative impact of e-waste and what steps should be considered responsible disposal techniques. Collaboration with local communities and stakeholders is also crucial, as it helps build a sense of collective responsibility and ownership over e-waste issues. Community engagement initiatives can empower PSCs to participate actively in recycling programmes while promoting sustainable consumption practices that can shift consumer behaviour towards more environmentally friendly choices.

Additionally, policy-driven initiatives are essential to create regulatory frameworks that encourage best practices in e-waste management. Without these comprehensive strategies, even consumers who are highly aware of the issues surrounding e-waste may feel overwhelmed and frustrated, ultimately undermining their ability to recycle effectively, regardless of the recycling campaigns in place.

6.2.6 Summary of the Discussion of the Main Research Question

This chapter highlights the link between economic incentives and e-waste management practices within the PSI. A significant gap in awareness exists regarding sustainable e-waste management and the economic value of proper recycling and disposal. Many organisations lack knowledge of effective practices, resulting in low participation in existing e-waste initiatives and diminishing the impact of economic incentives. While some participants fully understand disposal, they often overlook the concepts of opportunity cost and long-term benefits. Additionally, the trend of 'conscious avoidance,' where companies recognise e-waste yet fail to address it, reflects misguided perceptions of urgency or logistical challenges.

There is a pressing need for targeted education and outreach programs that inform private security companies about the health risks of improper e-waste management and the financial advantages of adopting an RRRR model. Such initiatives will enhance

participation rates in sustainable practices. Ultimately, bridging awareness gaps and showcasing the financial viability of e-waste management initiatives are crucial for fostering a sustainability culture within the PSI. Future research should focus on tailored economic incentives and educational campaigns that empower organisations to implement effective e-waste management practices, benefiting both the companies involved and broader environmental objectives.

6.3 Discussion: Research Sub-Question 1

Research sub-question 1

What kind of incentives cause the desired outcome for e waste management?

Forti et al. (2017) and Wang & Huo (2023) categorised incentives into two primary types: positive (or pull) incentives and negative (or push) incentives. Positive incentives encompass tax benefits, grants, financial subsidies, and direct monetary rewards, whereas negative incentives include fines, penalties, carbon taxes, environmental compensation, and legal repercussions. Participants were presented with a hypothetical zero-sum scenario in which they were required to choose between positive and negative incentives as motivators for increasing their participation. They were asked to identify factors that could encourage them to actively engage in e-waste management, regardless of their current level of involvement.

Those favouring positive incentives, such as Participant 2, underscored the importance of monetary incentives, articulating that "money is the main thing." Whether adopting a carrot or stick approach, financial compensation continues to serve as the foremost motivator, a finding that aligns with existing literature on electronic waste management. Participants 4, 9, 10, 11 and 12 expressed a perspective that highlights the effectiveness of the carrot method, emphasising how monetary incentives can stimulate engagement and promote positive behaviours in the context of e-waste recycling and disposal.

Advocates for negative incentives, such as Participant 8, referred to the concept of *"carrot and stick,"* expressing the belief that "*the stick eventually becomes the rule."* In support of this view, participant 1 suggests that negative incentives must be goal-specific for private security companies that supply electronic equipment to their clients, stating,

"If [one is] able to achieve these targets a year, [they can be] incentivised with [something]." (Participant 1) Echoing similar remarks, Participant 7 highlighted that regulation typically includes some incentive punitive or otherwise incentives. They suggest that punitive incentives must be selectively applied according to economic development and location, stating, *"In certain areas, it should be forced; I don't think you can force it throughout… we have to be practical. If you look at rural areas, there's no way you can enforce it."* (Participant 7)

Interestingly, some participants remained neutral despite being asked to provide a definitive zero-sum answer regarding positive or negative incentives. For instance, Participant 6 remarked, "It's *not about the money. As long as there is a policy guiding people on handling old electronics in the country."* Meanwhile, Participant 5 suggested that *"both [negative and positive incentives] can be effective. [If utilised together], they may have a greater impact because there are financially arrogant individuals. They have substantial wealth and may not think twice about breaking the law, as they can afford the consequences, while others may not have that option."* (Participant 5)

These observations highlight the necessity of employing qualitative research methods when examining such phenomena rather than relying exclusively on quantitative approaches characterised by rigid questionnaires that yield only binary responses. If statistical analysis were applied, it might suggest that half of the participants, 6 out of 12 (50%), endorsed positive incentives. In contrast, the other half could be inaccurately interpreted as supporting the premise that negative incentives hold greater importance. This misinterpretation of the findings would fail to contribute meaningfully to the academic discourse on e-waste management.

It is important to note that these findings are consistent with existing EPR frameworks. These frameworks include financial incentives and penalties for consumers and suppliers of e-waste. They represent significant economic incentives that can encourage private security companies to adopt desired behaviours.

Literature by Shevchenko et al. (2019) posited that a cost-sharing incentive system could provide the spark that ignites PSCs to adopt responsible e waste practices, fostering a more accountable approach to electronic waste handling. Take-back and collection schemes, levy systems and monetary incentives not only stimulate private sector participation in e-waste recycling but could also enhance the capabilities of PSCs to manage recycling and ensure responsible disposal (Sajid et al., 2022; Wang & Huo, 2023).

6.3.1 Summary of the Discussion of Research Sub-Question 1

Distinguishing between positive and negative incentives provides essential insights into motivating participation in e-waste management. Evidence from participants consistently demonstrates that financial compensation serves as a primary motivator, a finding that aligns with existing literature. Proponents of positive incentives emphasise their effectiveness, while advocates for negative incentives highlight the necessity for tailored regulations.

The perspectives of neutral participants indicate that a one-size-fits-all approach is inadequate; a strategic combination of both incentive types is crucial for achieving meaningful findings. This reinforces the importance of employing qualitative research methods to capture the nuances of participant viewpoints.

Furthermore, aligning these findings with established EPR frameworks underscores the need for a balanced strategy that effectively integrates incentives and penalties. Overall, this study sheds light on the complex motivations underlying e-waste management and emphasises the importance of customised approaches that address all stakeholders' diverse needs.

6.4 Discussion of Research Sub-Question 2

Research Sub-Question 2

What key barriers hinder private security companies' participation in sustainable e-waste management?

6.4.1 Operational Challenges in E-Waste Collection and Disposal

There is currently no effective e-waste collection and disposal system in the PSI, which poses a significant loss of revenue and environmental and public health concerns. This deficiency could be traced back to multiple factors, including the absence of comprehensive e-waste regulations and a general lack of awareness about e-waste management, from disposal and storage to recycling. Participant 4 emphasised this issue by stating that PSCs experienced a *"…limitation in terms of knowledge… and what you are disposing of."* This lack of awareness prevented PSCs from making informed choices about properly handling electronic waste.

Existing literature confirms that a lack of awareness concerning regulations, government policies, economic incentives, and the potential risks associated with improper disposal or storage of electronic waste and how to dispose of it represents significant barriers to effective e-waste management within the PSI (Baldé et al., 2017; Forti et al., 2017; Laffont & Martimort, 2001).

PSiRA plays a crucial role in providing guidance and oversight for industry regulations. However, the PSiRA's silence regarding e-waste management leaves PSCs without the necessary frameworks or directives to follow. As Participant 11 pointed *"PSiRA, the regulator, doesn't have teeth,"* implying that without robust, enforceable policies, PSCs are unlikely to prioritise e-waste management. This gap in regulatory oversight fosters an environment where PSCs remain uninformed, uninterested, and inactive when managing their e-waste.

Even if PSiRA were to initiate a comprehensive e-waste management regulation, there is no guarantee that PSCs would fully comply or engage in sustainable practices. The potential for "subversive compliance" exists, where companies may adhere superficially to regulations while finding loopholes to circumvent the intent of those laws. This behaviour can significantly undermine genuine efforts to foster responsible e waste practice within the PSI. Participant 8 drew a critical comparison to BBBEE laws, where certain companies engaged in deceptive practices by hiring *"... coloured and Indian CEOs and management"* purely for meeting certification requirements rather than fostering genuine advancement and equality.

6.4.2 Financial Barriers

Research conducted by Hodgkinson and Schoeman (2018) and Moyo et al. (2022) highlighted that e-waste recycling presented a considerable economic opportunity for PSCs. However, it also brought about notable financial challenges that discouraged these companies from pursuing effective e-waste management practices. Participant 3 emphasised this point by sharing their perspective on the hidden costs associated with e-waste management. They remarked, *"… you may need to end up having to pay for something …"* (Participant 3). This underscores the unpredictability of expenses that can arise from e-waste handling.

Similarly, Participant 4 supported this viewpoint by warning of the potential hazards in the workspace resulting from improper e-waste storage or disposal. They stated, *"If we don't recycle, it will also create a more dangerous environment for the employees,*

leading to future hazards." This highlighted the dual impact of neglecting e-waste management. On one hand, it presented financial challenges; on the other, it jeopardised employee safety and workplace conditions. Therefore, while e-waste recycling offered economic benefits, it was essential for PSCs to carefully consider the associated costs and the necessity of creating a safe working environment.

The issue raised by Participant 4 served as a motivating factor: earlier in the study, it was noted that recycling e-waste was often done voluntarily. Consequently, PSCs that have stored their electronic equipment unsafely on their premises might willingly dispose of their e-waste if presented with a suitable opportunity or collection system, allowing them to clear their office space and enhance safety.

6.4.2.1 Logistical Constraints

One significant challenge identified by the study findings is the difficulty in effectively tracking and monitoring e-waste disposal across various locations. This issue presents serious risks to both human health and the environment, as improper disposal methods can lead to the release of toxic substances. According to Ichikowitz and Hattingh (2020), global conditions relating to environmental conscious of e-waste practices are alarmingly inadequate. Yafen and Shevchenko (2021) pointed out that each country, industry, and organisation has adopted distinct methods for collecting and disposing of e-waste, resulting in a fragmented approach to e-waste management. This fragmentation complicated efforts to achieve effective oversight.

Participant 3 emphasised the significant challenge of managing e-waste when employees are dispersed across various locations nationwide. Participant 3 stated, "*With employees scattered across the country at different sites, you do lose oversight and control as a business."* This scattered presence complicated e-waste tracking efforts, leading to potential inefficiencies and increased risks regarding e-waste disposal and compliance with environmental regulations. The lack of centralised monitoring results in lost accountability and makes it harder for their company to comply.

Accurately assessing the magnitude of generated WEEE in South Africa presented significant challenges. Participant 12 highlighted the difficulty of tracking e-waste, stating, *"South Africans are huge consumers, and they possess a mindset of convenience,"* which resulted in the accumulation of considerable quantities of e-waste. This situation was exacerbated by the absence of an effective e-waste tracking system and a scarcity

of comprehensive literature regarding the amounts of e-waste produced, imported, and exported.

Despite these logistical impediments, other PSCs in the supply chain indicated their willingness to recycle their clients' obsolete electrical equipment, contingent upon their clients' consent. For instance, Participant 10 expressed confidence in their ability to facilitate e-waste collection, stating, *"… if my vehicle were travelling from Randburg to Wynberg, loaded with stuff I had collected, and I had three clients on the route I can help, I would pick it up."* The statement provided by Participant 10 demonstrates a general willingness to responsible practices amongst PSCs provided is it also convenient and does interrupt their core activities.

6.4.2.2 Regulatory and Compliance Challenges

The findings illustrate a concerning reality of significant misalignment in e-waste management policies and a prevalent lack of awareness regarding existing regulatory frameworks, leading to confusion and ineffective compliance. Maes and Preston-Whyte (2022) contend that the global systems for managing e-waste are fragmented and disjointed, failing to seamlessly integrate key processes such as product design, material sourcing, production, consumption, and recycling efforts. Participant 4 referenced the fragmented and disjointed e-waste regulatory system and how it creates an unwelcome atmosphere for PSCs to engage in e-waste, stating that "*if the policies clash or they do not benefit both parties in any manner, then it can create a more hostile environment to participate in such industries."* (Participant 4)

The lack of awareness surrounding e-waste regulations, combined with the misalignment, as highlighted by Maes and Preston-Whyte (2022), significantly undermined the effectiveness of these regulations and their implementation in PSI. Participant 10 stressed that *"there needs to be much more awareness"* about key components such as e-waste regulations, EPR, and Producer Responsibility Initiatives (PRI) among PSCs. They pointed out that enhancing understanding in these areas is crucial for effective compliance and sustainability. Moreover, it was essential for each PSC to formulate its comprehensive e-waste policies. By doing so, they could align with regulatory requirements, stay ahead, and establish a competitive edge by leveraging the profitable economic opportunities available through e-waste management. Participant 5 supported this idea, noting, *"in terms of our policies within the company, that was not yet classified,"* highlighting a gap that needed to be addressed for better strategic positioning in the evolving landscape of e-waste management.

6.4.3 Summary of the Discussion of Research Sub-Question 2

the investigation into e-waste management within South Africa's private security industry highlights critical operational, financial, and logistical challenges that hinder effective practices. The absence of robust regulatory frameworks and awareness among PSCs leads to inadequate electronic waste handling, posing serious risks to environmental integrity and public health. The inaction of bodies like PSiRA compounds these issues, leaving PSCs without necessary guidance.

Financial barriers, such as hidden costs and unpredictability, often prevent these businesses from adopting sustainable practices. However, with the right incentives and systems, PSCs can be motivated to prioritise responsible e-waste disposal. Logistical challenges further complicate waste monitoring and threaten both sustainability and human health. Addressing these issues requires a unified effort from government entities, the private sector, and communities. The PSI can advance toward a more sustainable future by implementing strong regulations and efficient collection systems.

6.5 Discussion of Research Sub-Question 3

Research Sub-Question 3

> How can incentive and disruptive innovation theories be leveraged to design a working framework that stimulates responsible WEEE management within the private security industry?

6.5.1 Strategies for Encouraging Sustainable E-Waste Practices

Forti et al. (2017) conducted a study highlighting the significance of positive incentives in encouraging responsible e-waste disposal among consumers. They identified various effective strategies, including tax benefits, grants, subsidies, cash rewards, take-back schemes and trade-in discounts, that motivate individuals to dispose of electronic waste appropriately. By providing these financial incentives, consumers were likelier to take action and deliver their e-waste to designated recycling locations rather than contributing to environmental pollution.

This approach promotes sustainable practices and raises awareness about the importance of proper e-waste management in safeguarding the environment. Participant 6 endorsed these findings by stating that "*you can create tax incentives... like maybe go*

to IT companies and say, or distributors of this equipment to say, if you show me that you are following a waste policy, we will give you a tax rebate of 1% or 2%." (Participant 6)

This approach benefits the companies financially and promotes sustainable practices in the industry. Take-back schemes have significantly enhanced e-waste collection rates by transforming recycling into an attractive and financially advantageous option for consumers. These programs encourage consumers to return their used electronic devices to manufacturers, often resulting in valuable incentives such as discounts on future purchases. For instance, Participant 5 shared their perspective: *"Whenever you return it to the manufacturer, a discount is given as an incentive. Yes, that would help, and it won't cost anyone much. Thus, I think that would motivate people."*

Yafen and Shevchenko (2021) assert that achieving long-term sustainability in the management of e-waste requires a multifaceted approach. They emphasised integrating various strategies, including rewards and punishments, to motivate behaviours that lead to effective e-waste disposal and recycling. The authors stressed the vitality of cultivating collaborations and partnerships within the e-waste value chain. Bridging between PSiRA, PSCs, government agencies, manufacturers, private businesses, and consumers, all of whom play vital roles in the ecosystem. By working together, these parties could create a cohesive strategy to tackle the pressing issue related to sustainability and a develop a lasting solution.

Participant 4 supported this viewpoint, commenting, *"If e-waste companies could forge more cooperative agreements, there would be greater collaboration."* This accentuates the idea that enhanced cooperation among e-waste recyclers and other stakeholders could lead to more effective solutions, such as improved recycling processes, better waste tracking, and increased public awareness regarding responsible disposal and recycling practices. Such collaborative efforts could foster innovation and create sustainable models for managing e-waste, benefiting the environment and society.

Yafen and Shevchenko (2021) also advocated establishing compulsory mandates that compel compliance and promote responsible e-waste management practices. By combining these various approaches, the authors believe that it is possible to drive significant progress toward sustainable e-waste solutions in the long term. Participant 10 emphasised that compliance with e-waste management could be effectively enforced at the procurement stage, particularly for tenders and large-scale projects. *"By making that a compulsory requirement, you then force the contractors or whoever is involved in the*

project to engage in proper e-waste management." (Participant 10). This approach ensures that all parties follow established protocols and necessary disposal practices, such as recycling, while fostering a commitment to sustainability and environmental responsibility. Additionally, mandating these requirements removes ambiguity, ensuring compliance is integral to the e-waste project framework. This strategy promotes accountability among PSCs and reinforces the importance of sustainable practices, ultimately addressing the challenges associated with e-waste more effectively.

6.5.2 Summary of the Discussion of Research Sub-Question 3

Question 3 highlighted that developing responsible e waste practices needed a multifaceted approach that included financial incentives, collaborative partnerships, and regulatory measures. The findings indicate a lack of disruptive innovation within Gauteng's private security industry. There is no evidence to support the assertion that this sector contributes to increased volumes of e-waste, as suggested by the research conducted by Dzimba and Van der Poll (2022), Caluza (2022), and Jain et al. (2023).

By combining tax benefits and trade-in discounts with mandatory compliance, responsible e-waste disposal behaviours among PSCs could be enhanced. Additionally, understanding the behavioural economics at play enabled more effective interventions. This comprehensive framework could significantly reduce environmental risks from e-waste while promoting sustainable practices across the PSI.

6.6 Conclusion

This chapter established a comprehensive link between the study's key findings and existing literature on three critical areas: economic incentives, disruptive innovation, and effective e-waste management practices. The central research question focused on how economic incentives could encourage private security companies (PSCs) to adopt responsible practices to manage their current electronic waste since it did not increase at a rapid rate in the sector to warrant a crisis. The analysis underscored the effectiveness of economic incentives and the need for optimised incentive systems to enhance e-waste management practices.

A significant finding was the widespread lack of awareness regarding e-waste management among PSCs, as highlighted by Bald et al. (2017) and Artang (2023) who indicate that awareness levels of what to do with WEEE are low in all spheres of society.

The level of unawareness extended to best practices for recovering economic or ‘scrap’ value from electronic equipment that has reached its end-of-life cycle.

Interestingly, while some PSCs contribute to the value chain via informal recycling, they also tend to store waste electrical and electronic equipment (WEEE) to mitigate health risks. Participants expressed concerns about the risks associated with static e-waste, including potential health hazards from rust and electromagnetic radiation. Despite their limited understanding of the recycling, reusing, restoring, and renewing (RRRR) model, participants recognized necessary actions to prevent harm and protect their working environment.

The chapter also addressed the phenomenon of conscious avoidance regarding e-waste regulations, where, despite awareness, PSCs lacked a systematic disposal approach. Some participants noted their collaborations with e-waste recycling companies to comply with accreditation requirements, while others indicated that their approach to disposal varied based on the equipment's size and type.

CHAPTER 7: Conclusion and Recommendations

7.1 Introduction

Chapter 6 outlined discussion of the research findings presented in Chapter 5. This discussion establishes a detailed connection between these key research findings and the literature reviewed in Chapter 2, enriching the understanding of the economic incentives in e-waste management in the private security industry and situating the research within the broader academic context.

Interestingly, the researcher did not make any findings that suggest disruptive innovation contributes to the volumes of e-waste generated by the private security industry. This theory is still relevant to the generation of electronic waste (e-waste) in other industries, such as smartphones, as well as in technologically advanced regions like Europe and Asia, and even in various countries in Africa, whether they share similar or different economic conditions. In South Africa, private security companies seem content with their current supply of technology and generally strive to retain ageing technological devices for extended periods. This behaviour inadvertently supports the informal sector, which continues to contribute add WEEE volumes often undocumented and difficult to trace.

Chapter 7 synthesises the key elements of the research, revisiting the main questions and their significance. It distinguishes between what was known and unknown to the researcher, outlines the specific research questions, and illustrates how the methodology provided answers. The chapter presents the findings, their interpretations, and contributions to scholarly discussions. Finally, it highlights the practical implications of the findings and offers recommendations for future research.

7.2 Background to the Research Problem

There is no question that e-waste generation is experiencing explosive growth across the globe (Awasthi et al., 2022). E-waste presents a complex landscape of opportunities and challenges. Valuable materials like silver, copper, gold and other precious earth metals amounting to $91 billion can be recovered when e-waste is properly recycled (Baldé et al., 2024), essential for producing new electronic devices. These valuable metals reduce the need for mining and resource extraction and support the circular economy by promoting the reuse of materials.

However, the informal disposal and handling of e-waste presents major risks. When electronic equipment is improperly stored or discarded in landfills and incinerated, toxic substances like cadmium, lead and mercury can percolate into natural water bodies and the ground, posing serious health risks to humans and wildlife. Additionally, informal recycling practices often lack safety measures, which expose them to hazardous materials. Therefore, while e-waste serves as a potential resource for recovery and sustainability, it also demands careful management to mitigate its harmful impacts on human health and the environment.

A staggering 400 kilotons of e-waste in South Africa was generated in 2019. Alarmingly, 86.2% of this burgeoning e-waste was improperly adequately managed and processed (Hodgkinson & Schoeman, 2018; Moyo et al., 2022). Even more concerning is that within the private security industry, there has been a complete lack of dialogue or recognition regarding the issue of e-waste, highlighting a significant missed economic opportunity and the gap in environmental awareness and responsibility.

This research aimed to investigate the potential of economic incentives in promoting recycling, reusing, restoring, renewing practices for electronic waste specifically within the private security industry. Given the increasing pressures on businesses to operate sustainably, this study utilised Incentive Theory to analyse how economic incentives could effectively motivate private security companies to embrace practices that reduce their electronic waste. By understanding the dynamics of these incentives, the research sought to identify practical strategies that could lead to significant improvements in e-waste management, benefiting both the environment and the operational efficiency.

7.3 Methodology

Twelve semi-structured interviews were conducted with randomly sampled executives from various private security companies operating in Gauteng province. These interviews gathered comprehensive insights into industry practices, awareness, readiness, challenges, and viewpoints on incentives and e-waste management. The discussions were recorded and transcribed by ReadAI, ensuring an accurate representation of the conversations for detailed analysis. Following the transcription, the data was systematically analysed using Atlas.ti, a specialised qualitative data analysis software. This analysis involved generating codes and themes highlighting key patterns and trends within the participants' responses. These emergent themes proved essential in addressing the research questions, enabling a deeper understanding of executive perspectives on economic incentives and e-waste management in the PSI.

7.4 Main Research Question - Key Findings

Question: What economic incentives could motivate the adoption of e-waste management practices in the private security industry?

Assumption: Poor e-waste management is caused by insufficient awareness, incentives, and regulatory gaps.

The key findings that emerged from the data regarding the main research question were as follows:

Lack of Awareness and indirect contribution to the e-waste problem: A significant gap exists among PSCs regarding the proper disposal methods for e-waste. Many PSCs do not fully understand the importance of responsible e-waste management practices or the economic incentives available, such as rewards for positive behaviour and fines for negative behaviour. This lack of awareness goes beyond individual practices and extends to a broader ignorance of relevant government policies, legislation, and e-waste take-back programs. As a result, there is poor participation in e-waste management initiatives. Furthermore, many PSCs are uninformed about the best practices for effectively handling and storing end-of-life electronics, preventing them from maximising the potential value of these discarded items. Most PSCs lack knowledge of established best practices for e-waste recycling and value extraction. Consequently, they often contribute indirectly to the e-waste lifecycle through various informal recycling methods or unsafe storage of electronics, which poses hazards in the workplace.

Conscious Avoidance: While some PSCs know e-waste regulations, the PSI lacks a systematic approach to promoting safe e-waste management practices. Research indicates that awareness of proper e-waste disposal methods varies depending on the size and type of EEE being discarded. Additionally, some PSCs do not participate in e-waste management initiatives because they do not consider their e-waste significant enough to warrant attention.

Underutilisation of Economic Value: Most PSCs are not tapping into the economic potential of recycling e-waste. They are also sceptical about receiving 'fair value' for their e-waste, which prevents them from engaging with e-waste management practices within the PSI.

Perceived Effectiveness of Incentives: The effectiveness of positive and negative economic incentives generates mixed reactions among PSCs. Some believe that

imposing fines could encourage PRCs to engage actively in e-waste recycling to avoid penalties, while others remain unaware of the potential consequences they might face. Several PRCs have expressed that negative incentives are more effective than positive ones in changing behaviours related to waste disposal, indicating a need for a deeper understanding of motivation. Research has shown that financial incentives can foster a sense of responsibility and compliance among PRCs; however, their optimal implementation in the industry is still lacking.

Limitations of Monetary Incentives: Findings suggest that when monetary incentives are withdrawn, the commitment to responsible e-waste management significantly declines. This indicates that reliance solely on monetary rewards is inadequate to foster sustainable behaviour. There is also a risk that monetary motivations may detract from the intrinsic desire to prioritise environmental sustainability and responsible resource management.

Role of Enforcement and Regulation: Regulations and effective enforcement are critical for unlocking the full potential of economic incentive systems. The presence of robust institutions significantly influences the efficacy of e-waste regulations. Studies suggest that in order for e-waste management initiatives to gain a foothold within the PSI, it would be pertinent to form a dedicated electronic waste department within PSiRA that would be responsible for overall compliance. This department would provide essential support to all registered security companies as per the PSiRA ACT. It would be responsible for issuing compliance orders directing the industry towards responsible WEEE practices. It is worth noting that the regulator would benefit in more than one way by developing specialisation in such departments as currently it is perceived to be non-responsive and a potential hindrance to transformation in the sector due to its silence on the matter of electronic waste.

7.4.1 Research Sub-Question 1 – Key Findings

Research Sub-Question: What economic incentives could motivate the adoption of e-waste management practices in the private security industry?

Assumption: Positive economic incentives are more effective than punitive measures in improving e-waste collection.

Types of Incentives: Two categories of findings are identified: positive (pull) and negative (push) incentives. Positive incentives encompass tax benefits, grants, financial subsidies, and direct monetary rewards. Conversely, negative incentives include fines,

penalties, carbon taxes, environmental compensation, and legal repercussions. Various PSCs contend that using both positive and negative incentives is effective. This approach acknowledges that individual private security companies may react differently to incentives, influenced by their financial circumstances and other pertinent factors.

Incentive Preferences: There were mixed opinions about the effectiveness of different types of incentives. Some participants believed that positive incentives, such as monetary rewards, would effectively motivate positive behaviour and engagement in e-waste management. Conversely, there was also support for negative incentives, which were considered equally effective. Negative incentives were found to act as deterrents by punishing unwanted behaviours and discouraging negative actions.

Cost-Sharing Incentive Systems: Literature indicates that cost-sharing incentives could propel PSCs to utilise existing recycling facilities and encourage their clients to do the same or rather use them as agents to carry out the disposal of WEEE. These systems promote accountability and enhance recycling capabilities, contributing to more effective waste management strategies.

7.4.2 Research Sub-Question 2 – Key Findings

Research Sub-Question: What barriers hinder private security companies' participation in sustainable e-waste management?

Assumption: Private security companies lack formal e-waste policies and, as a result, fail to recognise the economic and environmental value of e-waste.

Lack of Effective E-waste Management: PSiRA lacks robust, enforceable policies regarding e-waste management, leading to gaps in regulatory oversight and inaction from PSCs. The PSI urgently needs an effective system for collecting and disposing of e-waste. The absence of such a system leads to significant revenue loss and poses serious risks to environmental and public health. Furthermore, the lack of awareness surrounding e-waste management practices, from proper disposal and storage to recycling, must be addressed. It is essential to increase understanding of the relevant regulations, government policies, and available economic incentives. Without these critical steps, the industry will face substantial barriers to effective e-waste management.

Risk of Subversive Compliance: Even with regulations in place, companies often risk merely paying lip service to compliance, skilfully exploiting loopholes to undermine the very spirit of the laws.

Financial Barriers: Although e-waste recycling presents a promising economic opportunity, the financial challenges and hidden costs often discourage PSCs from engaging in this vital endeavour.

Logistical Constraints: E-waste is fragmented, complicating tracking and monitoring disposal practices across various locations. This fragmentation hinders practical management efforts and increases the potential risks to human health and the environment.

Policy Misalignment: The significant misalignment in e-waste management policies and a lack of awareness regarding existing regulatory frameworks confuse and hinder effective compliance.

Need for Awareness and Policy Formulation: There is a pressing need for increased awareness regarding e-waste regulations, EPR, and Producer Responsibility Initiatives (PRI). Each PSC must establish comprehensive in-house e-waste policies aligned with regulatory requirements and capitalise on economic opportunities. Furthermore, it is noteworthy that there exists a general willingness among PSCs to implement sustainable e-waste management.

7.4.3 Research Sub-Question 3 – Key Findings

Research Sub-Question: How can incentive and disruptive innovation theories be leveraged to design a working framework that stimulates responsible WEEE management within the private security industry?

Assumption: The private security industry generates significant electronic waste from devices such as security cameras, sensors, and alarm systems, highlighting the need for structured management practices.

The findings revealed several possible ways that are considered responsible electronic waste practices, which are as follows:

Financial Incentives: Financial incentives like tax rebates, subsidies, and cash rewards decisively motivate consumers to dispose of e-waste sustainably, ensuring proper disposal is prioritised. Take-back programs and trade-in discounts are potent incentives that compel consumers to return their electronics to manufacturers, enabling them to enjoy discounts on future purchases.

Collaborative Approaches: Collaboration among government agencies, PSiRAs, PSCs, manufacturers, businesses, and consumers is imperative for effectively managing electronic waste. Such stakeholder engagement can enhance recycling processes and promote greater public awareness regarding e-waste issues.

Regulatory Measures: Compulsory regulations are essential for ensuring compliance with e-waste management practices within the PSI. EPR promotes eco-friendly design and efficient recycling systems to reduce waste generation and improve recycling efficiency. Ultimately, this responsibility benefits the environment by minimising landfill waste and promoting a circular economy where materials are reused and recycled more effectively.

Public Awareness and Education: Awareness of the critical importance of proper e-waste disposal is vital in fostering sustainable practices and mitigating the environmental risks associated with e-waste.

7.5 Significance of Findings

7.5.1 Academic Implications

The findings reveal a significant gap in e-waste management practices within the PSI, highlighting an urgent need for well-structured interventions and more comprehensive research in this area. The research emphasises the intricate relationship among several key factors: public or consumer awareness regarding e-waste issues, economic incentives that encourage or discourage sustainable practices, the regulatory frameworks that govern e-waste disposal, and the behavioural factors that influence the choices made by PSCs within the industry.

Understanding how these elements interact is crucial for promoting effective and long-lasting solutions. These findings contain strategic guidelines for amendments of existing regulatory policy for the private security industry. Business management strategists, and academic studies focused on understanding perceptions of actors in the PSI have also been assisted by these insights. They suggest that a multifaceted approach is necessary to combat the meteoric rise of electronic waste and academic literature to understanding this phenomenon that will require collaboration for its management.

This research thoroughly examines various positive and negative economic incentives as well as monetary and non-monetary incentive systems and their effectiveness in driving behavioural change amongst PSCs. A key finding of interest to the researcher is

that the commitment to responsible e-waste management tends to decline significantly once monetary incentives are withdrawn.

This insight is particularly relevant in behavioural economics and incentive system design, as it highlights the limitations of relying solely on extrinsic motivators, such as monetary rewards, and accentuates the importance of fostering intrinsic motivation for sustainable practices that resonate with an entire industry or business. Moreover, the study reveals a complex landscape of responses to different incentives, with participants showing mixed reactions to both positive and negative approaches. This variability suggests that the PSI may not respond uniformly to all incentive structures, highlighting a significant opportunity for further, more nuanced research. By understanding the unique motivations and behaviours of various segments within this industry, academics and stakeholders can develop more effective incentive frameworks that encourage a lasting commitment to responsible e-waste practices.

7.5.2 Business Implications

The research emphasised that PSCs are missing substantial cost savings and revenue generation opportunities due to inadequate e-waste management practices. E-waste, if managed effectively, can yield valuable materials such as precious metals, plastics, and glass that can be recycled or sold, thereby transforming what is often viewed as a waste stream into a lucrative revenue stream. By adopting sustainable e-waste management practices, PSCs position themselves to seize opportunities in a growing niche market of environmentally conscious clients and stakeholders and enhance their corporate reputation and social responsibility. These practices demonstrate a commitment to environmental stewardship, which can lead to increased customer loyalty and attraction of new business partnerships.

Moreover, proper handling and processing of e-waste mitigate various risks associated with regulatory compliance and business obligations. As governments worldwide strengthen carbon tax policies and environmental protection laws, PSCs that fail to manage e-waste responsibly may face significant legal repercussions, financial penalties, and damage to their public image. Therefore, a proactive approach to e-waste management is not just an operational necessity but a strategic advantage that can contribute to PSCs' long-term sustainability and success.

Enhancing e-waste management processes significantly boosts operational efficiency. By effectively reducing storage costs, PSCs can eliminate unnecessary expenses for

housing redundant and obsolete EEE. Proper management is crucial, as improperly stored e-waste poses employee safety risks and can lead to hazardous situations. Additionally, streamlining these processes helps lower waste disposal fees, and managed e-waste can often be recycled or repurposed, reducing overall disposal costs. Furthermore, optimising resource utilisation ensures that valuable materials are recovered and reused, contributing to sustainability efforts and minimising environmental impact. Overall, a comprehensive approach to e-waste management protects employees and fosters a more efficient and responsible operational framework.

7.6 Research Limitations

One significant limitation of this research lies in its cross-sectional design. The study captures a snapshot of data; however, as time progresses, phenomena and variables evolve. This inherent dynamism prevents the establishment of transparent cause-and-effect relationships, as the variables are not fixed at a single point. Consequently, this limitation complicates our ability to ascertain whether one phenomenon directly influences another.

The research utilised a mono-qualitative, interpretivist approach, employing inductive reasoning and phenomenological thematic analysis to delve into the intricacies of economic incentives in e-waste management within the private security industry. While qualitative studies often yield rich insights, the reliance on a small participant pool of just twelve individuals limits the representativeness of the findings across the broader population. Furthermore, focusing exclusively on Gauteng province poses additional challenges, as it may not accurately reflect the contexts and conditions prevalent in the other eight provinces. Such a narrow scope can lead to biased conclusions and oversimplified stereotypes that may significantly underrepresent or misrepresent the experiences and realities of individuals in different regions and sectors of the study.

The research involved human participants and faced challenges related to information bias and limitations from non-response. Information bias can arise when the data collected is distorted due to inaccuracies in participants' responses or how questions are framed. Non-response limitations occur when many selected participants choose not to participate or fail to complete the study, potentially leading to unrepresentative samples. These factors can significantly skew the findings, ultimately diminishing the reliability and validity of the findings.

Another significant limitation of this research was the involvement of private security companies, which are inherently guarded in nature. Their core mission revolves around safeguarding valuable assets, individuals, and sensitive information, which often leads them to be secretive about their operational practices. Consequently, engaging some PSCs in meaningful discussions about specific aspects of their business operations proved challenging. This reluctance to share information ultimately restricted the valuable data that could be gathered during the research process.

7.7 Areas for Future Research

The key findings of this study shed light on several critical areas of academic significance, each brimming with potential for future research and exploration. Focusing on economic incentives in e-waste management within the private security industry, this investigation revealed important avenues for further inquiry. Specifically, there is a pressing need for a thorough exploration of policy and regulatory frameworks governing e-waste disposal, which directly impact sustainable practices. Additionally, the evolving themes of waste management alongside the principles of a circular economy merit closer examination, particularly regarding reducing environmental impact.

Moreover, enhancing environmental awareness and educational initiatives is crucial for cultivating a culture of responsible e-waste disposal among industry professionals and consumers alike. Innovation and technology management also stand out as areas ripe for exploration, given the rapid technological advancements that can facilitate more efficient e-waste solutions. The dynamics of supply chain management and ethical compliance also warrant deeper investigation. Future research endeavours should incorporate mixed-methods or quantitative approaches to bolster the contribution to academic discourse. This approach would provide a more robust framework, enriching the insights obtained from this current mono-qualitative study and offering a comprehensive understanding of the intricate landscape of e-waste management.

7.8 Study Conclusion

This research revealed that positive and negative economic incentives significantly impact the behaviour of PSCs. When attractive positive incentives, such as monetary rewards or bonuses, are provided, PSCs are likely to respond enthusiastically, striving to meet the criteria to earn these rewards. On the other hand, when faced with negative incentives, such as penalties or fines, PSCs may also adjust their behaviour favourably to avoid these punitive consequences. Interestingly, the study indicated that opinions

regarding the effectiveness of these two types of incentives in fostering desirable behaviour were varied, reflecting a complex relationship between incentive types and PSC responsiveness.

Consequently, relying solely on economic incentives may not adequately motivate PSCs to embrace sustainable e-waste management. Instead, a combination of external influences, such as comprehensive and stringent e-waste regulations, rigorous enforcement mechanisms, and the establishment of robust institutional frameworks, has proven essential in fostering responsible e-waste disposal and management among PSCs. These factors collectively create an environment that not only promotes compliance but also encourages a commitment to sustainability in handling e-waste.

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List of Appendices

Appendix A: The Participant Information Email

Dear Director/Manager

I hope this message finds you well. My name is_____ and I am currently a student at the University of Pretoria's Gordon Institute of Business Science, pursuing my MBA. As part of my research, I am exploring **disruptive innovation, economic incentives, and e-waste management within South Africa's Private Security Industry**, specifically focusing on Gauteng.

I would like to inquire about your availability for an online interview, which is expected to last approximately one hour. If you are willing to participate, please let me know your preferred date and time for the interview. Your insights will be invaluable in helping us understand how the Private Security Industry in Gauteng manages e-waste. Please note that your participation is entirely voluntary, and you have the right to withdraw at any time without penalty or loss of benefits. All collected data will be stored securely and reported without identifiers, ensuring your confidentiality throughout the research process.

Please find attached the interview guide, which outlines the types of questions that will be addressed during the interview. This should provide you with a better understanding of the discussion topics. Please sign and send back the consent form during or after the interview if possible.

Appendix B: Participant Agreement Form

Gordon Institute of Business Science
University of Pretoria

Informed consent letter

I am currently a student at the University of Pretoria's Gordon Institute of Business Science and completing my research in partial fulfilment of an MBA.

I am conducting research on exploring disruptive innovation, economic incentives and e-waste management within South Africa's Private Security Industry: A focus on Gauteng.

This interview is expected to last about an hour and will help us understand how South African Private Security Industry executives manage e-waste in Gauteng Province.

Your participation in this study is entirely voluntary, and you can withdraw at any time without penalty or repercussion. All data will be captured via a voice recording device and stored securely on a password-protected electronic device. This study is committed to ensuring your confidentiality throughout the research process. Information given will be coded using a pseudonym to protect your identity as a participant and ensure anonymity of the information given. If you consent to proceed with the interview, please sign below.

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

Researcher name	:	
Email	:	
Phone	:	
Research Supervisor name:		
Email	:	
Phone	:	+27-11-771-4000

Signature of participant: _____

Date : _____

Signature of researcher: _____

Date : _____

Thank you for considering participation in this study! Your contribution is invaluable.

Appendix C: Instrument – Interview Guide

Gordon Institute of Business Science
University of Pretoria

Interview Guide

1. Company Demographics

Size of the Company	
a. What is the number of employees in your company?	
Location	
c. Where is the main office located?	
d. Do you have additional operational sites within Gauteng Province or other provinces?	
Annual Revenue	
e. What is your company's estimated annual revenue?	

2. E-Waste Management Practices: Generation of E-Waste:

a. What is your understanding of e-waste?

b. What electronic equipment do you supply to your clients?

c. What type of electronic equipment is disposed of?

d. How much e-waste does the company generate annually?

3. Disposal Practices:

a. Do you have an e-waste policy or practice in this company?

b. What methods does the company currently use for e-waste disposal?

c. Do you participate in any e-waste recycling programme?

d. Do you have any working partnerships with recycling facilities?

e. Do you know of any private security companies that are practising e-waste recycling?

4. Recycling Rates:

a. What percentage of e-waste is recycled?

b. Are there any initiatives in place to improve recycling rates?

5. Knowledge of E-Waste Regulations:

a. How familiar is the company with existing e-waste regulations in South Africa?

b. Has this company received any training or awareness programmes regarding e-waste management?

6. Impact of Economic Incentives:

a. Do you know of any types of economic incentives with regard to e-waste?

b. Have you utilised any economic incentives?

c. How effective do you believe these incentives are in promoting e-waste management in the private security industry?

7. Participation in E-Waste Management Programmes:

a. What, in your opinion, could motivate your company to participate in e-waste management initiatives?

b. Are there any specific incentives that have led to increased participation?

8. Perceived Barriers to E-waste Management Participation

a. What are the main challenges the company faces in collecting and disposing of e-waste?

b. Are there financial, logistical, or regulatory barriers that hinder participation?

9. Leveraging Behavioural Economics: Framework for E-Waste Management:

a. How can behavioural economics be applied to improve your company's e-waste management practices?

b. What strategies could be implemented to encourage responsible electronic equipment management?

10. Suggestions for Improvement:

a. How can economic incentives be better designed to facilitate sustainable practices within your company and the private security industry?

b. What recommendations would you make for enhancing e-waste management within the private security sector?

Thank you for participating in my study.

Appendix D: Ethical Clearance Certificate

GIBS ETHICAL CLEARANCE APPLICATION FORM 2024/25

RESEARCH PROJECT INFORMATION

NAME:	[redacted]
STUDENT NUMBER:	12175782
PHONE NUMBER:	
E-MAIL ADDRESS:	12175782@mygibs.co.za
PROPOSED TITLE OF STUDY:	Exploring Disruptive Innovation, Economic Incentives, and E-Waste Management within South Africa's Private Security Industry: A focus on Gauteng.
RESEARCH SUPERVISOR:	[redacted]
E-MAIL OF SUPERVISOR:	[redacted]
RESEARCH CO-SUPERVISOR	
E-MAIL OF CO-SUPERVISOR	

The purpose of this Research Ethics process is to ensure that all research conducted under the auspices of GIBS is done so in an ethical manner, in accordance with the University's policy and in such a way that **the rights of all stakeholders** associated with the research are protected.

In order for the GIBS Research Ethics Committee to assess your application, you are required to submit **a description of your Research Methodology** that must contain sufficient detail to ensure that the required steps have been taken to achieve this purpose, in the research design, data collection, analysis and storage of data used in the conduct of this research.

Please indicate the nature of the output your research is aimed at producing (mark one box only):

- ☐ ABP Applied Business Project
- ☑ MBA Research Report
- ☐ MBA Project Publish Article
- ☐ MBA Teaching Case Study
- ☐ MBA Entrepreneurship Stream Portfolio
- ☐ MBA Consulting Stream Portfolio/MBA Health Stream
- ☐ MPhil Research Report

GIBS Ethics Policy distinguishes between FOUR main types of data and THREE main types of methodology. Please complete the table for ALL the data types that you plan to use. Note that all applications must be accompanied by a description of the methodology to be used in the study. Initial all sections that apply to your research

GIBS ETHICAL CLEARANCE APPLICATION FORM 2024/25

G. APPROVALS FOR/OF THIS APPLICATION

When the applicant is a student of GIBS, the applicant must please ensure that the supervisor and co-supervisor (where relevant) has signed the form before submission

STUDENT RESEARCHER/APPLICANT:

29. I affirm that all relevant information has been provided in this form and its attachments and that all statements made are correct.

Student Researcher's Name in capital letters:	[redacted]
Date:	21 Oct 2024
Supervisor Name in capital letters:	[redacted]
Date:	12 Nov 2024
Co-supervisor Name in capital letters:	
Date:	21 Oct 2024

Note: GIBS shall do everything in its power to protect the personal information supplied herein, in accordance to its company privacy policies as well the Protection of Personal Information Act, 2013. Access to all of the above provided personal information is restricted, only employees who need the information to perform a specific job are granted access to this information.

Decision:

Approved

REC comments:

Goodluck

Date: 18 Nov 2024

Appendix E: List of Codes

1. Absence of Financial Benefits for Equipment Returns
2. Avoidance of Financial Burden as a Compliance Driver
3. Basic Awareness and Training in E-Waste Management
4. Behavioural Economics in Corporate E-Waste Participation
5. Centralised Decision-Making in E-Waste Disposal
6. Client Loyalty as a Business Strategy
7. Client-Based E-Waste Policy Compliance
8. Common IT Equipment in the Organisation
9. Complementary workforce
10. Complexity of In-House Waste Sorting
11. Consumer Mindset and Convenience Preference
12. Corporate Image as a Driver for E-Waste Programs
13. Data-Driven Decision Making
14. Delayed Government Recognition of Informal Waste Issues
15. Device Exchange System
16. Diverse Range of Security Equipment
17. Dominance of Scrap Metal Recycling Over E-Waste
18. E-Waste as a Financial Safety Net
19. E-Waste as a Public Health Risk
20. E-Waste as an Economic Issue
21. E-Waste as Data Disposal
22. E-Waste Recycling for Income
23. Eco-Friendly Electronic Waste Disposal
24. Engagement with E-Waste Companies
25. Enhancing Collaboration
26. Equipment Return and Storage
27. Estimated Revenue
28. Exclusive Supplier Partnership for E-Waste Management
29. Expectations of Incentives for Carbon Reduction
30. Expectations of Incentives in Regulatory Implementation
31. Exposure to Waste Management Training
32. Financial Strain
33. Formalisation of E-Waste Disposal Procedures
34. Hesitancy to Pay for E-Waste Management Services
35. Incentives Foster a Sense of Responsibility
36. Incentives Must Outweigh Costs
37. Incentivised E-Waste Disposal
38. Incentivising E-Waste Disposal Through Rewards
39. Ineffectiveness of the Penalty System
40. Infrastructure Assessment and Equipment Disposal
41. Intrinsic Motivation and Sense of Responsibility

42. Intrinsic Motivation for E-Waste Management
43. Lack of Awareness of E-Waste Awareness Programs
44. Lack of Awareness of Financial Incentives
45. Lack of Awareness of E-Waste Regulations
46. Lack of Awareness of Regulatory Barriers
47. Lack of Business Innovation
48. Lack of E-Waste Recycling
49. Lack of Formal Disposal Planning
50. Lack of Formal Disposal Processes
51. Lack of Formal E-Waste Disposal Policy
52. Lack of Formal Policy
53. Lack of Standardised E-Waste Disposal Policies
54. Lack of Structured E-Waste Collection Routes
55. Lack of Transparency on E-Waste Destination
56. Lack of Understanding of Regulations
57. Larger Corporations More Likely to Comply
58. Leveraging Waste Disposal Habits
59. Limited Access to Incentive Information
60. Limited Accessibility to E-Waste Recycling Services
61. Limited Awareness of E-Waste Regulations
62. Limited Initial Awareness
63. Limited Knowledge About E-Waste Disposal
64. Location
65. Long-Term Cost of Workplace Hazards
66. Loss of Oversight Due to Dispersed Workforce
67. Mandatory Return of Removed Equipment
68. Manufacture-based Incentive
69. Mass Awareness as a Key Driver for E-Waste Participation
70. Modest Financial Returns from E-Waste Disposal
71. Need for Government-Led E-Waste Incubation Programs
72. Need for Greater Exposure and Awareness
73. Need for Industry-Specific Policies and Workshops
74. Need for Regulatory Oversight in E-Waste Management
75. No Industry Exposure to E-Waste Training
76. No Participation in E-Waste Training
77. No Participation in E-Waste Training
78. No Utilisation of Economic Incentives
79. Non-existent E-Waste Policy
80. Optimisation of Leftover Material
81. Participation in E-Waste Programs
82. Partnerships with Disposal Companies

83. Perceived Insufficient Financial Incentives Relative to the Workload
84. Performance-Based Incentives
85. Policy Development and Incentive Implementation
86. Policy Misalignment
87. Policy-Driven Upgrades
88. Potential for Industry-Wide Collaboration
89. Providing Advisory Support on Device Selection
90. Raising Awareness to Drive Behavioural Change
91. Recognition of Specialised Disposal Methods
92. Regulatory Compliance as an External Motivator
93. Regulatory Fines as a Compliance Incentive
94. Regulatory Ineffectiveness Due to Lack of Oversight
95. Resource Constraints in Regulation
96. Return to Supplier for Repairs
97. Returning Old Equipment to Clients
98. Strict Regulation Enforcement
99. Stronger Government Intervention for Compliance
100. Subversive Compliance in Regulatory Frameworks
101. Supplier-Assisted Disposal
102. Supply of Electronic Security Equipment
103. Tax incentives
104. Unclassified E-Waste Policies
105. Understanding of E-Waste
106. Variable Replacement Cycles for Security Equipment
107. Weak Regulatory Enforcement
108. Weight-Based Pricing of E-Waste