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Factors that influence urban South African consumers' e-waste recycling behaviour: Implementing the Theory of Planned Behaviour

By

Aadil Munsami

Student number: 18309624

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Supervisor:

Prof Alet C Erasmus

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Abstract

Technology advancement has led to a new societal challenge of e-waste, a highly complex amalgamation of chemicals, glass, precious metals and plastic that is extremely toxic when incorrectly disposed. Recycling is deemed as a method by which people can help reduce their impact on the environment with many studies aimed at understanding the factors that influence recycling behaviour. This study aimed to understand the factors that influence the e-waste recycling behaviour of urban South African consumers using the Theory of Planned Behaviour as a framework for understanding underlying factors that influence behaviour.

A quantitative study was undertaken with data collected through the distribution of a self-reported survey to a conveniently selected sample of which there were 160 respondents. Statistical analysis was conducted on the data collected and a model was constructed, using SEM regression analysis, to explain e-waste recycling behaviour.

The findings revealed that social pressure is a leading influencing factor of e-waste recycling behaviour together with laws and regulation, inconvenience of recycling, past experience and cost of recycling. Environmental awareness and attitude towards e-waste recycling was not substantiated. The findings support future research and policy makers in developing laws that encourage the recycling of e-waste for the Planet's sustainability.

KEYWORDS:

e-waste; theory of planned behaviour; structural equation modelling; South Africa; recycling

Declaration

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

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Aadil Munsami

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Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction and Research Problem

1.1 Introduction to the research problem

Planet Earth has always consisted of a multitude of living species that work in unison to sustain life. One could imagine Earth as a self-sustaining spaceship, traveling through the darkness of space and time on a journey with no apparent destination. Carl Sagan (1994), an American astronomer, reflected in his book *Pale Blue Dot*, that:

> *"Our posturing's, our imagined self-importance, the delusion that we have some privileged position in the Universe, are challenged by this point of pale light. Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there is no hint that help will come from elsewhere to save us from ourselves.*
>
> *"The Earth is the only world known so far to harbour life. There is nowhere else, at least in the near future, to which our species could migrate. Visit, yes. Settle, not yet. Like it or not, for the moment the Earth is where we make our stand".*
>
> (Sagan, 1994, para. 5-6).

This quote echoes the notion that as humans, we have an obligation to ensure the survival of our home and the species that share it with us.

1.2 Problem and purpose of the study

1.2.1 Research problem

The growth of the world population is accompanied by rapid urbanisation, a trend that is higher in developing countries where rapid unplanned urbanisation is causing multiple environmental challenges including land degradation, air and water pollution, and an increase in solid waste generation (Cobbinah, Erdiaw-Kwasie, & Amoateng, 2015; Troschinetz & Mihelcic, 2009; Zhang, 2016). The *Global Environmental Outlook (GEO-6) Report* confirmed that the global urban population

will continue to increase over the next 30 years, particularly in developing countries. It is further postulated that up to 60 percent of the total environmental impact caused by population growth can be attributed to household consumption, which is driven by economic development that increases the use of resources that contribute to environmental degradation. To date, the social and environmental challenges associated with urbanisation remain unsolved (UN Environment, 2019).

The rise of urbanisation poses a challenge to society in terms of increased levels of urban waste (Lee, Pant, & Ali, 2010). Over time, consumers, especially urban consumers/households, have become accustomed to new products, including convenience products such as single use plastics and packaging materials that form part of a convenience-driven lifestyle (Wagner, 2017). While all of these new materials have made consumers' lives much easier, peoples' indiscriminate use of the products and ignorance about the consequences of their behaviour are contributing to an alarmingly high environmental cost. Serious concern about the production of greenhouse gases, as well as the rate of pollution of water, soil and air that will have detrimental consequences for the future of the planet and the well-being of all living creatures, have drawn the attention of environmentalists, researchers and politicians, amongst others (Moore, 2019; Varotto & Spagnolli, 2017). In 2011, about 95 million tonnes of waste was generated in South Africa, of which only 10% was recycled (Statistics South Africa, 2018) despite existing legislation, policies and infrastructure that support recycling.

Recycling consists of the process of collecting and processing waste materials into useful materials (United States Environmental Protection Agency, n.d.). This is the most significant action that could reduce the impact of consumers' indiscriminate and even negligent every day post-consumption behaviours. Alternative post-use consumer behaviours are encouraged in the United Nation's Sustainable Development Goals (United Nations, n.d.), which call for action to promote prosperity while protecting the environment, and can help solve bigger environmental issues (Onel & Mukherjee, 2017). This is in addition to a call to rethink the use of certain materials and possibly restrict the production and use of plastic bags (Wagner, 2017). More immediate ways whereby the issue of pollution and wasteful consumption could be addressed are the recycling and reduction of household waste. Although these are ways through which consumers/households could become part of efforts to

conserve the environment and to protect our natural resources (Botetzagias, Dima, & Malesios, 2015), evidence of consumers' contribution and motivation to support this very worthy cause of recycling is not encouraging (Ferreira, Marx-Pienaar, & Sonnenberg, 2016; Frijters & Leigh, 2008; Rucker & Galinsky, 2009).

Based on consumers' existing post-consumption behaviours, specifically their recycling of e-waste, it is not yet clear which factors are currently jeopardising households' contributions towards recycling e-waste in South Africa, and which factors will encourage and enhance recycling as a way of (household) life to address the alarming statistics concerning environmental degradation, as well as to become part of the solution rather than the problem.

1.2.2 Purpose of the research

Gaining consumer support for socially responsible post-consumption household behaviour that will curb people's use of the many products that they have become accustomed to, which will encourage a conscious revisit of how electronic products are disposed of after use, is a primary step to address prevailing concerns about excessive pollution and environmental degradation (Mcintire, 2015; Zhang, 2016). However, as a first step towards the development of mechanisms that will encourage recycling as a way of life among South African urban households, it is important to identify the factors that determine households' post-consumption behaviour – particularly because so many households have to date not yet adopted sustainable consumption and responsible waste disposal practices, notwithstanding efforts to boost such behaviour in the past.

1.3 The need for the study

1.3.1 Business need

Consumption is seen as a driver for economic growth and a large contributor to Gross Domestic Product (GDP) in countries such as South Africa. Unfortunately these economic drivers are exerting considerable strain on the natural capital (resources) of the country (Christie, Sonnenberg, & Gous, 2016). World-wide efforts have been made to reduce waste with some cities targeting zero waste by 2020 (United States

Environmental Protection Agency, n.d.). Regrettably, this is offset by the rise of waste in fast-growing cities in south-east Asia and sub-Saharan Africa. The speed at which waste is being produced is now outpacing other environmental pollutants, including greenhouse gases. This indiscriminate waste production is choking the world's oceans and rivers with plastic and even resulting in flooding in certain developing cities around the world. Municipal budgets are strained by the increasing cost of solid waste management (Hoornweg, Bhada-Tata, & Kennedy, 2013).

Intervention by government agencies and business is therefore needed to help curb the impacts of consumption on the environment and society, but in order to do so, it is necessary to understand how consumers could be encouraged to cooperate and support these endeavours.

1.3.2 Theoretical contribution

Indisputably, society has developed unsustainable consumption patterns that have unfavourable consequences for the future of society and the environment. It is well documented that climate change is caused by human activity, including consumerism, i.e. excessive consumption, but especially irrational and conspicuous consumption and waste (Ferreira et al., 2016; Frijters & Leigh, 2008; Rucker & Galinsky, 2009). In South Africa, climate change could negatively impact fresh produce production by destroying the Western Cape's wine farms and farming in general, resulting in food scarcity, more expensive food products, and increasing pressure on the livelihoods of poor subsistence farmers (Marx-Pienaar, 2014). The World's population is on the rise with increased wealth, resulting in increased urbanisation and waste generation (Christie et al., 2016; Hoornweg et al., 2013). In the end, consumers will have to consciously consider the products that they use and how they dispose of waste and unwanted goods as part of a concerted effort to make a positive contribution towards the environment, the well-being of society and the health of our economy (Marx-Pienaar, 2014). The low percentage of waste recycled in South Africa (Statistics South Africa, 2018) is testament to the fact that further investigations are required to understand why some households engage in more responsible waste disposal behaviour and what needs to be done to encourage the adoption of alternative consumption practices and recycling in South Africa. This

research will provide evidence of factors that influence households' indiscriminate waste generation and disposal with a specific focus on e-waste, which would be useful to alleviate the pressing problem in ways that are practical and socially acceptable.

1.4 Research questions

This study's purpose is to understand the factors that influence the e-waste recycling Behavioural Intention of South African consumers. Using the Theory of Planned Behaviour (TPB) as an established framework for assessing Behavioural Intention (Ajzen, 1991), the following research questions were constructed:

- ***Research question 1:***
  How do Environmental Awareness and Attitudes towards recycling (as an encompassing construct) influence South African consumers' e-waste recycling Behavioural Intentions?

- ***Research question 2:***
  How does Social Pressure influence the e-waste recycling Behavioural Intentions of South African consumers?

- ***Research question 3:***
  How do Laws and Regulations influence South African consumers' e-waste recycling Behavioural Intentions?

- ***Research question 4:***
  How does the Cost of recycling influence South African consumers' e-waste recycling Behavioural Intentions?

- ***Research question 5:***
  How does the Inconvenience associated with recycling impact on South African consumers' recycling behaviours?

- ***Research question 6:***
  How do South African consumers' past recycling experiences influence their e-waste recycling Behavioural intentions?

- ***Research question 7:***
  How do South African consumers' past recycling experiences influence their perceptions of the inconvenience associated with e-waste recycling?

1.5 Methodology

A quantitative study was designed in the form of a survey. This entailed the creation of a structured questionnaire that was distributed electronically in order to assess the research questions proposed in Section 1.4, and to test the theoretical framework in assessing e-waste recycling behavioural intentions. The data collected was analysed using statistical methods, which are discussed further in Chapter 4.

1.6 Ethics

Ethical clearance was obtained from the University of Pretoria (Gordon Institute of Business Science) in order to conduct this research (see Appendix 1). Once consent was received from the University, the self-reported questionnaire was distributed conveniently to obtain the relevant data for analysis. The completion of the survey was voluntary and anonymous. This was clearly stated in the opening page of the survey, and respondents were able to opt out of the survey without any consequences if they wished to do so. All data collected were treated confidentially and carefully, ensuring that the data were not shared beyond the scope of this study.

1.7 Limitations

A non-probabilistic convenience sampling method was employed to collect data for analysis for practical reasons including affordability and time constraints. A sample of 160 respondents completed the survey, which was less than the expected sample size based on other studies that ranged between 200 and 400 respondents (Chan &

Bishop, 2013; Nguyen, Hung, Lee, & Nguyen, 2018; Onel & Mukherjee, 2017). The small sample size may not be representative of the South African population.

Given the sampling method chosen there are certain limitations, including sample bias and the fact that – based on the number of valid responses – a generalisation to the entire South African population is not possible (Etikan, Musa, & Alkassim, 2016). Structural Equation Modelling (SEM) is a large sample technique and small sample sizes may produce inconsistent conclusions (Carvalho & Chima, 2014), hence data should be interpreted with caution.

1.8 Conclusion and structure of the document

The remaining structure of this paper is explained in this paragraph. Chapter 2 is a literature review on the current circumstances of urbanisation and its associated impact on the environment and society; e-waste and the benefits of recycling; the TPB; and factors influencing e-waste recycling behaviour. Chapter 3 presents the theoretical framework and hypothesis development; Chapter 4 discusses the research methodology; the results of the study are presented in Chapter 5; and Chapter 6 discusses the findings, the theoretical framework and the link to literature. Finally, the conclusions and implications for theory and policy are presented in Chapter 7.

Chapter 2: Literature Review

2.1 Introduction

Modern society has to come to a realisation that their current lifestyle, purchase and consumption behaviour is negatively impacting the environment (Bamberg, Hunecke, & Blöbaum, 2007). Earth is planet with finite natural resources and a rapidly growing population that is resulting in the degradation of the environment. Society needs to consciously decide to shift to more sustainable production and consumption (Taljaard, Sonnenberg, & Jacobs, 2018). Adopting a pro-environmental behaviour, an action motivated by self-interest or concern for others, is required (Bamberg et al., 2007; Taljaard et al., 2018).

In this chapter, the existing literature on urbanisation, waste generation and recycling behaviour is discussed in general, as well as in the context of e-waste. The Theory of Planned Behaviour (TPB) is linked to recycling behaviour as a theoretical framework for this study, while possible interventions for improved recycling behaviours are identified. Finally, research opportunities to expand the existing knowledge on these phenomena are identified.

2.2 Urbanisation and related consequences

Urbanisation is a demographic, ecological, sociological and economic phenomenon (Cobbinah et al., 2015) that has been escalating since the early 20th century, fundamentally impacting the way people live (Zhang, 2016). It is estimated that at least three quarters of the World's population will be living in cities by 2050 (Moore, 2019; Zhang, 2016), with an exponential growth in developing parts of the World, especially Africa and Asia (Buhaug & Urdal, 2013; Hall, Dawson, Macdiarmid, Matthews, & Smith, 2017; Moore, 2019; Zhang, 2016). These estimates could, however, be conservative if one considers the imminent consequences of climate change such as rising sea levels that are forcing people to relocate, as well as extreme weather conditions that affect the way people live (Buhaug & Urdal, 2013; Hall et al., 2017). The provision of basic public services such as education; healthcare; housing and employment to this rapidly growing urban population is

negatively affected by a multitude of factors which result in the development of informal settlements around major cities. This has major implications in terms of available infrastructure and every day services, including waste disposal (Buhaug & Urdal, 2013).

In the end, rapid population growth, together with the concomitant increase in consumption, has a pervasive effect on societies and the environment, including increased waste generation (Buhaug & Urdal, 2013; Cobbinah et al., 2015; Hall et al., 2017; Zhang, 2016). Admittedly, urbanisation and projections of economic growth, especially in low-income developing nations, will enhance the quality of life for many, but the subsequent increase in consumption levels will also lead to an increased demand for natural resources, challenges in managing waste disposal, increased carbon dioxide emissions and a loss of biodiversity. These will have devastating consequences unless the issue is addressed soon (Moore, 2019; Sonnenberg, Jacobs, & Momberg, 2014).

2.3 Consumption of modern-day consumers

Excessive and indiscriminate consumption in modern Western cultures, as well as in developing societies, are partly due to the high value attached to the “new” and the “novel”, which is driven by technological advancements and a decline in the average costs of products (Campbell, 2013; Moore, 2019). This consumption commenced during the Industrial Revolution in the early 19th century (Moore, 2019), with products that had once been considered luxury items, such as cloth, white goods and electronics, becoming everyday household goods over time (Zaman, 2015). Society has since evolved to revere a binge consuming culture, which significantly impacts the way people relate to the World (Passini, 2013). This creates the impression that people often consume simply for the sake of consumption, without contemplating what they are doing and why (Campbell, 2013). There are indications that consumers are inclined to replace older products with the latest versions so rapidly that they are seldom satisfied with what they possess and are continually on the lookout for something more recent and trendier, creating a vicious circle of indiscriminate consumption. Because products are modified so rapidly, by the time a new product is acquired it is often already outdated (Passini, 2013). This is especially true for

sophisticated technology such as computers, cellular phones, cameras and household appliances. Products are now designed with shorter expected lifespans, further spurring swift consumption and discarding. This is exacerbated by the fact that it is sometimes cheaper to replace a product (such as clothing and electronics) than to repair or reuse it, fuelling a throwaway society (Gullstrand Edbring, Lehner, & Mont, 2016). Unavoidably, increased consumption contributes to the depletion of natural resources, air pollution, excessive waste generation and climate change as a result of changes in the natural environment (Gullstrand Edbring et al., 2016; Liobikiene, Mandravickaite, & Bernatoniene, 2016; Moore, 2019).

The consumption patterns of emerging economies such as Brazil, Russia, China, India and South Africa (BRICS) have become similar to those of high income industrialised countries (Sonnenberg et al., 2014), with the South African middle class consumer segment having grown substantially and increasing spending on a broad range of goods including apparel and electronics (Burger, Louw, de Oliveira Pegado, & van der Berg, 2015; Sonnenberg et al., 2014). Current societal norms promote sophistication and convenience, which have resulted in more self-centred consumers who believe that they are entitled to certain luxuries, irrespective of the implications of producing and disposing of such products (Marx-Pienaar & Erasmus, 2014).

2.4 Waste generation and waste management: associated challenges

2.4.1 The issue of urbanisation

Growing population levels, economic growth and rapid urbanisation have resulted in higher standards of living and increased levels of consumption of goods and services. Unfortunately, this has a secondary effect of accelerating municipal solid waste generation, which eventually outstrips the positive outcomes of population growth and urbanisation (Guerrero, Maas, & Hogland, 2013; Moore, 2019). This is spurred on by the progress of the latest evolution of the industrial revolution that is associated with technological advancement and many societal benefits (Campbell, 2013), resulting in sophisticated production as well as consumption processes

(Zaman, 2015). Cheaper products are flooding the market (Campbell, 2013) due to advanced production processes, which have evolved into a complex system that utilises composite and hazardous materials (Zaman, 2015). These have a wide variety of applications (Lebreton et al., 2017) and are difficult to dispose of, for example certain batteries and globes.

African cities are facing rapid population growth and urban expansion, however due to economic challenges, poor waste management is an unavoidable outcome (Moore, 2019). Generally population growth outstrips economic growth, which challenges governments and municipalities to provide adequate solid waste management. This, in turn, contributes to pollution, which impacts negatively on people's quality of life, challenges urban sustainability ambitions, and even jeopardises the physiological state of the natural environment (Moore, 2019). The current levels of global waste generation of approximately 1.3 billion tonnes is expected to double by 2025 largely driven by developing countries (Geiger, Steg, van der Werff, & Ünal, 2019; Moore, 2019). The traditional approaches to waste management are a linear process of collection and disposal with limited consideration for reducing the waste that is generated, reusing material, or recycling (Gullstrand Edbring et al., 2016; Moore, 2019; Rosa, Sassanelli, & Terzi, 2019). The most prominent method of waste disposal is still landfills or dumping sites, with only a small proportion of waste being recycled (Geiger et al., 2019). Unfortunately, many governments are ill-equipped to deal with solid waste management, more especially the rapid rise in solid waste, due to institutional, technical and financial constraints (Guerrero et al., 2013). This dilemma can be seen in developing countries which suffer from poor socioeconomic progress, environmental pollution, lower standards of living and multiple human health issues that exert even more pressure on the system (Moore, 2019).

2.4.2 Different types of waste

Various types of waste are generated by consumers, including plastic waste, textile waste, food waste and electronic waste, some of which have adverse consequences for the environment and society (Laitala, 2014; Lebreton et al., 2017; Marx-Pienaar & Erasmus, 2014; Taljaard et al., 2018). One of the most well documented and pressing issues facing society currently is the amount of plastic waste that is currently

being generated, which is polluting our land and oceans. As a consequence, many countries have banned the use of certain plastic bags as packaging material (Moore, 2019). A large proportion of plastic waste enters the ocean on a yearly basis, estimated at approximately 4.8 to 12.7 million tonnes. The durable and versatile nature of plastic has adverse consequences for marine life and human health. (Lebreton et al., 2017). The level of pollution in the oceans is an indication of the level of pollution that is plaguing society (Moore, 2019).

The textile and clothing industry is one of the World's largest and most polluting industries (Laitala, 2014; Taljaard et al., 2018). Its environmental footprint spans from natural resources, production processes to distribution and the disposal of the discarded products (Taljaard et al., 2018). The reason for clothing disposal is determined by consumers, including outdated trends, durability and limited storage (Laitala, 2014). It is estimated that in the UK, consumers dispose of approximately 30kg of clothing on average to landfills annually (Laitala, 2014).

Food wastage is another growing concern in society; curbing this wastage through more informed consumer decision-making could help to address climate change and food security issues (Marx-Pienaar & Erasmus, 2014; Oelofse & Marx Pienaar, 2016). Food wastage, especially improper food waste, has a number of negative consequences, including environmental pollution, the waste of resources along the supply chain, and socio-economic impacts that are related to food insecurity (Oelofse & Marx Pienaar, 2016). In South Africa, over 31% of food, mostly fresh produce, is wasted annually (Marx-Pienaar & Erasmus, 2014).

Advances in the electronics; and information and communications technology (ICT) industries, coupled with changes in consumers' lifestyles and consumption patterns, have led to a rapid growth in the supply and demand for electrical and electronics equipment (Ikhlayel, 2018). The prevalence of consumer electronics from the mid to the late 20th century, with advancements leading to shorter product lifespans, have led to an increased generation of electronic waste (Moore, 2019). Electronic waste (e-waste) or waste electrical and electronic equipment (WEEE) can be described as end-of-life electronic products and their associated parts that have been disposed of (Ghosh et al., 2016; Nguyen et al., 2018; Pérez-Belis, Bovea, & Ibáñez-Forés, 2015; StEP Initiative, n.d.). This description includes a large range of electronic devices

including televisions, computers, mobile phones and white goods (i.e. fridges, washing machines, dryers, etc), as explicated in Table 1. As newer, more advanced technology such as cellular phones, televisions, and home appliances are released into the market with greater adoption (Nguyen et al., 2018), older and possibly outdated electronic goods are discarded in significant numbers worldwide (Ghosh et al., 2016). E-waste in unapologetically adding to the global pollution problem (Pérez-Belis et al., 2015) as one of the fastest-growing waste streams globally (Ikhlayel, 2018).

Table 1: Types of waste in electrical and electronic equipment categories

Category	Types of equipment (examples)
Temperature exchange equipment	Refrigerators, freezers, air conditioners, heat pumps
Screen and monitors	Televisions, monitors, laptops, notebooks, tablets
Lamps	Fluorescent lamps, LED lamps, high-intensity discharge lamps
Large equipment	Washing machines, clothes dryers, electric stoves, large printing machines, copying machines, photovoltaic panels
Small equipment	Vacuum cleaners, toasters, microwaves, ventilation equipment, scales, calculators, radios, electric shavers, kettles, cameras, toys, electronic tools, medical devices, small monitoring and control equipment
Small IT and telecommunication equipment	Mobile phones, GPS, pocket calculators, routers, personal computers, printers, telephones

Source: Pérez-Belis et al. (2015)

2.4.3 The specific predicament related to e-waste

Increased levels of e-waste together with improper recycling and disposal techniques are leading to environmental and public health challenges globally (Ikhlayel, 2018; Kiddee, Naidu, & Wong, 2013; Nguyen et al., 2018). Informal recycling is on the rise in emerging markets in the Asian and African regions, where a large proportion of e-waste ends up in landfills or open dump sites (Finlay & Liechti, 2008; Ghosh et al., 2016; Ikhlayel, 2018; Mcintire, 2015; Nguyen et al., 2018).

The mere presence of e-waste can have detrimental effects on the environment's current and future use by contaminating water and soil that eventually affects the food supply, animals and land (Mcintire, 2015; Zhang, 2016). The current disposal techniques include landfills and incineration (Kiddee et al., 2013), both of which contribute to the environmental impact that affects humans both directly and indirectly (Kiddee et al., 2013). Crude dismantling techniques such as burning of electronics and acid baths to access copper and other valuable parts releases toxic chemicals such as lead, mercury, cadmium and other flame-retardant chemicals into the atmosphere, water and soil (Finlay & Liechti, 2008; Mcintire, 2015). Kiddee et al. (2013) reported that there are over 1,000 toxic substances in e-waste enter the agriculture and livestock that humans consume. The exposure to such materials and dismantling techniques have an impact on the health of the informal recyclers, causing respiratory health issues and lead poisoning, amongst others (Kiddee et al., 2013; Mcintire, 2015). Landfill disposal is still a prominent way of ridding oneself of old electronics in South Africa, with some formal and informal collection occurring (Finlay & Liechti, 2008; Ghosh et al., 2016). These poorly managed landfills combined with primitive recycling techniques lead to environmental pollution, which in turn leads to negative human impact through contamination of the food chain by toxic substances (Ghosh et al., 2016; Kiddee et al., 2013).

Many countries/regions globally have passed legislation related to this issue with the focus of improving the management of e-waste, including the European Union in 2002, Canada in 2006, the USA in different states in 2014, China in 2004 and Japan in 2001 (Pérez-Belis et al., 2015). The need to protect public health and the environment has led South Africa to develop the National Environmental Management Waste Amendment Act, 26 of 2014, to reform waste management practices however this does not directly address e-waste management (Finlay & Liechti, 2008; Ghosh et al., 2016). There have been many attempts to address this challenge in the past through various mechanisms including the formation of the e-Waste Association of South Africa in 2008 however these have failed due to inherent deficiencies including lack of clear roles and responsibilities of stakeholders (Amankwaa & Oteng-Ababio, 2014). The main difficulty faced by South Africa is that the laws aimed at addressing e-waste/hazardous materials in disparate as no single government department is responsible (Ghosh et al., 2016). In order to address the e-waste challenge in South Africa key stakeholders including government and

business need to understand the underlying issues regarding e-waste management including municipality process standardisation, e-waste recycling as well laws and regulations (Finlay & Liechti, 2008; Ghosh et al., 2016). There is a need for proper policies and laws but their impact is only felt if end users are prepared to accept and adhere to them (Kiddee et al., 2013).

2.4.4 Recycling of electronics

The recycling of e-waste enables the retrieval of secondary raw materials that can be put back into the manufacturing process, thereby reducing some of the need to extract more natural resources and in this way reducing greenhouse gas emissions (Geiger et al., 2019). Some of the precious metals contained in e-waste such as gold, copper and palladium may be recovered through recycling thus partially supporting the demand for these materials in production (Zhang, 2016). The recycling of e-waste is deemed the most appropriate manner to dispose of the waste and is supported by Life Cycle Assessments and Multi-Criteria Analysis on e-waste management (Streicher-Porte et al., 2005; Zhang, 2016). The recycling of e-waste allows for economic benefit through the recovery of metals and plastic that can be resold as raw materials for other industries (Streicher-Porte et al., 2005).

The responsibility that residents should take when it comes to e-waste recycling varies across the world. Places like Japan, the United States and the European Union follow the Extended Product Responsibility (EPR) although residents' responsibilities of e-waste recycling vary (Pérez-Belis et al., 2015; Wang, Zhang, Yin, & Zhang, 2011). In some EU countries producers are obligated to pay the e-waste recycling fee, whereas residents are only responsible for sending the product to collection points. However, in countries like Japan and Vietnam, residents pay the e-waste recycling fee (Nguyen et al., 2018; Wang et al., 2011). In contrast, in the United States, the responsibility of e-waste recycling is shared by producers, government and residents (Wang et al., 2011).

The waste challenges that the world faces and the resultant consequences of poor waste management can be partially addressed through recycling. Therefore, obtaining a better understanding of what drives people to recycle will therefore ensure a better probability of success in developing education programmes,

campaigns, public programmes, services and policies directed at increasing the rate of recycling (Geiger et al., 2019; Nguyen et al., 2018).

2.4.5 Goals and targets to reduce waste

Ambitious goals for a more sustainable circular economy have been taken up by various countries across the world. An official commitment through the Sustainable Development Goals (SDGs) (Moore, 2019) was proposed by the UN General Assembly and adopted by all United Nations Member States in 2015. They form part of the 2030 agenda for sustainable development and consist of 17 goals and 169 targets (Hák, Janoušková, & Moldan, 2016; United Nations, n.d.). Some of these goals build on the Millennium Development Goals (MDGs), while others incorporate new ideas (Hák et al., 2016) with a fundamental aim to “stimulate action over the next 15 years in areas of critical importance for humanity and the planet” (United Nations, n.d.). Two of the key objectives relate to: (i) people, with the aim to “end poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment”; and (ii) the planet with the aim to “protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations” (United Nations, n.d.).

Minimising the environmental impact of waste through the consumption of environmentally friendly products, as well as a reconsideration of products that are consumed, is the central aim of sustainable consumption. Green products are designed to reduce the consumption of natural resources and decrease the adverse environmental impacts of these products (Liobikiene et al., 2016). Although a challenge initially as it demands a mind shift from both consumers and companies. There may be economic benefit for companies that support green consumption behaviour in the long term (Moser, 2015).

2.5 People's recycling behaviours

2.5.1 Recycling explicated

Geiger et al. (2019) defined recycling as "an individual's waste collection intentions and behaviour to allow materials to be re-used". Recycling has been the topic of many studies especially to understand strategies to promote recycling and factors that determine individuals recycling participation. Some studies attribute recycling behaviour to factors such as extrinsic incentives; intrinsic incentives; external facilitators; internal facilitators; and demographic variables (Wang et al., 2011).

Miafodzyeva and Brandt (2013) concluded a meta-analysis of empirical studies that attributed recycling behaviour to four broad areas, including: (i) socio-demographic factors such as age, gender, income, dwelling and education level; (ii) technical-organisational factors such as collection schemes that are available for households to recycle, for example special containers, collection vehicles, unique methods, and distance to collection points; (iii) socio-psychological factors, which refer to motivational factors (general environmental concerns, moral norms, legal norms, and social norms) and situational factors (information, knowledge, past behaviour, personal effort); and (iv) context specific factors, which include a large and diverse number of variables including population density, political alliance, religious identity and sense of community. Recently, Geiger et al. (2019) also concluded a meta-analysis that identified factors related to recycling classifying factors into individual factors and contextual factors. Individual factors includes behaviour-specific factors such as recycling self-identity, personal norms towards recycling, past recycling, and perceived behavioural control over recycling), and general factors such as knowledge, attitudes and personal norm while contextual factors referred to the conditions in which recycling takes place, including recycling facilities in the neighbourhood, possession of a recycling bins and living conditions (Geiger et al., 2019).

2.5.2 Pro-environmental behaviour

Peoples' engagement in a certain behaviour e.g. recycling increases the more positive one feels towards that behaviour with the contrary also being true (Geiger et al., 2019). Therefore ones perception towards recycling determines their attitude

towards recycling and their awareness of the consequences of recycling on the environment. Their attitude related to the costs and benefits of recycling taking into account environmental cost and benefits (Geiger et al., 2019). Some researchers concluded that the stronger a person's environmental attitude, the more likely they are to recycle (Geiger et al., 2019; Miafodzyeva & Brandt, 2013) while others concluded a weak relationship between environmental attitude and recycling behaviour (Miafodzyeva & Brandt, 2013).

In the context of recycling, a descriptive norm can be understood as the degree to which an individual believes others recycle waste or engage in pro-environmental behaviour. While an injunctive norm is the degree of social acceptance that one requires for performing certain behaviours (Geiger et al., 2019). Various studies regarding recycling have concluded that social norms (descriptive norms and injunctive norms) are positively related to recycling, although some researchers argue that social norms may apply in the early stages of a recycling programme with stronger attitudes being formed towards the behaviour as the programme continues therefore not being further influenced by social pressure (Miafodzyeva & Brandt, 2013).

Personal moral norms are an internalised attitude governing an individual's behaviour, such as recycling. Behaviours aligned with one's personal moral norms promotes positive feelings within the individual and prevents negative feelings implying that people with a strong personal norm toward recycling and engaging in pro-environmental behaviour are more likely to recycle (Geiger et al., 2019). This is supported by research that concluded that personal responsibility to recycle reduces the efforts associated with the behaviour thereby increasing recycling participation (Miafodzyeva & Brandt, 2013). A moral obligation to recycle, social approval of recycling and other peoples recycling behaviour positively impact the recycling behaviour of people i.e. personal and social norms positively are positively associated to recycling (Geiger et al., 2019).

Increased knowledge about how to recycle or about environmental problems should encourage people to recycle their waste, yet Geiger et al. (2019) found that knowledge about how to recycle was less predictive than motivational factors in explaining recycling behaviour, with some researchers arguing that knowledge will

only affect recycling if the individual has prior motivation to engage in the behaviour. People with knowledge about the causes and effect of environmental challenges together with a concern of the environment have a greater likelihood of recycling (Geiger et al., 2019).

Some studies have included past recycling as a predictor of recycling, postulating the formation of a recycling habit as a result of a past recycling experience. Therefore a person who has recycled in the past will be more likely to develop a recycling habit, and therefore are more likely to recycle in the future (Geiger et al., 2019). The relationship between past experience and recycling behaviour may be habitual or related to a stronger self-identity or lower the perception of effort required to recycle (Miafodzyeva & Brandt, 2013).

A persons perception of their ability to engage in a certain behaviour can be considered as Perceived Behavioural Control (PBC) (Geiger et al., 2019). A higher PBC towards recycling or pro-environmental behaviour, the higher one's self-efficacy resulting in a higher likelihood one will engage in recycling (Geiger et al., 2019).

2.5.3 Effort associated with recycling

Contextual factors facilitate or inhibit recycling, for example local circumstances where recycling takes place. Studies have shown that having access to a recycling bin at home and appropriate recycling facilities nearby positively influence recycling (Geiger et al., 2019). Centralised locations are often efficient for waste collectors, but are inconvenient for households that do not want to make an effort to dispose of their household waste (Miafodzyeva & Brandt, 2013). The convenience of waste collection systems are of utmost importance to households, for example, households with access to kerbside collection systems are more inclined to sort their waste than households that do not (Chi, Wang, & Reuter, 2014; Miliute-Plepiene, Hage, Plepys, & Reipas, 2016). It was also found that waste separation increases when kerbside collection rather than drop-off sites are available (Struk, 2017). Recycling requires effort from the participants beforehand, to separate and store waste correctly in order for the recycling to occur, thus some researchers point out that some individuals may not recycle due to the inconvenience associated with this (Miafodzyeva & Brandt, 2013; Nguyen et al., 2018).

2.5.4 Legislation, policy and government participation

Research regarding the legal norms of recycling is inconclusive in determining recycling behaviour (Miafodzyeva & Brandt, 2013), however it has been noted that legislation, policy and government participation play a key role in the recycling of waste. Nguyen et al. (2018) found that Laws and Regulations significantly aid in predicting individuals' intentions when forecasting e-waste recycling. Their research in Vietnam with respect to e-waste recycling found that people's Awareness to the Environment and Attitudes towards recycling, Social Pressure, Laws and Regulations, Cost of recycling, and Inconvenience of recycling significantly affected residents' Behavioural Intention to recycle. The Cost of e-waste recycling was also considered to be difficult to accept for residents in Beijing (Wang et al., 2011), with four main determinants of residents' willingness towards e-waste recycling including: (i) convenience of recycling facilities and services; (ii) residential conditions; (iii) recycling habits; and (iv) economic benefits (Wang et al., 2011).

2.5.5 The relevance of socio-demographic factors

Age, gender, income, dwelling type and education level are the most pertinent socio-demographic factors that can influence households' recycling behaviour. A meta-analysis of multiple empirical studies concluded that recycling behaviour significantly depends on age and income, with education level being less influential in terms of recycling behaviour (Miafodzyeva & Brandt, 2013). Many studies on this topic which have tested the direct or indirect impact of socio-demographic factors on the behaviour of individuals to recycle have, however, produced mixed results. A study conducted on Greece's Blue Bin recycling programme concluded that demographic characteristics including age, gender, education and income levels were weak predictors of recycling intention (Botetzagias et al., 2015), which suggests that the enablers and challenges associated with recycling are not necessarily related to consumers' socio-demographic characteristics, but may be context specific. A recent study conducted in Brazil on electronic waste recycling behaviour concluded that age and income level indeed influence people's recycling behaviour, with higher income respondents being more likely to adequately dispose of e-waste and older respondents deemed to be more likely to participate in recycling initiatives (Echegaray & Hansstein, 2017). This was further supported by a study conducted in

Iran that aimed to understand household waste behaviours in a developing context indicating that age and gender are significant predictors of household waste behaviours (Pakpour, Zeidi, Emamjomeh, Asefzadeh, & Pearson, 2014).

2.6 The Theory of Planned Behaviour as a theoretical perspective

Human behaviour is diverse and encompasses both good and bad elements, such as the adoption of technology to improve job related skills on the one hand, and indiscriminate disposal of outdated electronics on the other (Davis, Campbell, Hildon, Hobbs, & Michie, 2015). Many studies have aimed to understand these behaviours and the underlying factors that cause individuals to act in a specific way, which is an essential issue for the development of change interventions and policies. Change interventions can occur at the individual, community and population levels, but in order to effect appropriate changes, behaviours and behavioural changes need to be understood. Various theories summarise and expand the existing knowledge of how to change behaviour across different populations and contexts, including widely used theories such as: (i) the Trans Theoretical Model of Change (TTM); (ii) the Theory of Planned Behaviour (TPB); (iii) the Social Cognitive Theory (SCT); (iv) and the Information-Motivation-Behavioural-Skills Model (Davis et al., 2015). Of these, TPB is one of the most influential and popular conceptual frameworks for the study of human behaviour (Ajzen, 2002). TPB has been used very successfully in various types of research in the past, for example health sciences, leisure sciences, entrepreneurship, psychology and marketing (Lortie & Castogiovanni, 2015).

The Theory of Planned Behaviour (TPB) builds on the Theory of Reasoned Action (TRA) to provide a useful framework for understanding the intricacy of human behaviour and motivational factors that determine the likelihood of an individual performing a specific behaviour (Ajzen, 1991; Montaño & Kasprzyk, 1992). The TRA asserts that a proxy for behaviour is behavioural intention which is preceded by attitude to perform a behaviour and subjective norms associated with the behaviour (Ajzen, 1991; Montaño & Kasprzyk, 1992). TPB expends this by adding perceived behavioural control to account for situations of no full control (Ajzen, 1991; Montaño & Kasprzyk, 1992).

Explained differently one could consider that TPB is supported by three underlying beliefs that culminate into behavioural intention the immediate antecedent of action (Ajzen, 2002). These beliefs are (i) behavioural beliefs i.e. an un/favourable attitude toward the behaviour ; (ii) normative beliefs i.e. expectations of others or social pressure ; and (iii) control beliefs i.e. the perceived ease or difficulty of performing the behaviour (Ajzen, 2002; Armitage & Conner, 2001). However, irrespective of whether the resources or impediments are internal or external, when individuals believe that they have the required resources and believe that they can overcome these challenges, they demonstrate perceived behavioural control (Ajzen, 2002).

Even though there has been criticism of TPB and TRA regarding the plausibility of correlational results explaining the power of behaviour (Montaño & Kasprzyk, 1992), and the tendency of these models to rely on self-reporting despite evidence to support self-presentational bias (Armitage & Conner, 2001), TPB has been used to develop many effective behavioural change interventions, indicating that changing the constructs relating to TPB will lead to subsequent behavioural change (Montaño & Kasprzyk, 1992).

To date, various consumer behavioural theories have been applied to explain what drives an individual to recycle. The TPB discussed above (de Leeuw, Valois, Ajzen, & Schmidt, 2015) suggests that the intention to recycle is influenced by an individual's attitude, subjective norms and perceived behavioural control (PBC). Many studies have incorporated additional predictors, with the TBP including moral norms, situational factors, demographics and past behaviour (Botetzagias et al., 2015).

TPB was used as theoretical point of departure in this study because it is still widely used in consumer behaviour research (Ajzen, 2008), including a number of studies conducted to understand green consumer behaviour (Liobikiene et al., 2016; Moser, 2015) and recycling behaviour (Botetzagias et al., 2015; Echegaray & Hansstein, 2017; Nguyen et al., 2018; Onel & Mukherjee, 2017; Sonnenberg et al., 2014).

2.7 Conclusion

The concept of urbanisation has been part of society for many decades and benefits society economically and socially, with developing countries experiencing exponential growth in the last few years. However, with all the benefits that are associated with urbanisation, this rapid growth does bring with it societal and environmental issue that are negatively impacting the planet.

With the advance of technology, production processes have become more efficient, products have become cheaper, and the spectrum of goods has increased. At the same time people have become wealthier, with growing appetites for goods and services demanding the latest clothing, technologies and foods. Rapid urbanisation, together with changing consumption patterns, have led to a throwaway society, driving a crisis of excessive waste generation.

Various types of waste are being generated including plastic, food, textiles and electronics, each of which contributes in their own way to the pollution of the planet. E-waste is a specifically challenging form of waste, with a complex make-up that is comprised of various materials such as precious metals, plastic and glass. The disposal of most waste is through landfills; little waste is recycled in order to drive a more sustainable form of consumption that will have a lower impact on the Planet. Due to the fact that e-waste contains valuable materials, this has spurred an industry for the recovery of some of these materials that has led to informal and rudimentary practices of extraction, which are harmful to humans and the environment.

Humans play a vital part in driving pro-environmental behaviour and ensuring more sustainable consumption practices that will not impact the environment negatively, which can resolve the pollution and climate change issues they have created. Recycling is a form of reducing the need for extracting future natural resources that impact the environment and driving waste to the proper channels. As per the literature review conducted, there are a number of external and internal factors that influence an individual's recycling behaviour. People's awareness of the environmental impact of their attitudes towards recycling will have a positive influence on recycling behaviour. This is further supported by the need for people to be accepted by society in terms of driving their actions. A difficulty related to the

process of recycling may inhibit recycling behaviour due to it being inconvenient and involving additional costs, however having past experience may lead to repetitive behaviour, making it easier for people to recycle as well as being supported by laws and policies that are in place.

Using the TPB theoretical framework, this research aimed to explain how certain factors can influence an individual's behavioural intention leading to recycling behaviour. Ajzen (1991) confirmed in his research that behavioural intention is a good predictor of an action, i.e. in this case intention to recycle may be a good predictor of recycling behaviour. The underlying constructs include attitude toward the action, subjective norms and perceived behavioural control.

The research problem, namely "To determine what factors influence urban South African consumers' e-waste recycling behaviour", was modelled using the Theory of Planned Behaviour. In South Africa the current level of recycling is low, and based on the research conducted to date, no studies could be found that investigated which factors drive consumers' recycling of e-waste. The theoretical framework and hypothesis development are discussed in the next chapter.

Chapter 3: Research Purpose and Hypotheses

3.1 Research purpose

The intention of this study was to identify the key factors that influence consumers' e-waste recycling behaviour within South Africa. The research was directed by the theoretical underpinnings of the Theory of Planned Behaviour, which also guided the conceptual framework. As discussed in the literature review, the advances in technology, urbanisation and consumerism have led to an increase in waste generation, including e-waste. E-waste, when compared to other forms of waste, is particularly harmful as it is composed of chemically different and even hazardous materials (Echegaray & Hansstein, 2017) that pose a potential risk to the environment and peoples' health. For this reason, the treatment of e-waste, which involves attempts to reuse, re-manufacture, recycle or dispose of it, is important given the growing proliferation of electronic equipment in people's everyday lives. This situation will highly likely be aggravated by the fourth industrial revolution, which is further encouraging the use of technology.

The literature review explored the three main constructs within the TPB namely, attitude, subjective norms and perceived behavioural control (PBC). Many studies utilise this framework to understand the motivating factors behind recycling intention, which is deemed to be a good predictor of recycling behaviour with respect to general solid waste. However, few studies have been undertaken to understand the factors that motivate the recycling behaviour of e-waste around the World (Echegaray & Hansstein, 2017; Nguyen et al., 2018).

An adaptation of the conceptual framework proposed by Nguyen et al. (2018) in their study of e-waste recycling behavioural intention was used in this study to identify relevant underlying constructs and their relationship to e-waste recycling behaviour (see Figure 3.1). The researchers defined recycling behavioural intention as "residents' likelihood and willingness to recycle e-waste" (Nguyen et al., 2018), while attitude, subjective norms and perceived behavioural control underlie behavioural intention (Ajzen, 1991). In the context of this study, Attitude refers to consumers' environmental awareness and their stance toward recycling; subjective norms refer to social pressure; and laws and regulations that are considered in the social context;

and perceived behavioural control is defined as the perceived Inconvenience of recycling and costs associated with recycling. As discussed in the literature, past recycling experience has been shown to positively influence e-waste recycling intention (Geiger et al., 2019; Nguyen et al., 2018), however no study could be found that has explicitly explored the factors that influence consumers'/households' e-waste recycling behaviour in South Africa.

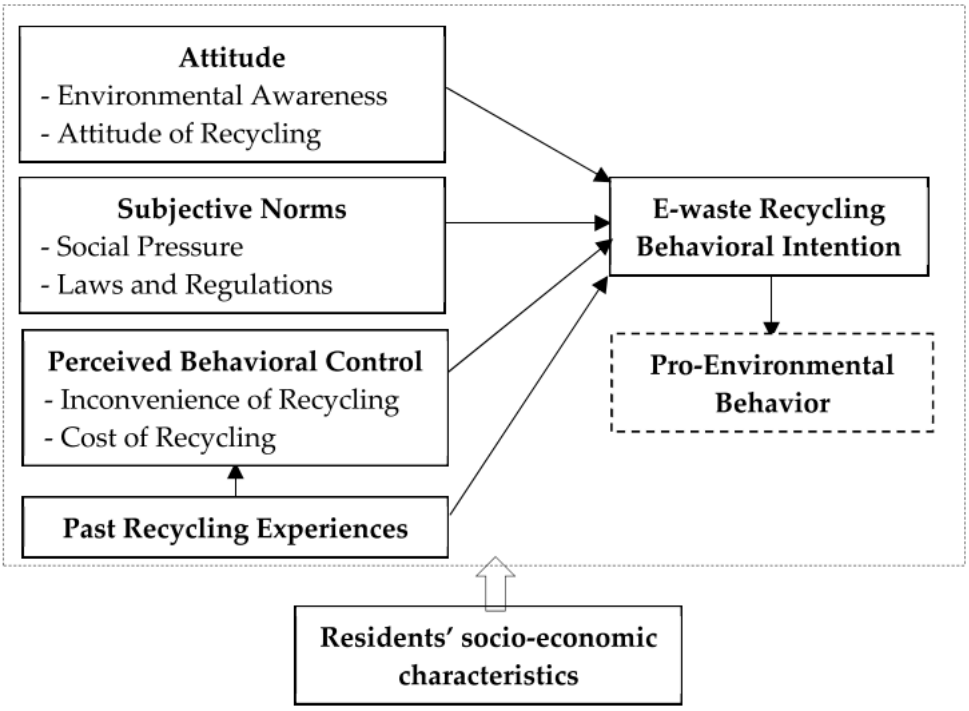

Figure 1: Conceptual framework (Source: Nguyen et al., 2018)

3.2 Research hypotheses

The hypotheses were developed from extant literature regarding which factors may influence the e-waste recycling behaviour of South African consumers.

3.2.1 Hypothesis 1 (H1)

The first research question sought to determine what relationship exists between Environmental Awareness and Attitudes towards recycling as an encompassing construct, and Behavioural Intention. According to the TPB and related literature discussed in Chapter 2, Environmental Awareness and Attitude (AAR) were

expected to positively affect the e-waste recycling Behavioural Intention (BI) of residents.

Null hypothesis ($H1_0$): Environmental Awareness and Attitude (as an encompassing construct) toward recycling do not affect residents' e-waste recycling Behavioural Intentions.

Alternative hypothesis ($H1_a$): Environmental Awareness and Attitude (as an encompassing construct) toward recycling positively affect residents' e-waste recycling Behavioural Intentions.

3.2.2 Hypothesis 2 (H2)

The second research question sought to determine what relationship exists between Social Pressure and e-waste recycling Behavioural Intention. According to the TPB and related literature discussed in Chapter 2, Social Pressure (SP) was expected to positively affect the e-waste recycling Behavioural Intention of residents.

Null hypothesis ($H2_0$): Social pressure does not affect e-waste recycling Behavioural Intention.

Alternative hypothesis ($H2_a$): Social pressure positively affects e-waste recycling Behavioural Intention.

3.2.3 Hypothesis 3 (H3)

The third research question sought to determine whether a relationship exists between Laws and Regulations and e-waste recycling Behavioural Intention. According to the TPB and related literature discussed in Chapter 2, Laws and Regulations (LR) was expected to positively influence the e-waste recycling Behavioural Intention of residents.

Null hypothesis ($H3_0$): Laws and Regulations do not influence consumers' e-waste recycling Behavioural Intention.

Alternative hypothesis ($H3_a$): Laws and Regulations positively influence consumers' e-waste recycling Behavioural Intention.

3.2.4 Hypothesis 4 (H4)

The fourth research question sought to determine the relationship between Cost of recycling and e-waste recycling Behavioural Intention. According to the TPB and related literature discussed in Chapter 2, the Cost of Recycling (CR) was expected to influence the e-waste recycling Behavioural Intention of residents.

Null hypothesis ($H4_0$): The Cost of Recycling does not influence consumers' e-waste recycling Behavioural Intention.

Alternative hypothesis ($H4_a$): The Cost of Recycling influences consumers' e-waste recycling Behavioural Intention.

3.2.5 Hypothesis 5 (H5)

The fifth research question sought to determine the relationship between the Inconvenience of Recycling and e-waste recycling Behavioural Intention. According to the TPB and related literature discussed in Chapter 2, any Inconvenience associated with Recycling (ICR) negatively impacts the e-waste recycling Behavioural Intention of consumers.

Null hypothesis ($H5_0$): The Inconvenience associated with recycling has no significant impact on consumers' recycling behaviour.

Alternative hypothesis ($H5_a$): The Inconvenience associated with recycling has a negative significant impact on consumers' recycling behaviour.

3.2.6 Hypothesis 6.1 (H6.1)

The sixth research question sought to determine the relationship between people's Past Experience of recycling and their e-waste recycling Behavioural Intention. According to the TPB and related literature discussed in Chapter 2, past recycling

experience (PE) positively impacts the e-waste recycling Behavioural Intention of consumers.

Null hypothesis ($H6.1_0$): The past recycling experience of consumers does not influence their e-waste recycling behaviour intention.

Alternative hypothesis ($H6.1_a$): The past recycling experience of consumers positively influences their e-waste recycling behaviour intention.

3.2.7 Hypothesis 6.2 (H6.2)

The last research question sought to determine what relationship exists between people's Past Experience of recycling and the Inconvenience of e-waste recycling. According to the TPB and related literature discussed in Chapter 2, people's past recycling experience negatively influences the Inconvenience associated with e-waste recycling.

Null hypothesis ($H6.2_0$): The past recycling experience of consumers does not influence their perception of the Inconvenience associated with e-waste recycling.

Alternative hypothesis ($H6.2_a$): The past recycling experience of consumers negatively influences their perception of the Inconvenience associated with e-waste recycling.

The hypotheses for this study are visually presented in Figure 2.

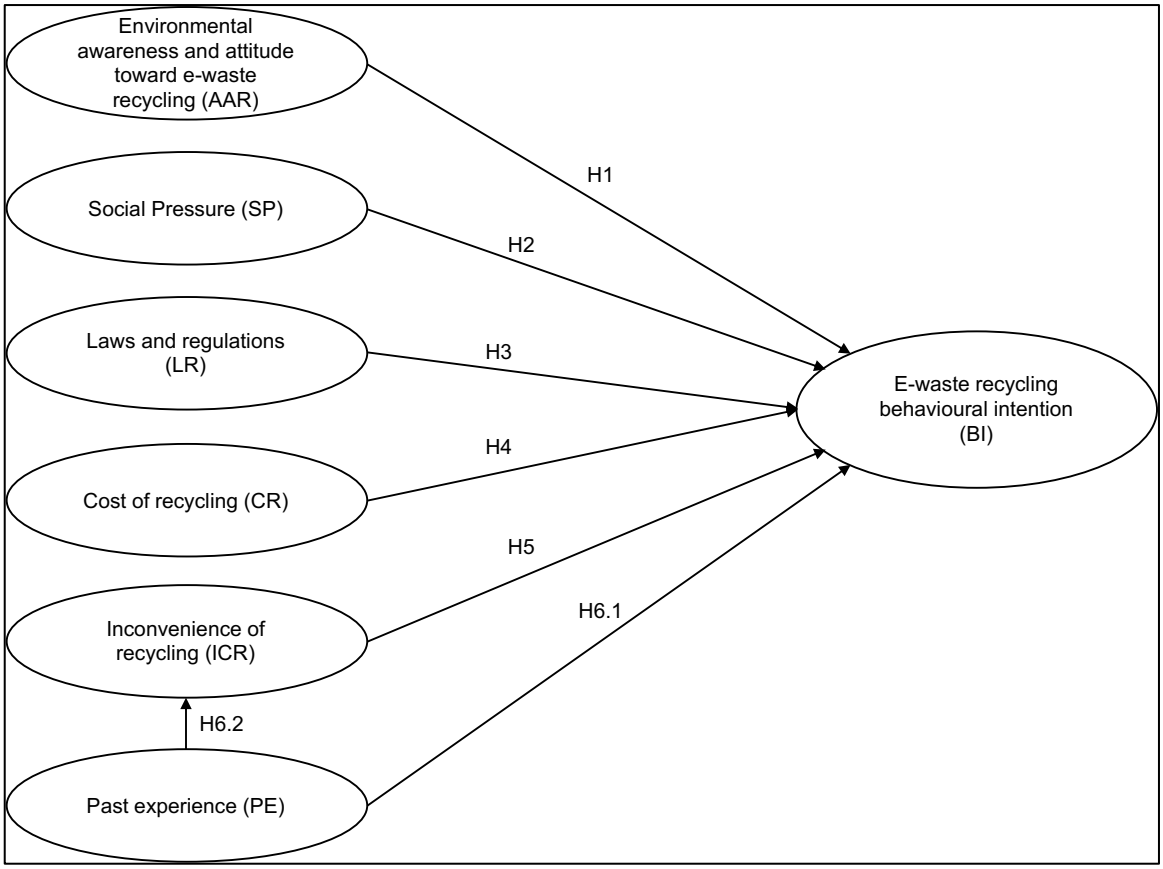

Figure 2: Hypothesis framework (Source: Nguyen et al., 2018)

Chapter 4 – Research Design and Methodology

4.1 Introduction

This chapter details the research philosophy and design, population under consideration, relevant units of analysis, sampling method, measurement instruments used to conduct the required statistical tests, data collection procedure, data analysis, as well as the limitations of the research.

4.2 Research philosophy and design

The research philosophy of pragmatism guided the research report, which argues that the most influential determinants of research are the research questions and research hypotheses. The current research was deductive, i.e. the hypotheses were tested systematically in order to prove or disprove said hypotheses as a mechanism of understanding the relationship between variables (Saunders & Lewis, 2018, p. 111-112).

The research aimed to describe the factors that influence consumers' e-waste recycling behaviour, considering the underlying components of TPB, in a South African context by means of the collection of measurable and quantifiable data. The research design employed was explanatory in order to explain the relationship between recycling intention that may determine consumers' recycling behaviours. According to Saunders and Lewis (2018, p. 118), an explanatory study is intended to investigate a situation or a problem in order to explain the relationships between the selected variables.

A cross-sectional survey design was employed to collect measurable and quantifiable data for the study, offering a snapshot of the research setting at a particular time in which respondents completed self-reporting questionnaires (Saunders & Lewis, 2018, p120-130). This approach is seen as an acceptable method for researching recycling behavioural intention (Botetzagias et al., 2015; Geiger et al., 2019; Miafodzyeva & Brandt, 2013; Nguyen et al., 2018; Onel & Mukherjee, 2017).

The objective of the research was to ascertain whether the underlying TPB constructs, identified in the literature, could provide a statistically significant prediction of e-waste recycling intention amongst South African consumers. The data was analysed through structural equation modelling, a general statistical modelling technique that is widely used in behavioural science (Hox & Bechger, 1998) to establish a model between all directly observed or latent constructs (Ullman, 2006). The measured constructs in this research were the underlying components of the TPB constructs including attitude (measured by Environmental Awareness and Attitude to Recycling); subjective norm (measured by Social Pressure and Laws and Regulations); and perceived behavioural control (measured by Cost of Recycling and Inconvenience of Recycling). An additional variable was added in reference to past recycling experience. Structural equation modelling is discussed Section 4.6.5.

4.3 Population, sampling and unit of analysis

4.3.1 Population

The target population for this explorative study was urban South African male and female electronic and electrical equipment consumers, of all population groups, who were 18 years or older at the time of the study (Saunders & Lewis, 2018). The pre-requisites to participate in this study were thus geographic location, age, use of electrical and electronic equipment, and the ability to read the questionnaire and complete it independently.

4.3.2 Unit of analysis and sampling

Sampling is considered a process of selection a representative portion of the population being studied taking into account its subsets (Gentles, Charles, Ploeg, & Ann McKibbon, 2015). A non-probabilistic convenience sampling method was employed allowing the researcher the ability to recruit individuals that were available, accessible and willing to part-take in the study (Saunders & Lewis, 2018, p. 147-148). This would not have been the researcher's first choice, however time limitations, geographical constraints and financial restrictions made it impossible to contract a company to collect the data.

4.4 Measurement instrument

A number of constructs were tested in this research project including recycling behavioural intention, attitudes towards recycling, subjective norms and perceived behavioural control utilising a questionnaire designed by Nguyen et al (2018). Nguyen et al. (2018) utilised questions adapted from various studies as well as interviews in their study e-waste recycling behaviour. To test their survey for reliability and validity, the authors conducted a pilot test with 50 respondents, followed by a reliability test of Cronbach's Alpha (α) (Nguyen et al., 2018).

The questionnaire employed in this study was divided into eight sections, one of which measured the demographic information including gender, age, education level, income level and area of residence, while the rest measured the constructs contained in the theoretical framework. Five constructs was tested each representing an underlying component of the TPB. Each construct consisted of statements to which the respondents recorded responses on a 5-point Likert-type scale.

4.5 Data collection

Once the researcher received ethical clearance from the Gordon Institute of Business Science's (GIBS) ethical clearance committee (see Appendix 1), an email was sent on behalf of the researcher to the potential respondents. A non-probability convenience sampling method was chosen discussed in Section 4.3.2, as well as snowball sampling, in order to obtain a good sample of respondents. A survey was distributed (refer to Appendix 2 for the questionnaire) to colleagues, friends and family via email link on the 16th August 2019, and was available to complete until the 3rd September 2019. Further to distributing the email link, participating respondents were requested to forward the survey link onto other potential respondents. A total of 160 respondents completed the survey.

The email included the GIBS letter head, motivation for and information about the research, confidentiality information and necessary definitions as well as the hyperlink to the online survey as suggested by Saunders and Lewis (2018, p. 156-158). Respondents could complete the survey at their convenience and pace.

4.6 Data analysis

The data were analysed in SPSS version 25, using a 95% confidence interval and a 5% significance level. The results section starts with a description of the profile of the sample, followed by descriptive results for the recycling dimensions, hypothesis testing and structural equation regression analysis.

4.6.1 Descriptive statistics

Descriptive statistics were conducted on the survey data, calculating percentages, frequencies, means and standard deviations to provide basic information on the demographic profile of the sample and frequency tables of the six sub dimensions. Cross tabulations were used to assess differences between two variables, e.g. the dimensions of the primary construct and gender.

4.6.2 Hypothesis testing

Hypothesis testing was used to compare the relationships between different factors that influence consumers' e-waste recycling (Saunders & Lewis, 2018, p. 194) assessing the likelihood of differences between behavioural intention to recycle and its predictors i.e. Attitudes, Social Norms and Perceived Behavioural Control. This test of significance enabled the researcher to determine whether the data were statistically significant and were therefore unlikely to have occurred by chance. Calculated p-values less than 0.05 resulted in the rejection of the null hypothesis (H_0) implying a relationship between the two variables (Bonett & Wright, 2015). A paired difference test was used to whether the means of two variables differ. A t-test was used an the population standard deviation of difference was unknown.

4.6.3 Normal distribution test

In order to conduct inferential statistics the data was tested for normal distribution, skewness and kurtosis. Skewness measures the degree and direction of asymmetry, while kurtosis is a measure of tail extremity reflecting either the presence of outliers in a distribution or a distribution's propensity for producing outliers (Westfall, 2014).

The standard deviations were also calculated to measure the spread of the data. A larger spread indicates a lower consensus among respondents (Westfall, 2014).

4.6.4 Correlations

In order to measure the relationship between the independent and dependent variables a correlation coefficient was calculated. In the case of this study the relationship between Behavioural Intention and the independent variables (Environmental Awareness and Attitude towards recycling; Social Pressure; Laws and Regulations; Cost of Recycling; Inconvenience of Recycling and Past Experience) (Saunders & Lewis, 2018, p. 201-202) was tested. Variable that are correlated vary together i.e. positive correlation means increasing or decreasing scores for both the dependent and independent variables, while a negative correlation, as one variable increases the other decreases (Saunders & Lewis, 2018, p. 196; Hemphill, 2003).

4.6.5 Structural Equation Modelling (SEM)

To test the relationships of the independent variables (Environmental Awareness and Attitude, Social Pressure, Laws and Regulations, Cost of Recycling, Inconvenience of Recycling, and Past Experience) with the dependent variables, SEM was used. This general statistical modelling technique is used to test relationships between observed and latent variables of various theoretical models and is consistently used in a wide range of scientific studies (Carvalho & Chima, 2014; Hox & Bechger, 1998), including those undertaken to understand the relationship between the predictors of recycling behaviour and consumerism utilising the TPB (Chan & Bishop, 2013; Jekria & Daud, 2016; Nguyen et al., 2018; Onel & Mukherjee, 2017). The SPSS statistical programme was used to calculate this inferential statistic and their p-values. The main assumption was that the sample came from an approximately normal distribution. The SEM multivariate regression can be mathematically expressed as follows:

$$\mathbf{Y\ (Intention\ to\ recycle) = \alpha + \beta 1 + \beta 2 + \beta 3 + \beta 4 + \beta 5 + \beta 6 + Demographics + c}$$

Where β1 - β6 are the independent variables (i-Environmental Awareness and Attitude, ii-Social Pressure, iii-Laws and Regulations, iv-Cost of Recycling, v-

Inconvenience of Recycling, and vi-Past Experience), α is the slope and c is the constant. The output of the SEM was a pathway analysis and a regression table.

4.7 Validity and reliability

In order to establish the integrity of the research and the ability to draw significant conclusion from the data validity and reliability was measured (Heale & Twycross, 2015). These concepts are explained below in relation to the current research.

Validity measures the credibility of a measure i.e. whether the measure means what is supposed to (Saunders & Lewis, 2018, p. 134). In this research, construct validity was achieved by conducting a thorough literature review to define and conceptualise the constructs in the context of this research. Established measurement instruments were used but were slightly adapted to suit the context of this research. The measurement scale of Nguyen et al. (2018) was used as a point of departure in order to enhance construct validity based on its successful previous application. This also ensured that the data collected via the survey provided sufficient data to meet the research objective and was a representation of the intended measure (Saunders & Lewis, 2018, p. 134-136). This measurement scale provided the researcher the ability to measure each component of the TPB.

Reliability refers to the consistency of a measurement instrument and can be empirically tested using the Cronbach's Alpha (Cortina, 1993; Heale & Twycross, 2015; Tavakol & Dennick, 2011). A Cronbach's Alpha was used to test the reliability of the constructs and is generally used to see if multiple question Likert-type scale surveys are reliable, i.e. if the tests have been designed to accurately measure the constructs. As questions used in this study measured latent variables that are difficult to measure in real life, Cronbach's Alpha scores were calculated to inform the internal consistency of the measurement scales. Cronbach's Alpha scores generally range from 0 to 1, with a score below 0.5 indicating unreliability. The lower limited for the Cronbach's Alpha is 0.70 but can be decreased to 0.6 for exploratory research (Cortina, 1993; Heale & Twycross, 2015; Tavakol & Dennick, 2011).

Validity and reliability measures where important measures for the researcher to ensure that the research is valid and publishable.

4.8 Research limitations

A non-probabilistic convenience sampling method was chosen, which has certain limitations including sample bias. This, combined with the small sample of 160 responses collected, limits the generalisation of the findings to the entire South African population (Etikan et al., 2016; Gentles et al., 2015). The composition of the sample was fairly evenly split between population groups, and the age and income demographics were not representative of the South African population group. SEM is a large sample technique and small sample sizes may produce inconsistent conclusions (Carvalho & Chima, 2014), hence data should be interpreted with caution.

4.9 Conclusion

The research methodology was discussed in this chapter detailing the process taken by the researcher to design and implement this study. The research philosophy was explained in relation to the research objectives and the population, sample and unit of analysis was defined.

The survey design and development of the research instrument was also explained and the constructs were described in relation to the components of the TPB.

The data analysis technique was described and justified together with the structural equation model. Validity and reliability was addressed as well as the limitations of the research.

Chapter 5: Results

5.1 Introduction

The results for this study are presented and discussed in this chapter in accordance with the hypotheses for the study, incorporating the literature reviewed in Chapter 2. Tables and figures are used to visually present some of the results. The chapter starts with a description of the profile of the respondents, followed by descriptive results for the dimensions pertaining to recycling. This is followed by testing associations between consumers' intention to recycle and the other constructs through correlations, hypothesis testing and regression analysis. The data were analysed in SPSS version 25, and, where relevant, using a 95% confidence interval and a 5% significance level.

5.2 Demographic profile of the respondents

The data collection process produced a total of 160 useful questionnaires through the convenience sampling method, explained in Chapter 4. The demographic characteristics of the respondents who took part in the study are presented in Table 2, which indicates that the sample was not fully representative of the South African population. This implies that a generalisation of the outcomes of the study in terms of the entire population is unfortunately not possible, however sub-sets of the sample were large enough to merit statistical analysis and to gain some insights into demographic groups, namely gender, age, income level, level of education, and population group, which could spur future research.

Gender representation of the sample indicated slightly more females (52.50%) than males (47.50%), which is partially aligned with the output of the last census taken in South Africa in 2016. This census concluded that the population gender distribution was slightly skewed towards females (51%) (Statistics South Africa, 2016). One can thus conclude that the sample was partially representative of the South African population.

The majority of the sample was aged between 23 and 49 years (90.63%), with a small portion of the sample being above 50 years old (9.38%). Based on the last census of South Africa concluded in 2016 for the population 25 years and above, those aged between 25 and 49 years (68.96%) represented a larger percentage of the population than those aged 50 years and older (31.04%), however the percentages were closer than those of this study (Statistics South Africa, 2016). Therefore, based on the results of the sample, one can conclude that this sample was not representative of the South African population. The inclusion of a larger percentage of younger consumers was not necessarily regarded as negative, however, as they are the segment of the population that could influence the youth of the country to practice more responsible environmental behaviour.

The majority of the sample was married or in a partnership (69.38%), and more female respondents were married than males (69.1% vs 56.6%). The last census conducted illustrated a contrasting view, with the majority of the respondents being single (65.95%), and only 34.05% indicating they were married or in a partnership (Statistics South Africa, 2016). This indicates that the sample was not representative of the South African population.

The population group representation in the sample was fairly evenly distributed between White (30.63%), Indian/Asian (29.38%) and Black African (25.00%), which was also not representative of the South African population where the majority of the population is Black African (80.66%) (Statistics South Africa, 2016). However, this allowed statistical comparisons across the different population groups in the sample about their e-waste recycling behaviour.

The sample contained a fairly large percentage of highly educated respondents, as more than half of the sample (64.4%) possessed post graduate qualifications with a few possessing only a Matric certificate (5%).

Table 2 presents the respondents' demographic characteristics (N = 160).

Table 2: Respondents' demographic characteristics (N = 160)

		Male		Female		Total	
Variable	**Category**	**n**	**%**	**n**	**%**	**n**	**%**
Gender	Male	76	100			76	47.50
	Female			84	100	84	52.50
Age Group	23-35 years	32	42.11	35	41.67	67	41.88
	36-49 years	37	48.68	41	48.81	78	48.75
	50-67 years	7	9.21	8	9.52	15	9.38
Marital Status	Divorced / Widowed / Single	25	32.89	24	28.57	49	30.63
	Married	43	56.58	58	69.05	101	63.13
	Partnership	8	10.53	2	2.38	10	6.25
Population Group	White	21	27.63	28	33.33	49	30.63
	Indian / Asian	24	31.58	23	27.38	47	29.38
	Black African	21	27.63	19	22.62	40	25.00
	Coloured	10	13.16	10	11.90	20	12.50
	Other	0	-	4	4.76	4	2.50
Education Qualification	Up to Matric	3	3.95	5	5.95	8	5.00
	Diploma	11	14.47	11	13.10	22	13.75
	Bachelor's Degree	9	11.84	18	21.43	27	16.88
	Post Graduate Diploma	38	50.00	36	42.86	74	46.25
	Master's Degree	14	18.42	12	14.29	26	16.25
	Doctorate	1	1.32	2	2.38	3	1.88
Monthly Earnings	<R5000	6	7.89	1	1.19	7	4.38
	R5001-10000	1	1.32	1	1.19	2	1.25
	R10001-20000	3	3.95	5	5.95	8	5.00
	R20001-50000	23	30.26	22	26.19	45	28.13
	>R50000	32	42.11	37	44.05	69	43.13
	Missing	0	0	0	0	0	0
Total		**76**	**100.00**	**84**	**100.00**	**160**	**100.00**

Figures 3 and 4 indicate the distribution of respondents per age and in accordance with household size. The median age was 39 years with an interquartile age of 33 years and 44 years. The mean household size was three, with a maximum of eight

and minimum of one. The household size was an indication that the sample included relatively small as well as large households, where household decisions are influenced by other household members.

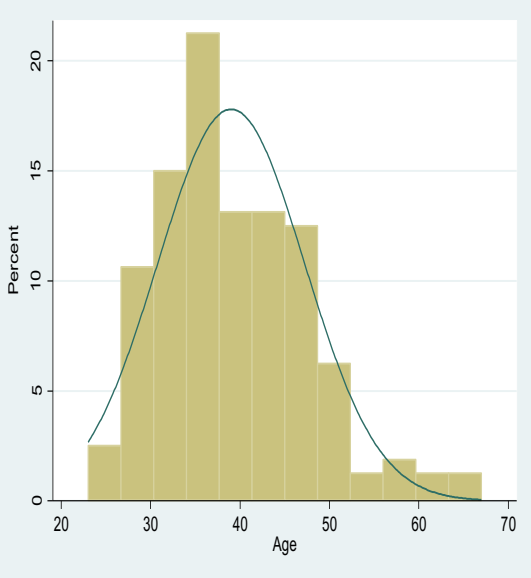

Figure 3: Respondents' age distribution

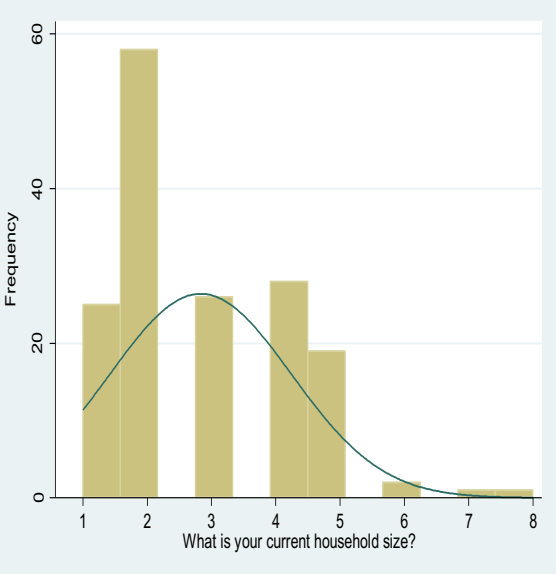

Figure 4: Respondents' household size

5.3 Results

The results and findings of this study are arranged and discussed in accordance with the hypotheses and the constructs tested, namely: Environmental Awareness and Attitude towards recycling; Social Pressure; Laws and Regulations; Inconvenience of Recycling; Past Recycling Experience and Behavioural Intention.

The mean scores were interpreted for each question relating to the constructs to understand the relevance of the construct in relation to the particular construct being measured. Considering the five-point scale utilised for data collection, an interpretation scale was decided on beforehand to be applied to the mean scores, which ranged from a minimum of 1 to a maximum of 5 unless otherwise advised. The interpretation scale is represented below:

$M>4\leq5$	Strongly agree with/support construct
$M>3.5\leq4$	Agree with/support construct
$M\geq2.5\leq3.5$	Moderately agree with/support construct
$M<2.5$	Disagree with/do not support construct

5.3.1 Respondents' Environmental Awareness and Attitude Towards Recycling (AAR)

As detailed in the literature review, the stronger one's pro-Environmental Awareness and Attitude towards recycling, the more likely one is to engage in recycling behaviour (Geiger et al., 2019). With sustainable consumption being such a relevant topic of discussion nowadays, one would expect consumers to be at least aware of concerns about excessive consumption and waste. The results presented in Table 3 are organised in descending order (for the means) and represent the extent of the relevance of the AAR construct within the sample tested.

Table 3: Respondents' Environmental Awareness and Attitude towards Recycling (AAR) variables mean score

Variable	n	Mean	SD
E-waste recycling is everyone's responsibility to reduce the volume of e-waste generated.	159	**4.49**	0.55
E-waste recycling improves the quality of the environment.	160	**4.35**	0.65
E-waste recycling is useful to create a better community environment.	156	**4.27**	0.62
E-waste recycling is a primary way to conserve natural resources.	160	**3.95**	0.82
I feel very satisfied when recycling e-waste.	158	**3.85**	0.85
E-waste recycling is the main way to reduce the use of landfills and emissions of greenhouse gasses.	160	**3.76**	1.03
I am not interested in the idea of e-waste recycling.	159	**1.81**	0.94

When interpreting the means (Max = 5), the respondents were very positive (M>4) about: e-waste recycling being everyone's responsibility to reduce the volume of e-waste generated; e-waste recycling improving the quality of the environment; and e-waste recycling being useful to create a better community environment. The respondents were also fairly positive (4.0<M>3.5) concerning e-waste recycling being a primary way to conserve natural resources; feeling very satisfied when recycling e-waste; and e-waste recycling being the main way to reduce the use of landfills and emissions of greenhouse gases.

Interestingly, respondents disagreed with the statement about not being interested in e-waste recycling. The nature of the question was such that respondents had to agree or disagree whether they were not interested in e-waste recycling. Based on the responses (M = 1.81), consumers' disagreed with the statement implying that they are interested in e-waste recycling. This is fertile ground for retailers and industry to explore in terms of responsible waste disposal for the future.

5.3.2 Relevance of Social Pressure (SP)

Literature indicates that social norms are a strong external influence that is relevant during recycling, particularly concerning influencing individuals to behave in a socially acceptable manner, as they deem others' approval or disapproval to be an influence on their actions (Geiger et al., 2019; Miafodzyeva & Brandt, 2013). The results presented in Table 4 represent the extent of the relevance of the SP construct within the sample tested.

The same key was applied for the interpretation of the means in the following sections.

M>4≤5	Strongly agree with/support construct
M>3.5≤4	Agree with/support construct
M≥2.5≤3.5	Moderately agree with/support construct
M<2.5	Disagree with/do not support construct

Table 4: Respondents' Social Pressure (SP) variables mean score

Variable	n	Mean	SD
If my family and friends are involved in e-waste recycling, I will also engage in it.	160	**3.83**	1.05
The community where I live would influence me to participate in recycling e-waste.	160	**3.36**	1.07
The media influences me to recycle e-waste.	160	**2.98**	0.98

The strongest form of social influence on the respondents in terms of e-waste recycling was family and friends (M = 3.83), followed by the community where they live showing a moderate influence to recycling behaviour (M = 3.36). Interestingly, the influence of media (M = 2.98) was only moderate. This indicates that people closest to the consumers might exert the strongest influence on their recycling of e-waste.

5.3.3 Relevance of Laws and Regulations (LR)

Although literature shows that legal norms regarding recycling behaviour are inconclusive (Miafodzyeva & Brandt, 2013), it has been demonstrated that legislation, policy and government intervention are relevant and key in supporting e-waste recycling behaviour (Nguyen et al., 2018). The results presented in Table 5 represent the extent of the relevance of the LR construct within the sample tested.

Table 5: Respondents' Laws and Regulations (LR) variables mean score

Variable	n	Mean	SD
If there are Laws and/or Regulations related to e-waste recycling, I will obey them.	160	4.21	0.74
Government policy would influence me to recycle e-waste.	160	3.49	1.09
South African laws stipulate responsibilities of residents to recycle e-waste.	160	2.70	1.04

The strongest influence in terms of e-waste recycling seem to be if laws and/or regulations related to e-waste recycling are enforced (M=4.21) followed by the government policies concerning the recycling of e-waste (M=3.49), although this was only a moderately strong influence compared to laws concerning the matter. South African laws stipulating the responsibilities of residents to recycle e-waste seemed less pertinent (M=2.7), indicating that the respondents were not clear about their responsibilities regarding e-waste recycling, despite them indicating that they would be encouraged by laws and/or regulations related to e-waste recycling.

5.3.4 Relevance of the Cost of Recycling (CR)

Research has shown that the Cost of recycling influences the recycling behaviour of consumers (Geiger et al., 2019; Miafodzyeva & Brandt, 2013; Nguyen et al., 2018), with some countries obligating producers to pay the e-waste recycling fee and residents only being responsible for sending the product to collection points. In countries like Japan and Vietnam, however, residents take charge of the e-waste recycling fee (Wang et al., 2011). The results presented in Table 6 highlight the relevance of the CR in terms of consumers' recycling intentions.

Table 6: Respondents' Cost of recycling (CR) variables mean score

Variable	n	Mean	SD
I think handling charges of e-waste recycling are high.	160	**3.37**	0.84
I think expenditure on transportation of e-waste to the recycling centre is high.	160	**3.32**	0.88
Recycling programmes are costly.	160	**3.22**	0.94

As shown in Table 6, all three items related to the Cost of recycling that may influence consumers' recycling intentions exerted a moderately strong influence. This implies that consumers believe that costs related to e-waste recycling are relatively high, but they are not overly concerned that it is too expensive because the related means were not high (3.4<M>3.2).

5.3.5 Relevance of the Inconvenience of Recycling (ICR)

Researchers have found that contextual factors such as the convenience of waste-collection systems may positively influence the recycling practices of individuals (Geiger et al., 2019), which includes ensuring that waste collection systems are convenient for households (Chi et al., 2014). The results presented in Table 7 indicate the relevance of Inconvenience with regard to recycling intentions.

Table 7: Respondents' Inconvenience of recycling (ICR) variables mean score

Variable	n	Mean	SD
I think neighbouring e-waste recycling channels are deficient.	160	**3.61**	0.95
It is inconvenient to transport e-waste to the collection point.	160	**3.36**	1.07
I have no time to send e-waste to the collection point.	160	**3.13**	1.12
It is difficult to sort e-waste for recycling.	160	**3.01**	1.18

While the respondents indicated that recycling channels in their neighbourhoods are fairly deficient (M=3.61), they were relatively unconcerned about any inconvenience related to the transportation of e-waste to the collection point (M=3.36), as well as

the time required to transport e-waste to a centralised collection point. The same applied for the sorting of e-waste (M=3.01). The latter could indicate that the respondents had not yet made the effort, and therefore did not comprehend the time and effort required.

5.3.6 Relevance of Past Recycling Experience (PE)

Past recycling has been considered in studies as an predictor of recycling behaviour, implying that a habit of recycling may inform future recycling behaviour (Geiger et al., 2019; Nguyen et al., 2018). The results presented in Table 8 show the relevance of Past Experience within the sample.

Table 8: Respondents' Past Recycling Experience (PE) variables mean score

Variable	n	Mean	SD
I am knowledgeable about the materials suitable for recycling.	160	2.99	1.21
During the past three months how frequently did you recycle your waste at home?	160	2.74	1.42
I am well acquainted with the recycling facilities.	160	2.42	1.09

The sample means indicate that the respondents perceived themselves to be only moderately knowledgeable about the materials suitable for recycling (M = 2.99) and moderately acquainted with the recycling facilities that are available (M=2.42). The frequency of recycling in the last three months was low to moderate (M=2.74), indicating that the respondents had limited awareness of how, what and where to recycle. This probably negatively influences their e-waste recycling.

5.3.7 Relevance of Behavioural Intention (BI)

As discussed in the literature review, the TPB asserts that a good predictor of behaviour is Behavioural Intention (Ajzen, 2002). The results presented in Table 9 highlight the respondents' Behavioural Intention to recycle.

Table 9: Respondents' Behavioural Intention (BI) variables mean score

Variable	n	Mean	SD
I am willing to tell my relatives about my e-waste recycling experiences.	160	**4.12**	0.71
I am willing to participate in environmental programmes held by the government.	160	**3.77**	0.94
I intend to drop-off my e-waste if formal collection systems are available.	160	**3.69**	1.08
I am willing to contact formal e-waste recycling organisations to deal with e-waste in the future.	160	**3.51**	1.03

The strongest indication of a positive Behavioural Intention towards e-waste recycling was willingness to share e-waste recycling experiences among relatives (M = 4.12), followed by willingness to participate in government recycling programmes (M = 3.77). Intention to drop off e-waste was moderately positive (M = 3.69), indicating some willingness from individuals to drop off their e-waste at a centralised collection point. However, one must contrast this to a previous indicator in the ICR construct, relating to the inconvenience of transporting waste to a central point (M = 3.36). Contrasting these indicators may imply that notwithstanding inconvenience to drop off e-waste at a central point, individuals still intend to do it. There is also a willingness by individuals to contact e-waste recyclers (M = 3.51), indicating that the presence of such an organisation is required.

5.4 Statistical procedures following descriptive analyses

5.4.1 Normal distribution of the data

Inferential statistics assume that the data are normally distributed, as discussed in the research methodology. The following figures depict the mean values (the peak of the bell) and whether the data in the scale were normally distributed (parametric) or heavily skewed (non-parametric). This was important in order to determine which test to use in the correlations, hypothesis testing and regression analysis.

Figures 5 and Figure 6 depict normally distributed data for the Environmental Awareness and Attitude towards Recycling (AAR) and Social Pressure (SP) constructs. The data does not part much from a normal distribution, as depicted by the symmetric bell shape. The mean score for AAR was 3.79, showing a moderately strong agreement, and SP was 3.39, showing moderate agreement with minimal standard deviation and skewness for both scales.

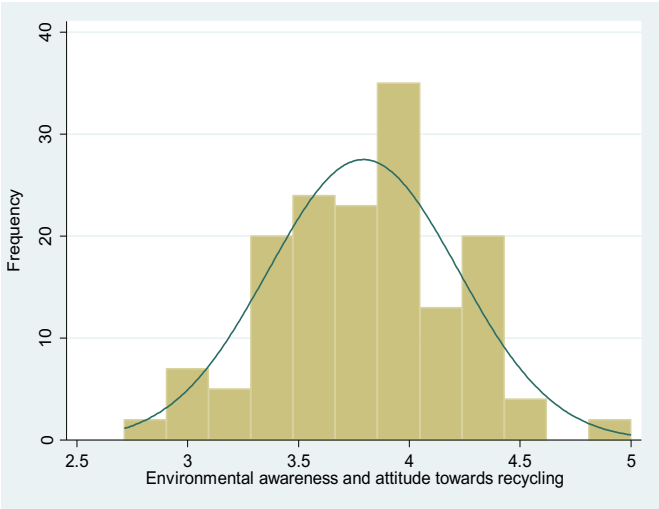

Figure 5: Environmental Awareness and Attitudes towards Recycling (AAR)

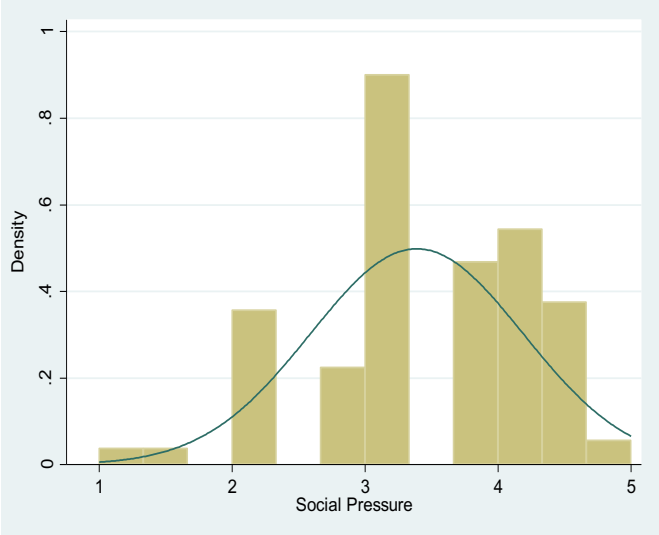

Figure 6: Social Pressure (SP)

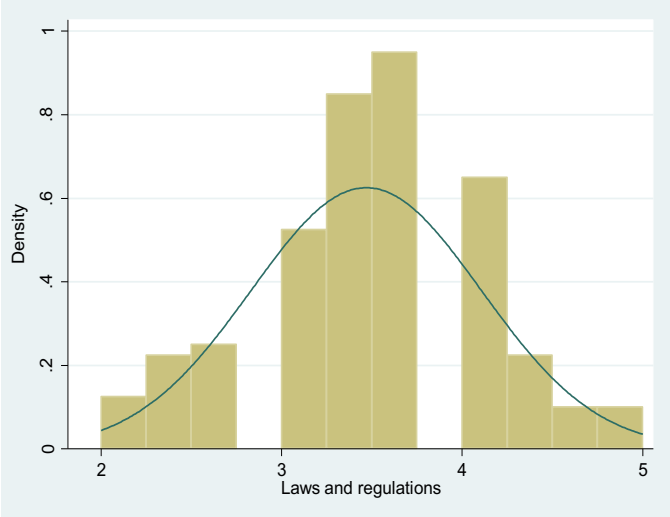

Figure 7: Laws and Regulations (LR)

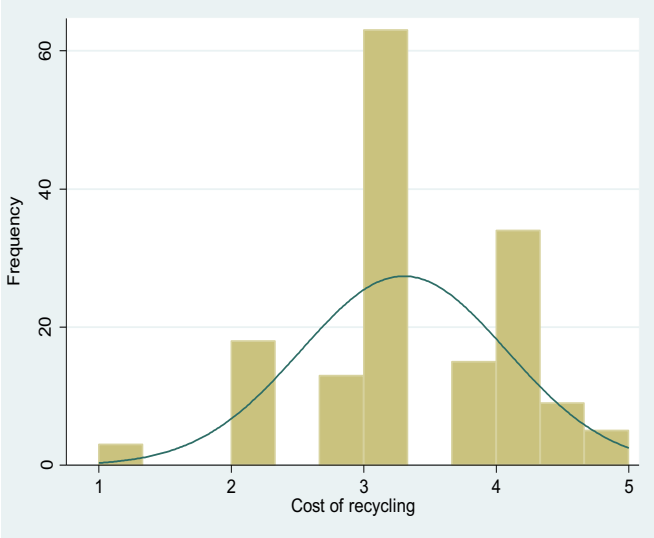

Figure 8: Cost of Recycling (CR)

Figure 7 depicts normally distributed data for the LR scale. The CR construct also has data that do not part much from normal distribution, as depicted by the symmetric bell shape in Figure 8. Both LR and CR showed moderate agreement with means scores of 3.47 (LR) and 3.30 (CR), with minimal standard deviation for both scales.

Figure 9 and Figure 10 depict the distribution of data for the ICR and PE constructs, illustrating that the data do not part much from normal distribution, as depicted by the symmetric bell shapes. Notably, the PE data were slightly skewed to the left, while that of the ICR scale was slightly right skewed. The mean score for ICR was 3.28 and for PE

was 2.72, with minimal standard deviation for both scales indicating that ICR and PE are not a strong influencers of BI.

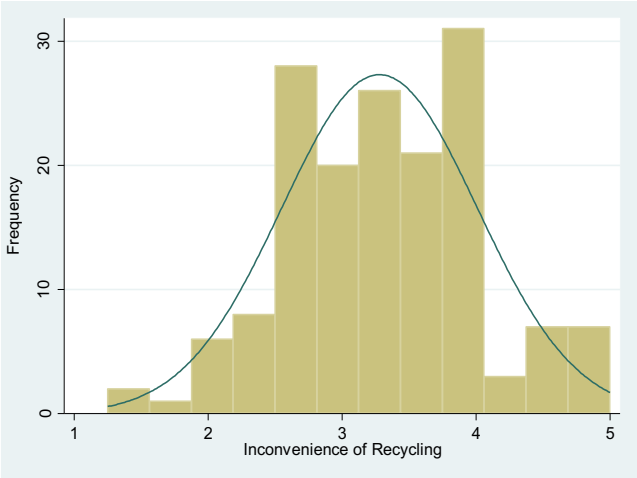

Figure 9: Inconvenience of Recycling (ICR)

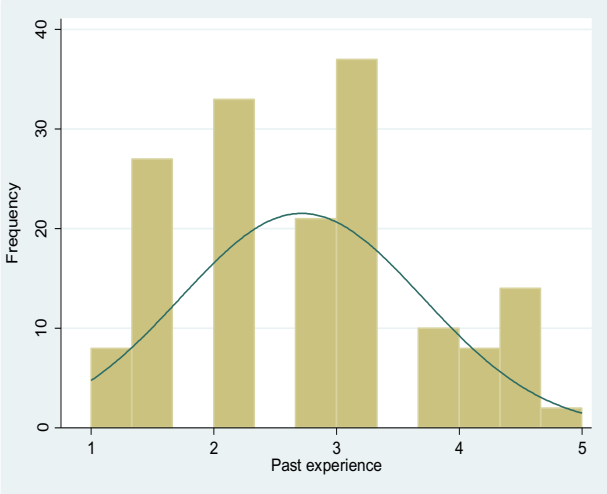

Figure 10: Past Experience (PE)

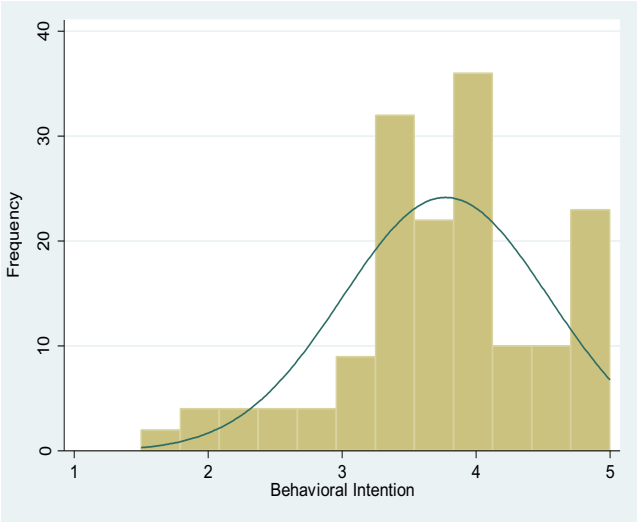

Figure 11: Behavioural Intention (BI)

Figure 11 depicts normally distributed data for the BI construct has normally distributed data as depicted by the symmetric bell shape. Notably the data was slightly skewed to the left with a mean score for BI of 3.77 with minimal standard deviation, indicating strong support for e-waste recycling.

5.4.2 Reliability statistics

As discussed in the Chapter 4, the Cronbach's Alpha (α) is used to assess the reliability of questionnaire by measuring the internal consistency of the constructs.

Table 10 indicates that the data for the dimensions in the study were reliable, as the Cronbach's Alpha was greater than 0.6 (Gliem & Gliem, 1992). A Cronbach's Alpha closer to 1.0 implies greater internal consistency of the items in the scale (Bonett & Wright, 2015). In this investigation, the internal consistency of the data was deemed acceptable as the Cronbach's Alphas were very close to, or exceeded, 0.6.

Table 10: Test of construct reliability

			Item-test	Item-rest	Inter-item	
Item	n	**Sign**	Correlation	Correlation	Covariance	Alpha
AAR	155	**+**	0.342	0	0	0.56
SP	160	**+**	0.536	0	0	0.58
LR	160	**+**	0.423	0	0	0.60
CR	160	**-**	0.351	0	0	0.61
ICR	160	**-**	0.649	0	0	0.67
PE	160	**+**	0.665	0	0	0.69
BI	160	**+**	0.629	0	0	0.66
Test scale					0	0.67

5.4.3 Correlation

Correlation refers to the technique used to measure the relationship between two or more variables, in this case, the relationship between Behavioural Intention (BI) and the independent variables (AAR, SP, ICR, PE, LR, CR), as shown in Table 11.

The results indicated the following:

- **Positive weak associations were found between Behavioural Intentions (BI) to recycle and Environmental Awareness and Attitude towards Recycling (AAR).** This suggests that a unit increase in AAR was likely to lead to an increase in BI. Results were significant at 5% level ($r_s=0.213$, $p<0.05$).
- There are **positive weak associations between Behavioural Intentions (BI) to recycle and Social Pressure (SP)**, suggesting that a unit increase in SP was likely to lead to an increase in BI. Results were significant at 5% level ($r_s=0.349$, $p<0.05$).
- There are **negative weak associations between Behavioural Intentions (BI) to recycle and Inconvenience of Recycling (ICR)**, suggesting that a unit decrease in ICR was likely to lead to a decrease in BI to recycle. Results were significant at 5% level ($r_s=0.247$, $p<0.05$).

Table 11: Correlation of dependent versus independent variables

	BI	AAR	SP	ICR	PE	LR	CR
BI	1						
AAR	0.2126*	1					
SP	0.349*	0.1891*	1				
ICR	-0.247*	-0.0934	-0.157*	1			
PE	0.351*	0.1646*	0.118	-0.36*	1		
LR	0.254*	0.1263	0.358*	-0.019	0.151	1	
CR	0.0065	0.1324	0.072	0.397*	-0.068	0.151	1
Gender	-0.223*	-0.1105	-0.068	0.163*	-0.040	-0.027	0.085
Marital status	-0.175*	-0.084	0.004	-0.133	-0.054	-0.028	-0.14*
Population group	-0.063	-0.0634	-0.015	-0.068	0.058	-0.18*	-0.031
Education	-0.0313	0.0598	-0.018	0.1398	-0.100	-0.007	0.0563
Earnings (annual)	0.182*	0.0239	0.171*	-0.127	0.074	0.016	-0.043
Age group	0.1495	0.1018	0.089	-0.17*	0.208*	-0.014	-0.029

- There are **positive moderate associations between Behavioural Intentions (BI) to recycle and Past Experience (PE)**, suggesting that a unit increase in PE was likely to lead to an increase in BI to recycle. Results were significant at 5% level ($r_s=0.351$, $p<0.05$).
- There are **positive moderate associations between Behavioural Intentions (BI) to recycle and Laws and Regulations (LR)**, suggesting that a unit increase in LR was likely to lead to an increase in BI to recycle. Results were significant at 5% level ($r_s=0.254$, $p<0.05$).
- There was **no association between Cost of Recycling (CR) and Behavioural Intention to recycle**, suggesting that CR and ICR increase together in the same direction. Gender, marital status and earnings are significant demographic factors of intention to recycle. Results were not statistically significant at the 5% level ($p>0.05$), thus CR seems to have an association with ICR ($r_s=0.397$, $p<0.05$),

5.5 Hypothesis testing

The paired t-test, also referred to as the paired-samples t-test, is used to determine whether the mean difference between two groups is statistically significantly different to zero.

5.5.1 Hypothesis 1 (H1): The effect of Environmental Awareness and Attitude toward Recycling

The following hypothesis was proposed based on extant literature which supports that those who are concerned about the environment and have knowledge about environmental problems and their causes are more likely to recycle. In addition, a positive attitude towards a certain behaviour, implies a higher likelihood that one will engage that behaviour (Geiger et al., 2019).

Null hypothesis ($H1_0$): Environmental Awareness and Attitude (as an encompassing construct) toward recycling does not influence residents' e-waste recycling Behavioural Intentions.

Alternative hypothesis ($H1_a$): Environmental Awareness and Attitude (as an encompassing construct) toward recycling positively influence residents' e-waste recycling Behavioural Intentions.

Table 12 indicates that there is a small difference between the means of AAR and BI (0.05), and the t-statistic of 0.801. The p-value ($Pr(|T| > |t| = 0.4244$) is greater than 0.05 ($p>0.05$), therefore the null hypothesis cannot be rejected. This evidence indicates that there is no statistically significant difference between the mean values of AAR and BI, implying that there is little chance that Environmental Awareness and Attitude toward Recycling positively affect residents' e-waste recycling Behavioural Intention.

Table 12: Results for Hypothesis 1

Variable	n	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
AAR	155	3.79	0.03	0.43	3.725	3.861
BI	155	3.74	0.06	0.76	3.622	3.862
diff	155	0.05	0.06	0.79	- 0.074	0.176

Mean (diff) = mean (AAR-BI) t = 0.8009 Pr(|T| > |t|) = 0.4244

Therefore, H1, which proposed that Environmental Awareness and Attitude toward Recycling (as an encompassing construct) positively affects e-waste recycling Behavioural Intention, is not supported.

5.5.2 Hypothesis 2 (H2): The effect of Social Pressure on e-waste recycling intention

The following hypothesis was proposed based on extant literature (Miafodzyeva & Brandt, 2013; Nguyen et al., 2018).

Null hypothesis ($H2_0$): Social pressure does not affect e-waste recycling Behavioural Intention.

Alternative hypothesis ($H2_a$): Social pressure positively affects e-waste recycling Behavioural Intention.

Table 13 indicates that there is a negative difference between the means of Social Pressure (SP) and Behavioural Intention to recycle (BI) (-0.38), as the t-statistic is large (-5.416). The p-value is less than 0.05 ($p < 0.05$), hence the null hypothesis (H_0: mean (diff)=0) is rejected. It can thus be concluded that there are statistically significant differences between SP and BI. The implication of these results is that there are chances that Social Pressure could positively affect e-waste recycling intention.

Table 13: Results for Hypothesis 2

Variable	n	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
SP	160	3.39	0.06	0.80	3.265	3.515
BI	160	3.77	0.06	0.77	3.653	3.894
diff	160	-0.38	0.07	0.90	-0.524	-0.244

mean(diff) = mean(SP-BI) t = -5.417 Pr(|T| > |t|) = 0.0000

Based on the results, H2, which proposed that Social Pressure positively affects e-waste recycling Behavioural Intention, is supported.

5.5.3 Hypothesis 3 (H3): The effect of Laws and Regulations on e-waste recycling Behavioural Intention

The following hypothesis was proposed based on extant literature (Miafodzyeva & Brandt, 2013).

Null hypothesis ($H3_0$): Laws and regulations do not influence consumers' e-waste recycling Behavioural Intention.

Alternative hypothesis ($H3_a$): Laws and regulations positively influence consumers' e-waste recycling Behavioural Intention.

Table 14: Results for Hypothesis 3

Variable	n	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
LR	160	3.47	0.05	0.64	3.369	3.568
BI	160	3.77	0.06	0.77	3.653	3.894
diff	160	- 0.30	0.07	0.87	- 0.440	- 0.169

mean(diff) = mean(LR - BI) t = -4.450 Pr(|T| > |t|) = 0.0000

Table 14 indicates that there is a negative difference between the means of Laws and Regulations (LR) and Behavioural Intention to recycle (BI) (-0.30), as the t statistic is large (-4.45). The p-value is less than 0.05 ($p < 0.05$), hence the null

hypothesis (H_0: mean (diff)=0) is rejected. This shows that there are statistically significant differences between LR and BI. The implication of these results is that there are chances that Laws and Regulations could positively impact e-waste recycling Behavioural Intention.

Based on the results, H3, which proposed that Laws and Regulations positively affect e-waste recycling Behavioural Intention, is supported.

5.5.4 Hypothesis 4 (H4): The effect of Costs of recycling on e-waste recycling Behavioural Intention

The following hypothesis was proposed based on extant literature (Miafodzyeva & Brandt, 2013; Nguyen et al., 2018).

Null hypothesis ($H4_0$): The Costs of recycling do not influence consumers' e-waste recycling Behavioural Intention.

Alternative hypothesis ($H4_a$): The Costs of recycling influence consumers' e-waste recycling Behavioural Intention.

Table 15: Results for Hypothesis 4

Variable	n	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
CR	160	3.30	0.06	0.78	3.181	3.423
BI	160	3.77	0.06	0.77	3.653	3.894
diff	160	- 0.47	0.09	1.09	- 0.642	- 0.301

mean(diff) = mean(CR - BI) t = -5.468 Pr(|T| > |t|) = 0.0000

Table 15 indicates that there is a negative difference between the means of Costs of Recycling (CR) and Behavioural Intention to recycle (BI) (-0.47), as the t statistic is large (-4.45). The p-value is less than 0.05 ($p < 0.05$), hence the null hypothesis (H_0: mean (diff)=0) is rejected. This means that there are statistically significant differences between CR and BI. The implication of these results is that there are

chances that the Costs of recycling could have an impact on e-waste recycling Behavioural Intention.

Based on the results, H4, which proposed that the Cost of recycling positively affects e-waste recycling Behavioural Intention, is supported.

5.5.5 Hypothesis 5 (H5): The impact of the Inconvenience of recycling on e-waste recycling Behavioural Intention

The following hypothesis was proposed based on extant literature (Miafodzyeva & Brandt, 2013; Nguyen et al., 2018).

Null hypothesis ($H5_0$): The Inconvenience associated with recycling has no significant impact on consumers' recycling behaviour

Alternative hypothesis ($H5_a$): The Inconvenience associated with recycling has a negative significant impact on consumers' recycling behaviour

Table 16: Results for Hypothesis 5

Variable	n	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
ICR	155	3.27	0.06	0.74	3.155	3.390
BI	155	3.77	0.03	0.43	3.725	3.861
diff	155	- 0.49	0.07	0.89	- 0.661	- 0.379

mean(diff) = mean(ICR - BI) t = -7.278 Pr(|T| > |t|) = 0.0000

Table 16 indicates that there is a negative difference between the means of Inconvenience of Recycling (ICR) and Behavioural Intention to recycle (BI) (-0.52), as the t statistic is large (-7.28). The p-value is less than 0.05 ($p < 0.05$), hence the null hypothesis (H_0: mean (diff)=0) is rejected. This shows that there are statistically significant differences between ICR and BI. The implication of these results is that there are chances that the Inconvenience of recycling has a negative significant impact on recycling behaviour.

Based on the results, H5, which proposed that Inconvenience of recycling negatively affects e-waste recycling Behavioural Intention, is supported.

5.5.6 Hypothesis 6.1 (H6.1): The influence of Past Experience on consumers' e-waste recycling Behavioural Intentions

The following hypothesis was proposed based on extant literature (Miafodzyeva & Brandt, 2013; Nguyen et al., 2018):

Null hypothesis ($H6.1_0$): The past recycling experience of consumers does not influence consumers' e-waste recycling behaviour intention.

Alternative hypothesis ($H6.1_a$): The past recycling experience of consumers positively influences consumers' e-waste recycling behaviour intention.

Table 17: Results for Hypothesis 6.1

Variable	n	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
PE	160	2.72	0.08	0.99	2.562	2.871
BI	160	3.77	0.06	0.77	3.653	3.894
diff	160	- 1.06	0.08	1.02	- 1.216	- 0.898

mean(diff) = mean(PE- BI) t = -13.14 Pr(|T| > |t|) = 0.0000

Table 17 indicates that there are negative differences between the means of Past Experience (PE) and Behavioural Intention to recycle (BI) (-1.06); the t statistic is the largest of all the tests (-13.14). The p-value is less than 0.05 ($p < 0.05$), hence the null hypothesis (H_0: mean (diff)=0) is rejected. There is thus evidence to conclude that there are statistically significant differences between PE and BI. The implication of these results is that the Past Experience of residents could potentially positively influence their intentions towards recycling e-waste.

Based on the results, H6, which proposed that Past Experience of recycling positively affects e-waste recycling Behavioural Intention, is supported.

5.5.7 Hypothesis 6.2 (H6.2): The effect of consumers' Past Experience on their perception of the Inconvenience of recycling

The following hypothesis was proposed based on extant literature (Miafodzyeva & Brandt, 2013; Nguyen et al., 2018).

Null hypothesis ($H6.2_0$): The past recycling experience of consumers does not influence their perception of the Inconvenience associated with e-waste recycling.

Alternative hypothesis ($H6.2_a$): The past recycling experience of consumers negatively influences their perception of the Inconvenience associated with e-waste recycling.

Table 18: Results for Hypothesis 6.2

Variable	n	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
PE	160	2.72	0.08	0.99	2.562	2.871
ICR	160	3.28	0.06	0.73	3.166	3.394
Diff	160	- 0.56	0.11	1.42	- 0.785	- 0.341

mean(diff) = mean(PE - ICR) t = -5.005 Pr(|T| > |t|) = 0.0000

Table 18 indicates that there are negative differences between the means of Past Experience (PE) and the Inconvenience of recycling (ICR) (-0.56), as the t-statistic is large (-5.005). The p-value is less than 0.05 ($p < 0.05$), hence the null hypothesis (H_0: mean (diff)=0) is rejected. This shows that there are statistically significant differences between PE and ICR. The implication of these results is that Past experience of residents negatively influences their perception of the Inconvenience of recycling.

Based on the results, H7, which proposed that Past Experience of recycling negatively affects Inconvenience of recycling, is supported.

5.6 Structural model

A structural model was formulated to test the research hypotheses and the constructs impact on Behavioural Intention to recycle e-waste. Figure 12 depicts the pathway analysis between the six independent variables (the exogenous variables) and the dependent variable (endogenous). There are six unidirectional arrows that point towards the Intention to recycle, indicating that the relationship is one way. This model tests the one-way relationship between Awareness, Social Pressure, Inconvenience to Recycle, Laws, Cost of Recycling, Experience and the Intention to recycle. The numbers of the arrows represent the effect size or extent of influence, with a negative sign suggesting a negative relationship and vice versa. On the right-hand side of the diagram are demographic variables, which also have unidirectional arrows towards the Intention to recycle.

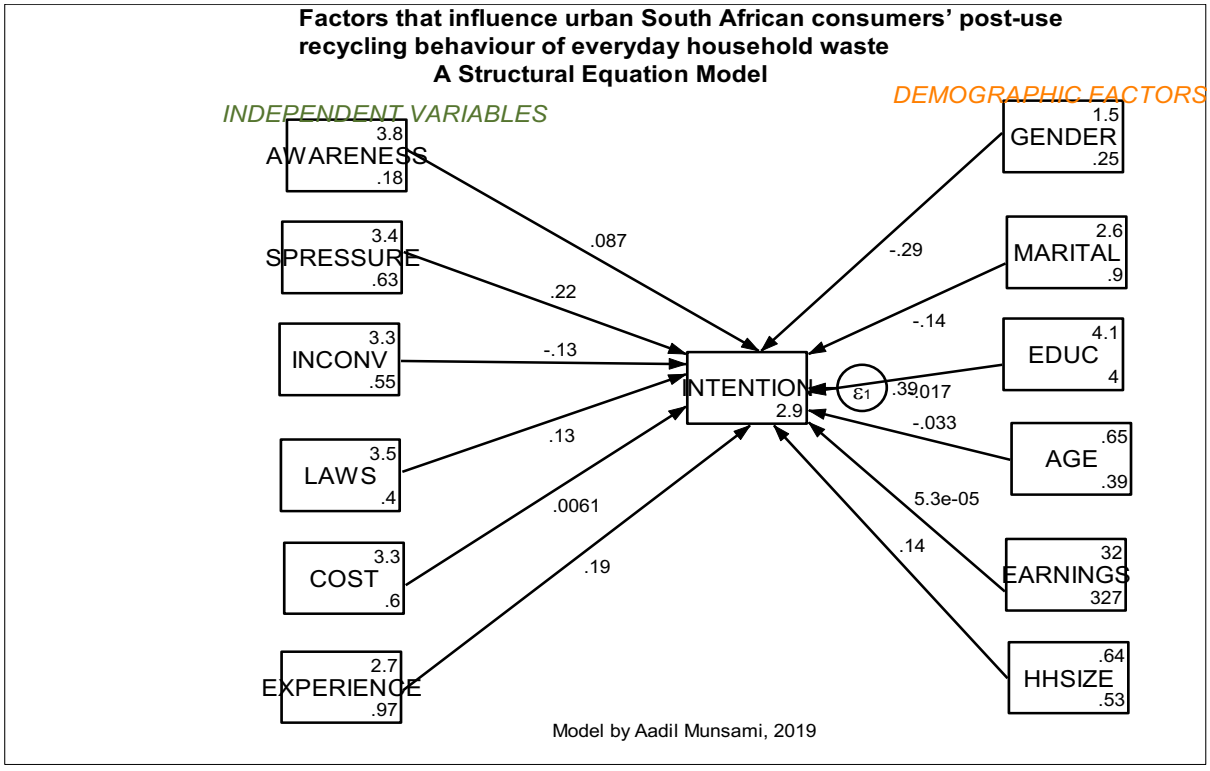

Figure 12: Structural Equation Model

Table 19 contains the SEM Regression model, which provides results on the relationship between the independent and dependent variables.

Significant factors in terms of intention to recycle include SP and PE, which were significant predictors of the Intention to recycle. The results were significant at the 5% level, suggesting strong evidence that a unit increase in Social pressure is likely to increase the intention to recycle by as much as 21% ($B=0.217$, $p<0.05$). Further results indicate that a unit increase/improvement in the Experience to recycle is likely to improve the Intention to recycle by as much as 18% ($B=0.185$; $p<0.05$).

Weak results indicate that the ICR is negatively associated with the intention to recycle ($B=-0.125$, $p<0.1$). These results are significant at the 10% level, which suggests that a unit increase in Inconvenience to recycle is likely to decrease the intention to recycle, or a unit decrease in Inconvenience to recycle is likely to increase the intention to recycle.

LR ($B=0.127$, $p>0.1$) and CR ($B=0.006$, $p>0.1$) were not significant predictors of the intention to recycle in this study. Although not significant, the model suggests that laws and regulations could influence the intention to recycle by as much as 12.7%.

Gender ($B=-0.125$, $p<0.05$) and marital status ($B=-0.285$, $p<0.05$) were significant factors associated with the intention to recycle e-waste. The results suggest that females are 12.5% less likely to have the intention to recycle than males, while widowed respondents are 28.5% less likely to have the intention to recycle. Weak evidence, at a 10% significance level, indicates that smaller households are 13.6 times more likely to recycle. Notably, education levels, age group and annual earnings have no influence on the intention to recycle.

Table 19: SEM Regression Model

	OIM					
Coef.	Std.	Err.	z	P>z	[95% Conf Interval]	
Structural						
INTENTION	<-					
AWARENESS	0.087	0.13	0.68	0.494	- 0.162	0.335
SPRESSURE	0.217	0.07	3.12	0.002*	0.080	0.353
LAWS	0.127	0.09	1.48	0.138**	- 0.041	0.295
COST	0.006	0.07	0.08	0.933	- 0.137	0.150
EXPERIENCE	0.185	0.06	3.31	0.001*	0.076	0.295
INCONV	- 0.125	0.08	-1.51	0.131**	- 0.288	0.037
GENDER	- 0.285	0.11	-2.65	0.008*	- 0.496	- 0.074
MARITAL	- 0.138	0.06	-2.38	0.017*	- 0.252	- 0.025
EDUCATION LEVEL	- 0.017	0.03	-0.62	0.538	- 0.071	0.037
AGE	- 0.033	0.09	-0.37	0.713	- 0.208	0.142
HOUSEHOLD INCOME	0.000	0.00	0.02	0.986	- 0.006	0.006
HOUSEHOLD SIZE	0.136	0.08	1.8	0.072**	- 0.012	0.284
_cons	2.932	0.71	4.15	0	1.547	4.317
var(e.INTENTION)	0.388	0.04	0.31	0.48		

5.7 Conclusion

The demographic profile of the sample shows that the majority were females aged between 23 and 49 years of age, with a good educational background.

The mean value analysis of the constructs, together with the correlation analysis, highlighted the following: an increase in Environmental Awareness and Attitude toward Recycling (AAR); Social Pressure (SP); Past Experience (PE); and Laws and Regulations (LR) are likely to increase e-waste recycling Behavioural Intention (BI), while a decrease in Inconvenience to Recycle (ICR) is likely to increase Behavioural Intention (BI). All the hypotheses were supported, except for H1.

The findings presented in this chapter are discussed in further detail in Chapter 6.

Chapter 6 – Discussion of Results

6.1 Introduction

Chapter 5 presented the results of the statistical analysis of the sample data collected. In this chapter, the results are discussed according to the sequence of the hypotheses, taking the TPB framework into account, to understand recycling intention and behaviour. A cognitive approach was taken in order to understand the consumer as an individual. These results are also compared and contrasted to the existing literature in order to extend the body of knowledge regarding factors that influence consumers' e-waste recycling behaviour.

6.2 Discussion on Behavioural Intention (BI)

Literature indicates that many studies conducted across various disciplines, including entrepreneurship, recycling behaviour and consumer behaviour, support the TPB framework that proposes that Behavioural Intention is a good predictor of consumers' behaviour (Ajzen, 2008). Behavioural intention, in turn, is supported by attitude, subjective norms and perceived behavioural control, and changing these constructs will lead to a change in behaviour (Montaño & Kasprzyk, 1992).

The Cronbach's Alpha for PE was 0.66, indicating a relatively strong measure of test accuracy, i.e. the test measured what it was designed to measure. The mean score indicates that there is support for the BI construct, implying that respondents have an intention towards e-waste recycling. The results indicate that consumers are willing to share their knowledge of e-waste recycling and participate in recycling schemes and environmental programmes ($M>3.5<5$). As indicated in the literature, one can conclude that Behavioural Intention is a good measure to use as a predictor of e-waste recycling behaviour (Ajzen, 2008).

6.3 Discussion on the influence of Social-Demographic Factors on Behavioural Intention (BI)

The demographic constructs that were tested for correlation in relation to Behavioural Intention to recycle e-waste indicated that gender (rs=-0.223), marital status (rs=-0.175) and earnings (rs=0.182) influence Behavioural Intention to some extent, whereas population group, education level and age group do not have a significant influence on BI. These findings are similar to those of Botetzagias et al. (2015), who conducted a study of the Blue Bin recycling programme in Greece that concluded that age, gender, education level and income levels are weak predictors of recycling intention. However, another study conducted in Brazil on e-waste recycling found that age and income level positively influence recycling intention (Echegaray & Hansstein, 2017). Another study conducted in Iran revealed that age and gender are significant predictors of recycling behaviour (Pakpour et al., 2014). The results from various studies conducted on recycling behaviour are therefore mixed (Miafodzyeva & Brandt, 2013), suggesting that there is not a strong association between socio-demographic factors and consumers' recycling intention.

The SEM regression model in Figure 12 illustrates the relationship between demographic factors and Behavioural Intention, with gender and marital status having the strongest influences on e-waste recycling intention. Further investigation revealed that women are less likely to recycle e-waste than men, with widowed individuals (under the "single" demographic) being the least likely to recycle e-waste. Both of these measures showed some significance, however it was not enough to make a compelling argument to focus the attention of e-waste recycling programmes on these demographic groups.

Overall, the results of the study indicate that demographic characteristics are only weak indicators of e-waste recycling intention and thus e-waste recycling behaviour.

6.4 Discussion on Environmental Awareness and Attitudes Towards Recycling (AAR) as a sub-construct of Attitude (H1)

Utilising the conceptual framework presented in Figure 2, the study sought to explore how Environmental Awareness and Attitude towards e-waste recycling influence consumers' e-waste recycling intention and the behaviour of South African consumers.

The mean scores for each variable measured through the questionnaire were analysed in order to understand the central tendency for each question. Central tendency is a useful measure in psychology, as it represents what is normal for the data, condensing the responses into one representative value. The mean score for the Environmental Awareness and Attitude towards recycling construct was M=3.79, and the data were normally distributed with minimal standard deviation. The mean score indicates that most of the respondents had positive attitudes towards recycling (AAR). There was a strong agreement (M>4<5) that e-waste recycling is beneficial for the environment and natural resources, as well as the responsibility of everyone. This indicates an awareness of the positive impact that e-waste recycling has on the environment. It is also important to note that partaking in e-waste recycling brings about feelings of satisfaction and that respondents are interested in e-waste recycling.

The Cronbach's Alpha for AAR (used to measure attitude) was 0.56, as per Table 10, indicating reasonable internal consistency, i.e. the test measured what it was designed to measure.

The correlation coefficient is a quantitative assessment calculated to measure both the strength and the direction of linear relationships between continuous variables in relation to others i.e. it indicates that as one variable changes in value, the other variable changes in specific direction. The values range between -1 and +1. The greater the absolute value, the stronger the relationship, while the sign of the value indicates the direction of the relationship. The correlation coefficient of AAR in relation to BI was 0.2126 (Table 11) indicating a weak positive relationship between the variables, i.e. as AAR increase so does BI. This implies that increased

Awareness of the Environment and Attitude towards e-waste recycling may slightly positively influence Behavioural Intention towards e-waste recycling.

Table 12 indicates that the p-value of the test was greater than the predetermined level of significance ($p>0.05$), thus the null hypothesis could not be rejected. This implies that there is no significant difference between AAR and BI, indicating that there is a limited chance that Environmental Awareness and Attitude toward Recycling will positively influence consumers' e-waste recycling Behavioural Intention. This is partially supported by the weak positive correlation of the AAR with BI shown in Table 11, which highlights that an increase in AAR may lead to an increase in BI.

The insignificant outcome of this test contradicts the outcome of the Theory of Planned Behaviour (TPB) that asserts that Behavioural Intention is the best predictor of behaviour. The TPB postulates that Behavioural Intention is preceded by an individual's attitude to perform a certain behaviour, as well as subjective norms and perceived behavioural control to perform said behaviour (Ajzen, 1991). This implies that the TPB is supported by the beliefs about the likely consequences or other attributes of behaviours, i.e. the favourable or unfavourable attitude towards a behaviour (Ajzen, 2002).

Literature indicated that those who are concerned for the environment and have knowledge about environmental problems and their causes have a higher likelihood of recycling (Geiger et al., 2019). Further, if one has a positive attitude towards a certain behaviour, the more likely one is to engage in that behaviour (Geiger et al., 2019; Miafodzyeva & Brandt, 2013). The literature also indicates that e-waste is not disposed of correctly, which negatively impacts the environment and humans, and that recycling is one of the most effective ways of reducing e-waste pollution (Geiger et al., 2019). Nguyen et al. (2018) found that Environmental Awareness and Attitude toward recycling positively influence consumers' e-waste recycling intention.

Because the outcome of the hypothesis in this study was not supported, it cannot be concluded that Environmental Awareness and Attitude to recycling significantly influences Behavioural Intention of e-waste recycling. Therefore, in this study, the TPB in respect of attitude being a good predictor of Behavioural Intention is not

supported, i.e. attitude does not predict South African consumers' e-waste recycling Behavioural Intention.

The SEM results illustrated in Figure 12 show a weak positive relationship between the AAR construct and e-waste recycling intention, while Table 19 indicates that AAR is not a statistically significant influence in terms of the e-waste recycling intention of South African consumers. This supports the conclusion that AAR is not a good measure of South African consumers' BI, and that these findings contradict current literature on the topic.

6.5 Discussion on Social Pressure (SP) as a sub-construct of Subjective Norm (H2)

Subjective norms as part of the Theory of Planned Behaviour were tested using two sub-constructs, namely Social Pressure and Laws and Regulations. The discussion that follows concentrates on the Social Pressure construct, with Laws and Regulations being discussed in the following section.

The mean score for the Social Pressure construct was M=3.39, with the data being normally distributed with small standard deviations. The mean score indicates that most respondents support the construct. The results indicate that the strongest form of social influence in terms of e-waste recycling is family and friends (M=3.83), followed by community influence (M=3.36). This implies that close relationships with those in our immediate circle play an important role in influencing our behaviour. However, even though outside influences such as media do influence our behaviour, that influence is not strong. The prevalence of social media and online influencers in modern society have not yet been considered in research to date, and it would be interesting to explore social media's influence on human behaviour compared to traditional media in respect of e-waste recycling.

The Cronbach's Alpha for SP was 0.58, indicating reasonable internal consistency in the data, i.e. the test measured what it was designed to measure.

The correlation coefficient of SP in relation to BI was 0.349, indicating a positive relationship between the variables, i.e. as SP increases, so does BI. This implies that increased Social Pressure may positively influence the Behavioural Intention of consumers' e-waste recycling.

The second hypothesis sought to establish how Social Pressure influences e-waste recycling Behavioural Intention. The p-value of the test was less than the predetermined level of significant difference between SP and BI, indicating that there is a likelihood that Social Pressure will positively influence consumers' e-waste recycling Behavioural Intention.

As discussed in the literature review in Chapter 2, the TPB is supported by beliefs about normative expectations of other people who exert Social Pressure or subjective norms (Ajzen, 2002). Geiger et al. (2019) found that people are more likely to recycle if they believe others do it or if they engage in pro-environment behaviour, and if they want to gain social approval. This is supported by other studies which indicate that social norms (descriptive and injunctive norms) are positively related to recycling (Miafodzyeva & Brandt, 2013).

The SP construct in this study showed strong significance in influencing Behavioural Intention, as illustrated in the SEM regression model. This result supports the positive result of H2, suggesting that Social Pressure influences e-waste recycling Behavioural Intention. This result is further supported by a reasonably solid and positive correlation coefficient, indicating that Social Pressure positively influences the e-waste recycling behavioural of South African consumers.

6.6 Discussion on Laws and Regulations (LR) as a sub-construct of Subjective Norm (H3)

Following on from the previous section, the following discussion focuses on the discussion of the results of Laws and Regulations as a sub-construct of subjective norms.

The mean score for the Social Pressure construct was: M = 3.47. The data were normally distributed with small standard deviations. The mean score indicates that

most respondents support the construct, implying that LR is relevant. The results indicate that if laws, regulations and policies regarding e-waste recycling existed, there is a strong likelihood that consumers would obey them (M=4.21). An interesting outcome was that some consumers were ill informed about South African laws regarding e-waste recycling (M=2.70), which indicates a weak understanding of the current legal landscape regarding e-waste regulation in South Africa.

The Cronbach's Alpha for LR was 0.60, indicating a reasonable measure of test accuracy of the test measurement to measure Behavioural Intention.

The correlation coefficient of LR in relation to BI was 0.254, indicating a positive relationship between the variables, i.e. as LR increases, so does BI. This implies that an increase in Laws and Regulations may positively influence the Behavioural Intention of consumers towards e-waste recycling.

The third hypothesis sought to establish how Laws and Regulations influence e-waste recycling Behavioural Intention. The p-value of the test was less than 0.05, therefore a significant difference exists between LR and BI indicating that there is a chance that Laws and Regulations positively influence consumers' e-waste recycling Behavioural Intention. The SEM regression model in Figure 5.10 illustrated that LR had a weak positive yet significant influence on the e-waste recycling behaviour of South African consumers.

Various regions across the world, including Japan, the United States and the European Union, have adopted policies and regulations to govern the roles and responsibilities of producers and consumers of e-waste (Geiger et al., 2019; Pérez-Belis et al., 2015; Wang et al., 2011). These also build on the SDGs adopted by countries and corporations across the world (Moore, 2019; United Nations, n.d.). Studies have concluded that legislation, policy and government participation play a vital role in the recycling of waste (Miafodzyeva & Brandt, 2013; Nguyen et al., 2018). Similarly, this study concluded that Laws and Regulations will positively influence the e-waste recycling Behavioural Intention of South African consumers, thus supporting the existing literature. The implication is thus that the South African government should consider implementing clear e-waste legislation that will clearly set out the roles and responsibilities of producers and consumers with regard to the safe

disposal of e-waste, as such legislation does not currently exist (Finlay & Liechti, 2008; Ghosh et al., 2016).

6.7 Discussion on Cost of recycling (CR) as a sub-construct of Perceived Behavioural Control (H4)

The construct of perceived behavioural control proposed under the Theory of Planned Behaviour was tested using two sub-constructs, namely Inconvenience of recycling and Cost of recycling. The discussion that follows deals with the Cost of recycling, with Inconvenience of recycling being discussed in the following section.

The mean score for the Social Pressure construct was M=3.30, and the data were normally distributed with minimal standard deviation. The results indicate that there was moderate agreement that the handling charges, transportation costs and recycling programme costs were hinderances to e-waste recycling.

The Cronbach's Alpha for CR was 0.61, indicating an acceptable measure of test accuracy, i.e. the test measured what it was designed to measure. The correlation coefficient of CR in relation to BI was 0.01, indicating no relationship between the variables, i.e. CR does not influence BI. This implies that an increase in the Cost of e-waste recycling will not influence people's Behavioural Intention.

The fourth hypothesis sought to establish how the Cost of recycling influences e-waste recycling Behavioural Intention. The p-value of the test was less than the predetermined level ($p<0.05$), implying a significant difference between CR and BI. This indicates that there is a chance that the Cost of recycling influences consumers' e-waste recycling Behavioural Intention. The SEM regression model confirmed a positive relation between CR and BI, however it was very weak.

The Cost of recycling has been addressed differently by different countries. The options include the Cost of the recycling being the responsibility of the manufacturer or the consumer (Nguyen et al., 2018; Pérez-Belis et al., 2015). The results of this study indicate that the Cost of recycling may be a hinderance to e-waste recycling behaviour, which suggests that further investigation is needed to understand how infrastructure should be constructed to help reduce the cost of e-waste recycling.

However, the results also imply that cost does not substantially influence e-waste recycling intention, indicating that irrespective of the Cost of recycling, people may not be substantially deterred from recycling.

6.8 Discussion on Inconvenience of Recycling (ICR) as a sub-construct of Perceived Behavioural Control (H5)

This discussion focuses on the results of the Inconvenience of recycling as a sub-construct of perceived behavioural control.

The mean score for the Social Pressure construct was M=3.28, and the data were normally distributed with minimal standard deviation. The results indicate that there is agreement that e-waste recycling channels are deficient (M=3.61), however transportation of e-waste, time to transport and sorting of e-waste only moderately impacts e-waste recycling Behavioural Intention (M>2.5<3.5).

The Cronbach's Alpha for ICR was 0.67 indicating test accuracy, i.e. the test measured what it was designed to measure. The correlation coefficient of ICR in relation to BI was -0.247, indicating a weak negative relationship between the variables, i.e. as ICR increases, so BI decreases. This implies that an increased Inconvenience may negatively influence people's Behavioural Intention towards e-waste recycling.

The fifth hypothesis sought to establish how Inconvenience of recycling influences e-waste recycling Behavioural Intention. The p-value of the test was less than the predetermined level ($p<0.05$), and a significant difference between ICR and BI indicates that there is a chance that the Inconvenience of recycling negatively influences consumers' e-waste recycling Behavioural Intention. This result was supported by the SEM regression model, which showed a reasonable negative association between ICR and BI.

According to Geiger et al. (2019), contextual factors related to recycling play a vital role in e-waste recycling and recycling in general, while access to convenient recycling facilities as well as knowledge about how to recycle positively influence recycling. This research supports this theory by concluding that Inconvenience of

recycling negatively influences consumers' recycling behaviour. The implications for this are that more drop-off points, collection programmes and clear education programmes may help increase the level of e-waste recycling adoption and behaviour in South Africa.

6.9 Discussion on Past Experience (PE) in relation to Behavioural Intention (BI) and Inconvenience of Recycling (ICR) (H6)

Past experience was added to the general TPB model to analyse if Past Experience with regards to e-waste recycling impacts Behavioural Intention to recycle and Inconvenience of recycling.

The mean score for the Social Pressure construct was M=2.72 and the data were normally distributed with small standard deviations. The mean score indicates that there is low moderate support for the influence of Past Experience on recycling. The results indicate that the consumers are knowledgeable about materials to recycle and that they do recycle, but not frequently (M>2.5<3.5), and they do not have a strong acquaintance with recycling facilities (M<2.5).

The Cronbach's Alpha for PE was 0.69 indicating test accuracy, i.e. the test measured what it was designed to measure. The correlation coefficient of PE in relation to BI was 0.351, indicating a weak positive relationship between the variables, i.e. as PE increases so does BI. This implies that increased past recycling experience may positively influence the Behavioural Intention of e-waste recycling. It was also interesting to note that the correlation coefficient of PE in relation to ICR was -0.36, indicating a weak negative relationship between the variables, i.e. as PE increases, ICR decreases.

The last two hypotheses sought to establish how past recycling influences e-waste recycling Behavioural Intention (H6.1) and how a past recycling experience influences Inconvenience of recycling (H6.2). The p-value for both tests was less than the predetermined level of significance, indicating that there is a chance that past recycling experience influences both e-waste Behavioural Intention and Inconvenience of recycling. The SEM regression model in Figure 12 illustrated that

PE has a significantly positive influence on e-waste recycling intention of South African consumers.

The literature reviewed concluded that past recycling behaviour positively influences e-waste recycling behaviour (Geiger et al., 2019; Nguyen et al., 2018) as people may develop a habit of recycling, thereby reducing the effort associated with recycling. Both the link to Behavioural Intention and Inconvenience of recycling were tested in this study, with the results suggesting that Past Experience influences e-waste recycling intention directly as well as indirectly by potentially reducing the Inconvenience associated with e-waste recycling. The implications for this are that programmes should be introduced to create a recurring incentive for individuals to recycle.

6.10 Concluding remarks

Previous studies illustrate varying results regarding the influence of socio-demographic characteristics on consumers' recycling behaviour (Geiger et al., 2019; Miafodzyeva & Brandt, 2013; Nguyen et al., 2018). The results of this study indicate that none of the demographic factors have a noteworthy impact on the Behavioural Intention of South Africans to recycle e-waste.

The TPB framework is a well-researched framework that has been used to understand what factors influence the Behavioural Intention of people to perform a specific action/behaviour (Ajzen, 2008). This framework has been used in various studies on consumer behaviour, recycling behaviour and other behaviours (Ajzen, 2008; Botetzagias et al., 2015; Echegaray & Hansstein, 2017a; Nguyen et al., 2018), and underpins methods that may be employed to achieve a certain outcome. As discussed in the literature, this framework is underscored by three sub-constructs, namely attitude, subjective norms and perceived behavioural control (Ajzen, 1991). This model was deconstructed to identify various underlying sub-constructs that may influence the e-waste recycling behaviour of South African consumers.

The results presented can be summarised as follows:

- Environmental Awareness and Attitude towards e-waste recycling does not positively influence e-waste recycling Behavioural Intention of South African consumers.
- Social Pressure and Laws and Regulations positively influence the e-waste recycling Behavioural Intention of South African consumers. This supports the literature that subjective norms influence recycling behaviour.
- Cost of recycling has a slightly negative influence on e-waste recycling Behavioural Intention, as does Inconvenience of e-waste recycling. These two constructs together illustrate that perceived behavioural control influences behaviour, which supports the literature on the topic.
- Past recycling experience reduces the perceived Inconvenience of recycling and positively influences the e-waste recycling intention of South African consumers.

The next chapter discusses what impact these findings have for both literature and business/government.

Chapter 7: Conclusion

7.1 Introduction

This study set out to investigate which factors influence the e-waste recycling behaviour of South African consumers. Based on the literature reviewed it was established that a number of factors have led to the current environmental issues facing society today. The rise of urbanisation has resulted in the concentration of humans around central areas around the world since the beginning of the 20th century. This trend was first seen in developed countries, but has now quickly spread to developing nations around the world. This phenomenon encompasses many aspects including demographic, ecological, sociological and economic factors. The current trend indicates that the majority of the world's population will be living in cities by 2050, indicating that this phenomenon will not slow down. Rapid urbanisation has major implications for the environment and society, including infrastructure availability, waste management, consumption patterns and the related negative consequences.

The advancement of technology has led to a rapid change in the way humans consume, driving a "throw-away" society in which the latest trends drive what, when and why people buy goods and services. This consumerist behaviour has resulted in the generation of excessive waste, which is accompanied by outdated infrastructure, policies and laws, resulting in pollution. This pollution is generated by a wide array of goods including food, textiles, plastic and electronics. The excessive generation of waste and the poor management of this waste has led to the pollution of land, water and air, which in turn has led to climate change that has devastating consequences for the environment, society and the creatures that share this Planet with us. Carl Sagan (1994) put it eloquently when he said, "…there is no hint that help will come from elsewhere to save us from ourselves".

E-waste, generated by the disposal of old electronic equipment, has been rapidly increasing, and due to the complex construction of this equipment the manner in which it is disposed has major consequences for the environment and human beings. It is widely considered normal to dispose of this waste through traditional means, e.g. landfills, however this is causing dangerous chemicals to be released into the soil,

which is being transferred to agriculture and livestock that humans in turn consume. Another challenge is driven by the fact that these goods are constructed from valuable materials that can be a source of income for some. Informal recyclers utilise dangerous and rudimentary techniques to gain access to these valuable materials which are hazardous to them and further degrade the environment.

The recycling of e-waste is a more constructive means to dispose of these goods and has the lowest impact on both humans and the environment. This also supports the global initiative of sustainable consumption and production motivated by the United Nation's Sustainable Development Goals (SDGs). Even though some countries have passed laws, regulations and policies regarding the recycling of e-waste, a further understanding of how to influence people to partake in such initiatives is fundamental to making them viable in the longer term.

The Theory of Planned Behaviour (TPB) is a widely used framework (Ajzen, 1991) that was formulated with the purpose of establishing what influences individuals to perform certain behaviours. This theory is widely used in the study of recycling behaviour to help researchers and policy makers understand how to drive certain behaviours and establish a more sustainable way of living.

South Africa is a developing country with a growing wealthier urban population that is consuming more, resulting in excess waste. With poor policies and infrastructure in place, this is resulting in pollution and contributing to the negative impact of waste on the environment. In order to help understand what can be done to help alleviate this challenge, this study undertook to understand what factors influence the e-waste recycling behaviour of South African consumers utilising the TPB framework.

7.2 Principal findings

The results indicate that no single demographic factor has a substantial impact on the Behavioural Intention of South Africans to recycle e-waste. The TPB model was deconstructed to identify various underlying sub-constructs that may influence the e-waste recycling behaviour of South African consumers. The results presented above can be summarised as follows:

- Environmental Awareness and Attitude towards e-waste recycling does not positively influence the e-waste recycling Behavioural Intention of South African consumers.
- Social Pressure and Laws and Regulations positively influence the e-waste recycling Behavioural Intention of South African consumers. This supports the literature that subjective norms influence recycling behaviour.
- The Cost of recycling has a small negative influence on e-waste recycling Behavioural Intention, as does Inconvenience of e-waste recycling. Together these two constructs illustrate that perceived behavioural control does influence behaviour, which supports the literature on the topic.
- Past Recycling Experience reduces the Inconvenience of recycling and positively influences the e-waste recycling intention of South African consumers.

Compared to previous research that was consulted to formulate the hypotheses for this research:

- H1 is not supported, indicating that Environmental Awareness and Attitude (as an encompassing construct) toward recycling do not positively affect residents' e-waste recycling Behavioural Intention.
- H2 is supported, indicating that Social Pressure positively affects e-waste recycling Behavioural Intention.
- H3 is supported, indicating that Laws and Regulations positively influence consumers' e-waste recycling Behavioural Intention.
- H4 is supported, indicating that the Costs of recycling influence consumers' e-waste recycling Behavioural Intention.
- H5 is supported, indicating that the Inconvenience associated with recycling has a negative significant impact on consumers' recycling behaviour.
- H6.1 is supported, indicating that the Past Recycling Experience of consumers positively influences their e-waste recycling Behaviour Intention.
- H6.2 is supported, indicating that the Past Recycling Experience of consumers negatively influences their perception of the Inconvenience associated with e-waste recycling.

7.3 Implications of the research

Many countries have adopted legal frameworks and policies for managing the impact of e-waste on the environment and society (Pérez-Belis et al., 2015). However, as highlighted in the literature, South Africa has not adequately provided a legal framework or policy that consumers and producers can follow to curb the e-waste challenge faced in the country (Finlay & Liechti, 2008; Ghosh et al., 2016). This study found that Laws and Regulations can be a significant influencer of responsible e-waste recycling behaviour and this, combined with a clear cost structure and recycling programmes, could help promote e-waste recycling within the country. Government and business should embark on a combined effort to help limit the impact that e-waste has on society and the environment. Sectors such as electronics manufacturing and telecommunications are net producers of electronics that eventually contribute to increased e-waste, and thus should take an active role in trying to combat the pollution resulting from the incorrect disposal of e-waste.

This study aimed to expand the theory of e-waste recycling by including South Africa in the list of countries in which e-waste recycling behaviour has been assessed. The key findings allude to the fact that Social Pressure remains a key driver in predicting e-waste recycling behaviour. An interesting finding from the research is that Awareness and Attitude towards recycling is not a significant factor in determining e-waste recycling behaviour in South Africa. This finding contradicts prior findings that suggest that attitude about a certain behaviour will lead individuals to fulfilling that behaviour (Geiger et al., 2019; Miafodzyeva & Brandt, 2013).

7.4 Limitations of the study

The study tested a sample that was not representative of the population of South Africa, therefore generalisation to the entire South African population may not be possible from the findings. This was largely driven by the chosen sampling method, i.e. convenience sampling. A further limitation of the study is that the reliability of the constructs tested were questionable, as some of the Cronbach's Alphas were borderline and not quite at the accepted level of >0.6. SEM is also a large sample

technique and small sample sizes may produce inconsistent conclusions (Carvalho & Chima, 2014), hence the data should be interpreted with caution.

7.5 Suggestions for future research

A key suggestion for future research is to use a more directive sampling method to gain better insights into the data for a representative population group. The TPB is a well-established framework, however other researchers may want to add additional behavioural metrics to the study to gain further insight into the drivers of behavioural influences on e-waste recycling. The telecommunications industry is becoming one of the fastest growing contributors of electronic devices, thus future research should concentrate on the disposal behaviour of mobile devices distributed by this industry.

7.6 Concluding remarks

To the researcher's knowledge, this study represents the first quantitative assessment of the factors influencing the e-waste recycling behaviour of South African consumers using the Theory of Planned Behaviour. The study is, therefore, a first step in understanding what policy makers, businesses and researchers should investigate to further understand the problems associated with e-waste, including the consequences for the environment. The results presented are therefore given in the context of e-waste recycling behaviour.

The study sought to explain what influences consumer e-waste recycling behaviour using the TPB constructs of attitude, subjective norm and perceived behavioural control. The findings thus provide novel insights into this rapidly emerging challenge facing the future well-being of the Planet. However, more research is required in order to increase the explanatory power of the model presented. This may be achieved through exploring alternate models and additional factors.

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Appendix 1

Gordon Institute of Business Science
University of Pretoria

14 August 2019

Aadil Munsami

Dear Aadil

Please be advised that your application for Ethical Clearance has been approved.

You are therefore allowed to continue collecting your data.

Please note that approval is granted based on the methodology and research instruments provided in the application. If there is any deviation change or addition to the research method or tools, a supplementary application for approval must be obtained

We wish you everything of the best for the rest of the project.

Kind Regards

GIBS MBA Research Ethical Clearance Committee

Gordon Institute of Business Science
Reg. No. 99/19816/08

26 Melville Road, Illovo, Johannesburg
PO Box 787602, Sandton, 2146, South Africa

telephone **(+27) 11 771 4000**
fax **(+27) 11 771 4177**

website **gibs.co.za**
University of Pretoria

Appendix 2

Constructs	Measurement	Likert Scale				
		1	2	3	4	5
Environmental awareness and attitude towards recycling (AAR), 7 items	E-waste recycling is the main way to reduce the use of landfills and emissions of greenhouse gasses.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	E-waste recycling is a primary way to conserve natural resources.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	E-waste recycling improves the quality of the environment.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I feel very satisfied when recycling e-waste.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	E-waste recycling is useful to create a better community environment.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	E-waste recycling is everyone's responsibility to reduce the volume of e-waste generated	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I am not interested in the idea of e-waste recycling.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Social Pressure (SP), 3 items	If my family and friends are involved in e-waste recycling, I will also engage in it.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	The media influences me to e-waste recycling.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	The community where I live would influence me to participate in recycling e-waste.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Laws and regulations (LR), 3 items	South African laws well require the responsibilities of residents to recycle e-waste.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	Government policy would influence me to recycle e-waste.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	If there are laws and or regulations related to e-waste recycling, I will obey them.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Cost of recycling (CR), 3 items	Recycling programs are costly.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I think expenditure on transportation of e-waste to the recycling center is high.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I think handling charges of e-waste recycling are high.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Inconvenience of Recycling (ICR), 4 items	I feel difficult to sort e-waste for recycling.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I have no time to send e-waste to the collection point.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	It is inconvenient to transport e-waste to the collection point.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I think neighboring e-waste recycling channels are deficient.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Past experience (PE), 3 items	I am well acquainted with the recycling facilities.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I am knowledgeable about the materials suitable for recycling.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	During the past three months how frequently did you recycle your waste at home.	Never	Rarely	Sometim	Often	Always
Behavioral Intention (BI), 4 items	I am willing to contact formal e-waste recycling organizations to deal with e-waste in the future.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I intend to drop-off my e-waste if formal collection systems are available.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I am willing to participate in environmental programs hold by the government.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	I am willing to tell my relatives about the e-waste recycling experiences.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Demographic details	What is your gender?					
	What was your age at your last birthday?					
	What is your highest level of education?					
	What is your approximate household income (to the nearest R1000)?					
	According to the Employment Equity Act, to which population group do you belong?					
	Do you belong to an environmental activist group or organisation?					
	Please provide your area of residence?					
	What is your current household size?					
	Please indicate your marital stauts?					