

Predictors of Willingness to Participate in E-waste Recycling in Johannesburg: A Case of Electronic and Electric Repair Firms

Rudo Cynthia Christine Chinomona

ABSTRACT

This study examines the predictor variables of willingness to participate in e-waste recycling in Johannesburg. Nine hypotheses are posited and in order to empirically test them, a sample data set of 307 was collected from Gauteng Province of South Africa. The results indicate that The results of the study reveals that awareness of e-waste hazard, awareness of benefits of e-waste practices and awareness of e-waste policies each have a significant, direct and positive influence on knowledge of e-waste practices and attitude towards e-waste practices. Furthermore, the results revealed that knowledge on e-waste recycling practices and attitude towards e-waste recycling practices each have a direct positive influence on willingness to adopt e-waste recycling practices. Drawing from the study's findings, managerial implications are discussed and limitations and future research directions are suggested. By and large, this study immensely contributes new knowledge to the existing body of e-waste recycling literature in South Africa - a context that is often most neglected by some researchers in developing countries.

Key words: *E-waste recycling, Knowledge of e-waste, Attitude towards e-waste, E-waste policy awareness, Benefits of e-waste, e-waste hazards, Willingness to adopt e-waste practices, South Africa Recycling Industry, South Africa e-waste.*

1.0. INTRODUCTION

As the world advance in technology, people's life is getting easier by each day but somehow at the expense of the pollution and hazardous waste being produced (Borthakur & Govind, 2018; Babayemi, Osibanjo & Weber, 2017). For instance, Baldé, Wang, Kuehr and Huisman, (2015) note that there are over 41.8 million tons of e-waste generated all over the world, but only less than 20% of e-waste is reported as formally treated by national take-back systems and schemes through recycling – thus the remainder of e-waste contributing to the threat of environmental pollution. As e-waste becomes a growing concern around the world (Awasthi, Zeng & Li., 2016) South Africa is no exemption. According to Cucchiella, D'Adamo, Koh, and Rosa (2015), the estimated annual growth rate for e-waste stream in South Africa is between 3-5% and this rate is three times greater than other waste streams in Southern Africa

(Singh, Li & Zeng 2016). While e-waste has become a global menace, recycling is being taunted as a possible sustainable and environment friendly solution to this problem. To this end, there has been growing interest among scholars, policy makers and the green advocates alike, on determining the factors that motivate the people's willingness to participate in e-waste recycling.

Needless to say, a cross-examination of the extant literature seems to show that a plethora of studies have focused on recycling as one of the solutions to reduce e-waste hazards and several benefits have been associated with proper recycling of e-waste (Heacock, Kelly, Asante, Birnbaum, Bergman, Bruné, Buka, Carpenter, Chen, Huo & Kamel, 2015; Borthakur & Govind, 2018; Babayemi et al., 2017). According to the National Norms and Standards for Disposal of Waste to Landfill (2013), with continuous increases of the disposal of e-waste, proper disposal has fast become a non-option for e-waste, hence the only option left for e-waste is recycling. However, despite these noted benefits and the need for recycling, the empirical literature indicates that as little as 5.2% of households recycled e-waste in 2015 (Afrika, Oelofse, Strydom, Mvuma & John, 2016).

Lack of awareness and knowledge of proper disposal of e-waste has impact on behavioural outcomes in the organization, management practitioners and academics have, increasingly, had to focus on increasing awareness among the public of South Africa. Despite this attention, there is a gap in empirical evidence on the lack of proper e-waste recycling, not only in developed, but also developing countries, particularly in South Africa. Drawing from the research gap, this study, in broad terms examined the effects of e-waste awareness on e-waste perceptions and behavioral intentions (e-waste recycling) of Small and Medium Repair Enterprises. In particular, the current study sought to fill in the identified research void by investigating the influence of e-waste hazards, perceived benefits of e-waste practices, and e-waste policy on knowledge of e-waste practices, attitude towards e-waste practices, and eventually, the SME's willingness to participate to e-waste recycle e-waste.

Premised on the research findings, this study is expected to make academic and practical contributions to the existing body of behavioural theories. The results of this study provide empirical evidence that aligns with and substantiates the underlying theoretical framework, as they illustrate that awareness of e-waste plays a crucial role in shaping individuals' inclination to participate in e-waste recycling activities. The conceptual model under consideration, which has undergone theoretical and empirical validation, offers managers, policymakers, and

researchers a framework for comprehending and improving e-waste management in South Africa. The present investigation offers several methodological contributions, the study investigated the relationships between several predictors (precisely, e-waste hazard awareness, benefits of e-waste practices, and e-waste policy awareness) and the outcome variable (willingness to participate in e-waste recycling). Additionally, the study aimed to explore the potential mediating effects of knowledge on e-waste practices and attitudes towards e-waste within this relationship.

The remainder of the paper will provide literature review and the current research constructs mentioned earlier, proposes a willingness to participate in e-waste recycling research model, and develops research hypotheses. The methodology follows with a summary of data collection and measurement procedure. The data set is then analyzed and the results are reported. Next, discussion and conclusions are delineated. In the last section, implications and limitations of the current research and future research directions are highlighted.

2.0. LITERATURE REVIEW

2.1. Behavioral reasoning theory (BRT)

According to Sahu, Padhy, & Dhir (2020), there is a growing consensus among scholars regarding the heightened significance for firms to enhance their comprehension of the factors influencing consumer acceptance of innovations, including the reasons, timing, and conditions under which such acceptance occurs. Various theoretical frameworks are accessible for the purpose of comprehending the adoption of innovations, thereby facilitating the understanding of scholars and practitioners. Several well-known examples in the field include the diffusion of innovation theory (DOI), the technology acceptance model (TAM), the theory of reasoned action (TRA), and the theory of planned behavior (TPB). However, it has been noted that the majority of these frameworks have faced criticism for their primary focus on acceptance-related factors, while neglecting to address consumer resistance (Claudy, Garcia & O'Driscoll, 2015; Sahu et al., 2020). Previous research has demonstrated that new products and services often experience a significant rate of failure due to a failure to adequately comprehend the various factors contributing to consumer resistance or barriers to their acceptance (Antioico & Kleijnen, 2010). The current state of affairs remains unchanged in the realm of e-waste recycling as previous research has predominantly concentrated on comprehending the favorable factors that impact individuals' intentions to engage in e-waste recycling. As a result,

there is a dearth of information regarding consumers' inclination to participate in e-waste recycling, which has become an increasingly pressing issue for policymakers, necessitating prompt investigation.

Prior research has indicated that the factors contributing to resistance towards innovation are not necessarily the inverse of the factors promoting acceptance of said innovation (Claudy et al., 2015; Kleijnen, Lee, & Wetzels, 2009; Sahu et al., 2020). The health advantages associated with recycling electronic waste can be considered as justifications for participating in recycling practices. The potential factors contributing to individuals' reluctance to engage in e-waste recycling include the significant financial burden and the associated inconveniences. Therefore, a comprehensive understanding of consumer behavior necessitates an analysis of both the factors that support and those that oppose it.'

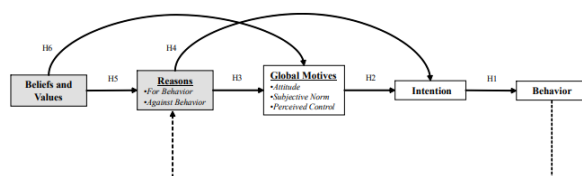


Figure 1: Behavioral reasoning theory model (Westaby, 2005)

Researchers have employed the Behavioral Response Theory (BRT) to examine consumer behavior in various domains, including organic food (Tandon Dhir, Kaur, Kushwah, & Salo, 2020), excessive alcohol consumption (Norman, Byambaa, De, Butchart, Scott, & Vos, 2012), consumer attitudes towards innovations (Claudy et al., 2015, 2013), managerial decision-making (Westaby, Probst, & Lee, 2010), and the adoption of mobile banking (Gupta and Arora, 2017).

2.2. E-waste Awareness

The lack of consumer awareness poses a significant challenge in the management of electronic waste (e-waste). Merely establishing and enforcing a regulatory framework that clearly delineates the responsibilities of different stakeholders is not enough. The lack of awareness and civic responsibility among individual consumers, who are the primary sources of E-waste generation, presents a significant challenge in effectively managing E-waste within urban communities. The presence of toxic substances in electronic waste (e-waste) gives rise to a range of diseases in the human population. The prevention of e-waste can be achieved through

the dissemination of knowledge regarding e-waste and effective strategies for managing substantial quantities of electronic waste.

E-waste Awareness is defined as “Knowledge that something exists or understanding of a situation or subject at the present time based on information or experience” (Cambridge University, 2014, p 22). This study make use of this definition for it addresses objectives that the study aims to cover. Li et al. (2015) argue that the level of e-waste awareness is influenced by factors such as consumer participation, technical capacity, and the presence of national legislations. In a study conducted by Wang, Guo and Wang, (2016), the primary determinants of residents' e-waste recycling behavior were examined. According to Shaikh et al. (2020), it is argued that the implementation of well-defined and efficient policies is crucial at the upstream level in order to enhance awareness.

2.3. E-waste Hazards

One hazardous waste product that has gained recognition relatively recently is derived from the disposal of electrical and electronic equipment (EEE) (Esmaeilian, Wang, Lewis, Duarte, Ratti, & Behdad, 2018). The comprehensive understanding of the potential consequences of exposure to hazardous substances found in electronic waste (e-waste) remains incomplete. Nevertheless, existing research has explored the correlation between e-waste exposure and elevated concentrations of chemicals and metals in biological samples derived from human subjects (Zhang, Shi, Meng, Guo, Li, Liu & Hu, 2019). Increased awareness of the societal consequences of electronic waste (e-waste) serves to mitigate environmental pollution and mitigate adverse effects on human well-being. Extensive scholarly investigations have been conducted to explore the societal consequences of electronic waste (e-waste), encompassing its effects on global economies, cultures, and the well-being of individuals. The extensive study conducted by Kirby and Lora-Wainwright (2015) has shed light on the practices and consequences associated with the disposal and recycling of electronic waste (e-waste) in China and Japan. Their research has emphasized the significant contribution of this resource to the recent economic development observed in East Asia. The significance of consumers' disposal behavior and awareness in effective e-waste management interventions has been widely acknowledged (Borthakur & Govind, 2017). However, a considerable number of consumers lack knowledge regarding the significance of recycling e-waste or the various safe disposal options that are accessible to them. As a result, the study recommends the prompt

implementation of recycling guidelines and the mitigation of contaminated sites in order to minimize occupational exposure and mitigate potential negative health consequences for individuals.

2.4. Benefits of E-Waste Practices

The promotion of environmentally friendly e-waste management programs necessitates a critical focus on enhancing information campaigns, capacity building, and awareness (Akram, Natasha, Fahad, Hashmi, Wahid, Adnan, & Nasim, 2019; Li & Achal, 2020). In the context of developing and transition countries, it is imperative to allocate considerable focus towards the development of information management systems that effectively delineate the factors that contribute to e-waste, as well as its generation and subsequent management (Ravindra & Mor, 2019). The presence of chemicals in electronic waste poses a significant risk to both the environment and human health. Increasing awareness about the presence of hazardous materials in laptops and their potential impact on the environment and human health can effectively persuade individuals to adopt proper disposal practices. Individuals who are knowledgeable about laptops, especially regarding the presence of hazardous materials, generally support the idea of implementing responsible practices for disposing of laptops. Hansmann and Steimer (2015) posit that an individual's behavior is predominantly influenced by their social and cultural context.

The dissemination of information to consumers regarding the significance of recycling, as well as the methods and locations for recycling, has the potential to augment public engagement in recycling efforts (Liu, Teng, & Han, 2020). Moreover, the recycling habits of an individual can be readily influenced by the social circle comprising family and friends. Differences in e-waste recycling among residents were observed based on the family typology and the socioeconomic stratum to which the family belongs (Aboelmaged, 2021). Haron, Sidique, and Radam (2018) state that research frequently integrates psychological and econometric models in diverse approaches and models. The theory of planned behavior is widely recognized and utilized as a psychological theory in current research within the field.

2.5. E-waste Policy Awareness and Management

In the Republic of South Africa, it is incumbent upon every citizen to fulfill their obligation in safeguarding the natural environment. According to Article 5.1 of the Constitution of South Africa, individuals are designated as trustees of the nation's natural resources and environment. This responsibility is intended to benefit both current and future generations. It is considered a

fundamental duty of every citizen to actively contribute to the safeguarding of the natural environment, the preservation of South Africa's diverse biodiversity, and the prevention of any form of ecological degradation. This includes addressing issues such as noise pollution, visual pollution, and physical pollution by adopting and endorsing practices and policies that are environmentally friendly (Constitution Drafting Committee, 2008). Therefore, it is imperative that the populace of South Africa possesses knowledge regarding the extant environmental policies and regulations.

The existing body of scholarly literature offers comprehensive insights into the health and environmental ramifications of electronic waste, as well as the level of infrastructural assistance available in South Africa. Nevertheless, there is a dearth of comprehensive data regarding the level of awareness among the Indian populace regarding the implementation of government policies pertaining to the management of electronic waste (e-waste) as well as the adoption of appropriate disposal methods (Grant, 2019; Ichikowitz & Hattingh, 2020). The regulatory framework concerning electronic waste (e-waste) in South Africa is currently absent. The regulation of used electrical and electronic equipment is overseen by the Department of Environment, which has issued guidelines for its proper disposal. Furthermore, the current state of technological waste, practices, and economic conditions significantly influence the potential for recycling e-waste (Zeng et al., 2017).

2.6. Knowledge on E-waste Practices and Management

The understanding of the product life cycle can also impact an individual's beliefs and behaviors related to disposal practices. For consumers, it is crucial to possess adequate knowledge regarding product usage prior to making a final purchasing decision (Poggiali, 2015). Understanding how to use a product effectively can enhance an individual's ethical considerations when making purchasing decisions.

Acquiring knowledge regarding various methods of waste disposal can enhance an individual's ability to make informed decisions regarding their disposal practices. Knowledge is a result of having familiarity, awareness, or understanding of a specific subject within a particular community (Akkajit et al., 2020). This refers to the process of gaining knowledge, information, descriptions, or skills related to a specific subject. This can be achieved through personal experience or formal education, using methods such as perception, discovery, or learning. Previous research has demonstrated that individuals who possess an understanding of the negative environmental impacts associated with not engaging in recycling activities, similar to

the concept of consequences in Schwartz's framework, are more likely to engage in recycling behaviors (Morales, Holtschlag, Masuda, & Marquina, 2019; Ahmad, Kim, Anwer & Zhuang, 2020; Käser & Schwartz, 2020). In contrast, prior studies indicate a limited correlation between overall environmental concerns and recycling behavior (Li, Li, Jin, & Wang, 2019; Li, Zhao, Ma, Shao, & Zhang, 2019; Cruz, & Manata, 2020; Chaturvedi, Kulshreshtha, & Tripathi, 2020; Chao, Yu, & Yu, 2023; Lou & Li, 2023).

2.7. Attitude towards E-waste Practices

Due to variations in national contexts, scholars from different countries exhibit divergent perspectives regarding the extent of responsibility that should be assumed by residents in the domain of e-waste recycling. Borthakur and Govind (2018) argue that in many developing countries, the level of willingness to pay for waste management and green electronics is generally lower compared to the willingness to pay for water and electricity fees (Sivathanu, 2016). The primary obstacles in e-waste recycling are widely regarded as a lack of understanding regarding the toxicity of e-waste and the risks associated with improper recycling methods (Marques & Silva, 2017). Previous research indicates that there exists a significant correlation between a positive attitude and the propensity to participate in a specific behavior (Tandon, Dhir, Kaur, Kushwah & Salo., 2020). Moreover, it has been observed that attitudes have a positive impact on consumer intentions (Basha & Lal, 2019; Claudy Garcia, & O'Driscoll, 2015, 2013; Tandon et al., 2020). As an illustration, Claudy et al. (2015) found that the adoption intentions of consumers were positively influenced by their attitude towards the usage of micro wind turbines and car-sharing. According to the research conducted by Tandon et al. (2020), it was observed that consumers' perception and evaluation of organic food had a significant impact on their intention to purchase such products. Likewise, a favorable disposition among consumers towards the recycling of electronic waste is expected to be correlated with heightened intentions to engage in e-waste recycling.

2.8. Willingness to Participate in E-waste Recycling

According to Pan and Li (2016), behavioral intention refers to an individual's inclination or readiness to engage in a specific behavior. In essence, it denotes the level of commitment an individual desire to dedicate towards engaging in the behavior of e-waste recycling. Previous research suggests that individuals who have a greater inclination to engage in e-waste recycling are more probable to actively participate in such activities (Echegaray & Hansstein, 2017; Oztekin, Teksoz, Pamuk, Sahin & Kilic, 2017). Borthakur and Govind (2018) posit that the propensity of consumers to engage in recycling activities is contingent upon their income levels

and the convenience factors associated with recycling. Consumers with a higher income exhibit a greater propensity to actively engage in recycling initiatives on a voluntary basis. However, this inclination may diminish when the recycling process becomes more time-consuming. In summary, it can be inferred that the perception of time and individuals' attitudes towards time play a crucial role in influencing consumers' inclination to engage in e-waste recycling, as suggested by previous studies (Babayemi et al., 2017; Duraisamy et al., 2017). Willingness refers to the inclination of individuals to engage in online e-waste recycling, reflecting their intentions (Lyu, Chen & Guo, 2023).

Previous studies have indicated that individuals who possess a greater inclination to engage in e-waste recycling are more probable to actively participate in such activities (Echegaray & Hansstein, 2017; Oztekin, Teksöz, Pamuk, Sahin & Kilic, 2017). Numerous scholars have conducted research on the various determinants that impact e-waste recycling behavior (Mohamad, Thoo & Huam, 2022; Delcea, Crăciun, Ioanăș, Ferruzzi, & Cotfas, 2020; Shahrudin, Said, Hotrawaisaya, Nik Abdul Rashid & Azman Perwira, 2020; Shevchenko, Laitala & Danko, 2019; Lou, 2022). In summary, it can be inferred that the perception of time and individuals' attitudes towards time play a significant role in influencing consumers' inclination to engage in e-waste recycling, as indicated by previous studies conducted by Babayemi et al. (2017) and Duraisamy et al. (2017). According to the empirical findings presented by Davis and Morgan (2008), who was cited by Sun, Law and Schuckert, (2020), behavior attitude and perceived behavior control emerge as significant explanatory factors in predicting behavior.

3.0. CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

Figure below depicts the conceptualized research model of the study. In a broader sense, the conceptual model put forward that awareness factors (e-waste hazards awareness, awareness of benefits of e-waste practices, e-waste policy awareness) influence the perception factors (knowledge on e-waste practices and attitude towards e-waste practices) which eventually influence the behavioral factor (willingness to participate in e-waste recycling). The hypothesized relationships between the research constructs are highlighted.

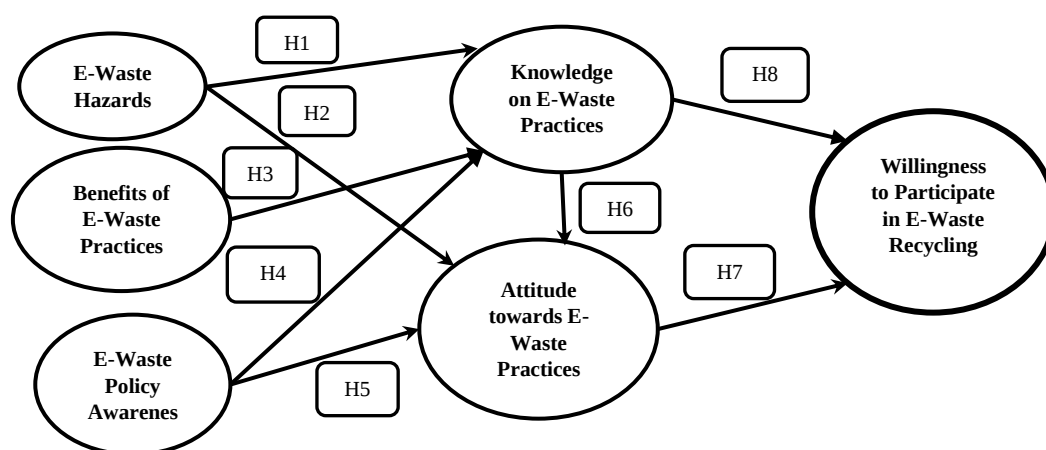


Figure 2: Research Model

3.1. Hypothesis Development

3.1.1. Awareness of E-waste Hazards and Knowledge on E-waste Practices

It appears that awareness of the negative effects of e-waste is still limited across the globe – especially in developing countries such as in Africa (Babayemi et al., 2017). As a result of this limited awareness, knowledge on e-waste practices remain scant (Daum, Stoler & Grant, 2017). In particular, the lack of awareness of e-waste hazards means that information and hence understanding of the negative consequences of e-waste hazards (physical or social in nature) may be necessitating the lack of knowledge on e-waste practices among electronic gadgets and equipment users (Duraismy et al., 2017). Previous studies in developed countries such as the USA, the UK, and some European countries have found a positive association between awareness factors and e-waste practices (Duygan & Meylan, 2015; Mane, Paspatis, Aabakken, Anderloni, Arvanitakis, Ah-Soune, Barthet, Domagk, Dumonceau, Gigot & Hritz, 2019; Ahadzie, King & Asibey., 2017). Based on the above discussion and the empirical evidence, this study, therefore, posits that:

H1: There is a positive relationship between awareness of e-waste hazards and knowledge on e-waste practices in South Africa.

3.1.2. Awareness of E-waste Hazards and Attitude towards E-waste Practices

According to Sugimura and Murakami (2016), individuals who have a higher level of awareness on the consequences of a phenomenon are likely to have a befitting attitude towards

performing a certain behavior. Such a view is buttressed by Menikpura, Sang-Arun and Bengtsson (2016) and Shaikh, Thomas, Zuhair and Magalini (2020) who argued that awareness leads to consciousness and consciousness influences and changes consumers' frame of reference and perceptions hence, attitudes towards the adoption of certain consumer behaviors. More so, the empirical literature is awash with evidence proving a positive relationship between awareness and attitude change (Rautela, Arya, Vishwakarma, Lee, Kim & Kumar, 2021; Islam, Dias & Huda, 2021; Kumar, Gaur, Liu & Sharma, 2022; Kumar et al., 2018). Although the awareness of consequences is considered to be one of the variables used to activate the relationship between personal norms and behaviour in the NAM, Davies et al. (2002) explained that a higher awareness level of desirable outcomes of certain behaviour would increase the intention to perform recycling. This factor was proved to be significant and a direct predictor of recycling behaviour (Tonglet et al., 2004; Chen and Tung, 2010) when applying the TPB. Thus, drawing from the discussion and empirical evidence, the current study conjecture that:

H2: There is a positive relationship between awareness of e-waste hazards and attitude towards e-waste practices.

3.1.3. Awareness of Benefits of E-Waste Practices and Knowledge on E-waste Practices

A cross-examination of the empirical literature seems to point to the fact that information provided to consumers to create awareness of some benefits of a product or services makes them more knowledgeable and hence a positive view of the product or service (Ravindra & Mor, 2019; Liobikienė Juknys, 2016; Mencarelli Lombart, 2017; Zeng et al., 2017). In the same token, this study, argues that awareness of the benefits of e-waste practices provides insights to the consumers of electronic gadgets and equipment. Such insights are likely to make the consumers more knowledgeable of the benefits that might accrue to them because of adopting e-waste practices. A positive relationship between awareness and knowledge acquisition has been supported in the prior empirical literature (Wang, Tian, Zhu & Zhong, 2017; Ikhlayel, 2018). Thus, based on the foregoing discussion, the current study proposes that:

H3: There is a positive relationship between awareness of the benefits of e-waste and knowledge on e-waste practices.

3.1.4. Awareness of Benefits of E-Waste Practices and Attitude towards E-waste Practices

A broad class of studies based on consumer attitudes and behaviour indicates that consumer awareness plays a pivotal role in shaping their attitudes towards certain brands and services offered (Hamid & Cheng, 1995; Ohajinwa, Van Bodegom, Vijver & Peijnenburg, 2017; Kianpour, Jusoh, Mardani, Streimikiene, Cavallaro, Nor, & Zavadskas., 2017; Nduneseokwu et al., 2017; Kumar et al., 2018). More so, when consumer realize that there are benefits to be accrued – they are likely to develop a positive attitude towards a product or service rendered (Wan et al., 2015). The current study expects that when consumers of electronic gadgets are aware of the benefits of e-waste practices, they are likely to develop an appreciative mindset that will trigger a positive inclination and attitude towards e-waste practices. Drawing from the empirical evidence on the awareness and attitude relationship, this study, therefore, hypothesizes that:

H4: There is a positive relationship between awareness of the benefits of e-waste and attitude towards e-waste practices.

3.1.5. E-Waste Policy Awareness and Knowledge on E-waste Practices

Previous studies that have focused on e-waste policies across the globe seem to indicate that awareness campaigns are crucial for consumers of electronic gadgets and equipment to obtain sufficient knowledge that supports e-waste practices (Patrick & Benwari, 2014; Tiep et al., 2015; Babayemi et al., 2017). Some studies had applied the model and drawn policy implications for changing factors influencing recycling behaviour (e.g., Aboelmaged, 2021; Wang et al., 2019; Kumar, 2019). The discussion on policy implications commonly stressed how to change attitude and shape individual knowledge, address social norm through information and communication campaign, and facilitate recycling behaviour through setting up appropriate and convenient recycling facilities. In a related study by Istiqfarah (2020), the authors found a positive association between policy awareness, effectiveness and consumer knowledge on the recycling behavior. Based on the foregoing previous empirical findings, the current study, therefore, conjectures that:

H5: There is a positive relationship between e-waste policy awareness and knowledge on e-waste practices.

3.1.6. E-Waste Policy Awareness and Attitude towards E-waste Practices

An interrogation of the spate of the literature shows that customer who is aware of e-waste policies are also environmentally conscious and are more likely to develop a positive attitude towards e-waste (Pan and Li, 2016; Bridgens, Lilley, Zeilig & Searing, 2017). Furthermore, the empirical literature reveals that there is a positive relationship between policy awareness and attitude towards adoption of environmentally friendly practices and technologies (Nduneseokwu Qu & Appolloni, 2017; Echegaray & Hansstein, 2017; Borthakur & Govind, 2018). On the other hand, Mei, Wai, and Ahamad (2016) found that environmental awareness and behaviour towards the awareness is not positively related. The environmental awareness is not strong enough to positively reflect in the behaviour. It is expected by this study that consumers of electronic gadgets and equipment who are aware of e-waste policy and support environmentally friendly practices – are likely to have a positive attitude towards e-waste recycling practices. Drawing from the aforementioned empirical evidence, this study postulates that:

H6: There is a positive relationship between e-waste policy awareness and attitude towards e-waste practices.

3.1.7. Knowledge on E-waste Practices and Attitude towards E-waste Practices

According to Dhir, Sadiq, Talwar, Sakashita and Kaur (2021), people's attitude and knowledge on environment issues and awareness are very important to improve the natural environment. Individuals' views on natural environment and surrounding reflect their knowledge on environmental issues. A positive attitude and perception on environmental issues and awareness plays a significant role in conserving the environment (Marques & da Silva, 2017; Xuemei & Luiz, 2015; Almasi et al, 2019; Park, Jeon & Sullivan, 2015; Veirman, Cauberghe & Hudders, 2017). Various studies on this subject matter have mostly confirmed a positive relationship between acquired knowledge and thereafter attitude towards a behavioral disposition (Rafi, Ahsan, Saboor, Hafeez & Usman, 2011; Matthes & Naderer, 2016; Vanwesenbeeck, Walrave & Ponnet, 2017). Besides, studies on e-waste have also confirmed an association between knowledge and attitude towards e-waste practices (Liu, Teng & Han, 2020; Raut, Das, & Kumar, 2015; Amoroso and Lim, 2017; Kumar et al., 2018). Such studies have found a positive effect of knowledge on attitude and therefore following the same logic – the current study posits that:

H7: There is a positive relationship between knowledge on e-waste practices and attitude towards e-waste practices.

3.1.8. Knowledge on E-waste Practices and Intention to Adopt E-waste Recycling

According to Tiep et al. (2015), knowledge on e-waste practices is crucial in determining whether consumers of electronic gadgets and equipment can end up e-waste recycling. Moreover, evidence by Babayemi et al. (2017) and Duraisamy et al. (2017) indicate that sufficient knowledge on e-waste disposal practice influences the desire to handle irreparable electronic equipment and eventually the intention to participate in the recycling of e-waste. In this study, it is also expected that knowledge of e-waste practices can have a positive effect on the intention to adopt e-waste recycling, hence the following hypothesis:

H8: There is a positive relationship between knowledge on e-waste practices and intention to adopt e-waste recycling.

3.1.9. Attitude towards E-waste Practices and Intention to Adopt E-waste Recycling

Empirical findings by Echegaray and Hansstein (2017) and Nwagwu and Okuneye (2016) noted that awareness of environmental problems has a positive associated with recycling intention. These findings were supported by findings on predictors of e-waste recycling adoption done by Mejabi (2014). Furthermore, Echegaray and Hansstein (2017) and Borthakur and Govind (2018) confirmed the existence of a positive relationship between attitude towards e-waste practices and e-waste adoption intentions. It is important to understand the attitude repair firms' managers or owner for it has been empirically proved that a positive or negative attitude is likely to influence their willingness to participate in e recycling. Therefore, based on the prior empirical findings, this study postulates that:

H9: There is a positive relationship between attitude towards e-waste practices and intention to adopt e-waste recycling.

4.0. RESEARCH METHODOLOGY

4.1. Sample and data collection

The present study was conducted within the geographical context of South Africa, a nation situated in the southern region of the African continent. The study was constrained to a singular urban area within South Africa, specifically Johannesburg, due to two distinct rationales. Johannesburg, as a prominent urban center and economic focal point in South Africa, attracts a diverse population from various regions of the country who are in search of employment opportunities and sources of income. Furthermore, Johannesburg, renowned as the primary

economic center, boasts the presence of the most prominent industrial enterprises within the nation (South Africa Gazette, 2019). At the time of the current investigation, the urban area of Johannesburg encompassed a total of over 1,000 establishments dedicated to the recycling of electronic waste, as reported by the South Africa Gazette in 2019. The final usable sample was 307. The data collection process was specifically targeted towards small businesses or individuals engaged in the repair of electronic or electric products. Furthermore, the organization distributed the questionnaire to their peers within the same industry.

4.2. Measurement instrument and questionnaire design

The measurement instrument employed in this study consists of five sections, wherein each of the four constructs is assessed in five of these sections. Proper modifications were made in order to fit the current research context and purpose. “E-Waste Hazards” measure used a four-item scale while “Benefits of E-Waste Practices” used a four-item scale, all adapted from Wan et al (2018). “E-Waste Policy Awareness” used a five-item scale measure adopted from Ylä-Mella et al. (2015) and Jayaraman et al (2019). While “Attitude Towards E-Waste Practices” used a five-item scale measure adopted from Zhang et al (2018) and Wang et al. (2014). “Knowledge on E-Waste Practices” used a four-item scale measure adopted from Echegaray and Hansstein (2017) and Finally, “Willingness to Participate in E-Waste Recycling” was measured using a four-item scale adapted from Wang et al. (2014) and Holland et al. (2006).

5.0. DATA ANALYSIS AND RESULTS

5.1. Descriptive Results

The information shown in table above presents a demographic description of respondents. In the subsections that follow (through section), the four demographic characteristics that were included in the questionnaire are discussed sequentially, and the results are reviewed. Type of business, Operational years, Type of products repaired, and What do you do with old or unused parts are among the demographic characteristics. The respondents were asked to report their demographic information, including formal business (49.2%); informal business (50.8%). Operation years: Less than 1 year (21%); 2-4 years (42.7%); 5-7 years (32.9%); 7-9 years (3.3%). Type of products repaired: ICT and Telecommunications equipment (3.3%); Office Electronics (62.9%); Large Household Appliances (27.7%); Small Household Appliances (5.2%) and All the above (1%). What do you do with old or unused parts: I keep them in the

storeroom (5.2%); I take them to the recycling center (39.1%); I dispose them with mixed waste (16.9%) and I sell them (38.8%).

Table 1: Descriptive results.

RESULTS FOR DEMOGRAPHIC CHARACTERISTICS					
Type of Business	Frequency	Percentage (%)	Operational years	Frequency	Percentage (%)
Formal Business	151	49.2	Less than 1 year	65	21.2
Informal Business	156	50.8	2-4 years	131	42.7
			5 - 7 years	101	32.9
			7 - 9 years	10	3.3
Total	307	100.0	Total	307	100.0
Type of products repaired	Frequency	Percentage (%)	What do you do with old or unused parts	Frequency	Percentage (%)
ICT and Telecommunications equipment	10	3.3	I keep them in the storeroom	16	5.2
Office Electronics	193	62.9	I take them to the recycling center	120	39.1
Large Household Appliances	85	27.7	I dispose them with mixed waste	52	16.9
Small Household Appliances	16	5.2	I sell them	119	38.8
All the above	3	1.0			

5.2. Structural Equation Modelling – A Component Based Approach

In order to statistically analyse the measurement and structural models. Smart PLS is a regression-based technique that originates from path analysis. Bootstrapping resampling method was used to test the statistical significance of the relationships. `

5.3. Measurement Model Assessment

According to Zhang, Shen, Wang, De Roeck, and Lombaert (2018), employing a two-step methodology involving structural equation modeling (SEM) is advisable. In the initial step, the

measurement model is evaluated by examining its unidimensionality, reliability, and validity (both convergent and discriminant). During the second phase, the structural model undergoes evaluation through the examination of the causal relationships between latent constructs, as proposed by the theoretical framework, with a focus on the significance of the paths.

5.3.1. Reliability Measurement Assessment: Cronbach's Alpha (CA) and Composite Reliability (CR)

Table 2 below provides the Reliability measures. Cronbach alpha and Composite reliability coefficients were used to assess the reliability of measurement instruments used measure the research variables. Overall, it was observed that all Cronbach alpha values surpassed the recommended threshold of 0.5. Consequently, this indicates that all measurement instruments employed in the study can be considered reliable. Composite reliability index greater than 0.7, is deemed acceptable (Alarcón, Sánchez & De Olavide, 2015). Hence, all the measurement instruments can be deemed reliable.

Table 2: Measurement Instrument Assessment

Research Constructs	Cronbach's Alpha	Composite Reliability
Attitude towards e-waste practices (ATEWP)	0.828	0.886
Benefits of e-waste practices (BEWP)	0.867	0.910
E-waste hazards (EWH)	0.840	0.893
E-waste policy awareness (EWPA)	0.767	0.866
Knowledge of e-waste practices (KEWP)	0.823	0.882
Willingness to participate in e-recycling (WPER)	0.870	0.911

5.3.2. Validity Assessment: Convergent Validity and Discriminant Validity

5.3.3. Testing Convergent Validity

Convergent validity is primarily evaluated through the examination of average variance extracted and factor loadings (Crego et al., 2015; Hair et al., 2016). The factor loadings exceeding 0.5 are displayed in the Table 5 below, illustrating evidence of convergent validity. The lowest factor loading was 0.750, representing ATEWP2 whereas 0.878 was the highest and represented WPER3.

Table 3: Convergent Validity

Research Variables		Factor Loadings	Average Variance Extracted (AVE)
EWH	EWH1	0.763	0.677
	EWH2	0.833	
	EWH3	0.852	
	EWH4	0.839	
BEWP	BEWP1	0.845	0.716
	BEWP2	0.866	
	BEWP3	0.882	
	BEWP4	0.790	
EWPA	EWPA3	0.835	0.682
	EWPA4	0.790	
	EWPA5	0.852	
ATEWP	ATEWP1	0.790	0.661
	ATEWP2	0.750	
	ATEWP3	0.853	
	ATEWP4	0.855	
KEWP	KEWP1	0.817	0.652
	KEWP2	0.822	
	KEWP3	0.770	
	KEWP4	0.819	
WPER	WPER1	0.822	0.719
	WPER2	0.841	
	WPER3	0.878	
	WPER4	0.851	

5.3.4. Testing Discriminant validity

Fornell and Larcker Criterion

The Fornell-Larcker criterion is ascertained by comparing the square root of a construct's average variance extracted (AVE) with the correlations between said construct and all other constructs. The current investigation revealed that the square root of the average variance extracted (AVE) for a particular construct demonstrated a greater magnitude than its connection with another construct, as indicated in Table 4. Hence, providing strong support for establishment discriminant validity

Table 4: Fornell-Larcker Criterion

	ATEWP	BEWP	EWHP	EWPA	KEWP	WPER
ATEWP	0.813					
BEWP	0.629	0.846				
EWHP	0.636	0.766	0.823			
EWPA	0.640	0.573	0.563	0.826		
KEWP	0.733	0.568	0.603	0.645	0.807	
WPER	0.727	0.632	0.673	0.679	0.754	0.848

Hetero Trait-Mono Trait (HTMT) Ratio (Inter-Construct Correlation Matrix)

According to Yusoff (2020), in order to assess discriminant validity, it is necessary to ascertain whether the correlation between the research constructs is below 1.0. The inter-correlation values between paired latent variables, as presented in Table 5, are all below 1.0. This observation supports the presence of discriminant validity.

Table 5: Heterotrait-Monotrait Ratio (HTMT)

	ATEWP	BEWP	EWHP	EWPA	KEWP	WPER
ATEWP						
BEWP	0.741					
EWHP	0.756	0.892				
EWPA	0.798	0.704	0.695			
KEWP	0.874	0.661	0.707	0.804		
WPER	0.850	0.726	0.781	0.832	0.876	

5.4. Summary of Measurement Model Assessment

The following Table 6 presents the descriptive statistics and item-to-total correlation values obtained using SPSS statistical software. Additionally, it includes the Reliability and Validity

indicators generated by Smart PLS software. Based on the data in Table 5 below, the results demonstrate that the item-to-total correlation values meet the established criterion of 0.5, indicating their acceptability. The factor loadings for the retained measurement instruments exhibited values exceeding 0.5.

Table 6: Scale accuracy analysis

Research construct		Scale item		Cronbach's Alpha	CR	AVE	Factor Loadings
		Mean	SD				
EWB	EWB1	3.59	1.158	0.840	0.893	0.677	0.763
	EWB2	3.67	1.236				0.833
	EWB3	3.13	1.065				0.852
	EWB4	3.19	1.191				0.839
BEWP	BEWP1	3.22	1.109	0.867	0.910	0.716	0.845
	BEWP2	3.20	1.193				0.866
	BEWP3	3.36	1.064				0.882
	BEWP4	2.99	1.218				0.790
EWPA	EWPA3	3.27	1.015	0.767	0.866	0.682	0.835
	EWPA4	3.67	1.111				0.790
	EWPA3	3.27	1.015				0.835
ATEWP	ATEWP1	3.76	1.167	0.767	0.866	0.682	0.790
	ATEWP2	3.11	1.038				0.750
	ATEWP3	3.48	1.133				0.853
	ATEWP4	3.32	1.155				0.855
KEWP	KEWP1	3.26	1.111	0.823	0.882	0.652	0.817
	KEWP2	2.56	1.047				0.822
	KEWP3	2.92	1.113				0.770
	KEWP4	2.91	1.121				0.819
WPER	WPER1	3.30	1.073	0.870	0.911	0.719	0.822
	WPER2	3.33	1.140				0.841
	WPER3	3.05	1.255				0.878
	WPER4	3.12	1.167				0.851

Note: EWH- E-waste hazards; BEWP-Benefits of e-waste practices; EWPA- E-waste policy awareness; KEWP-Knowledge of e-waste practices; ATEWP-Attitude towards e-waste practices; WPER- Willingness to participate in e-waste recycling. SD= Standard Deviation CR= Composite Reliability AVE= Average Variance Extracted

As can be seen in Table 5, all items have loadings greater than 0.6 (Xu, Hua, Wang & Xu, 2020), indicating that they explain at least 60% of what they expected to measure (convergent validity). The lowest AVE value is 0.750 which exceeds the recommended 0.5 (Purwanto, 2021) – an indication of the existence of discriminant validity. The least squared root of AVE is 0.652 while the highest inter-construct correlation value is 0.911. Therefore, this further confirms the existence of discriminant validity. Using the composite reliability (CR) value and Cronbach's alpha value, the measurement instrument's reliability was assessed and the lowest values is 0.767, respectively, which exceeds the recommended acceptable value of 0.7 (Sürücü & Maslakci, 2020). All in all, these results confirm the reliability and validity of the measurement used in this study.

Figure 1: Structural Model Assessment (Path Analysis) – Hypotheses Testing

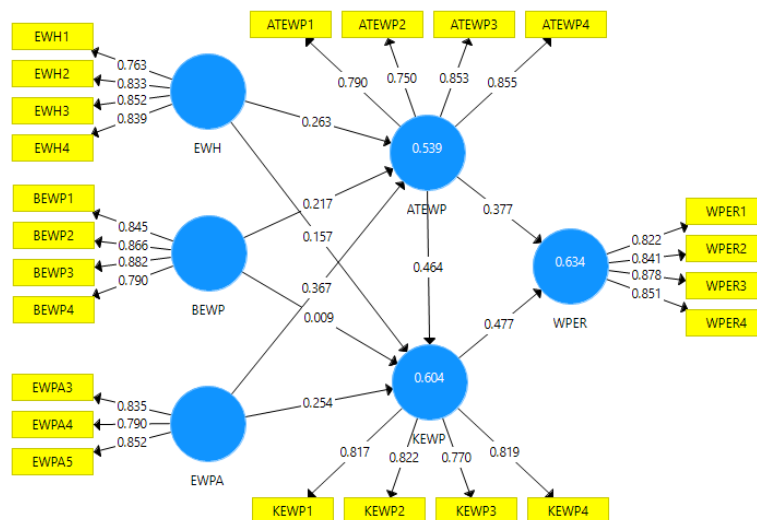


Figure 3: Structural Model

5.5. Hypothesis Results

Nine hypotheses were tested, and the path coefficients provided in Figure 3. The significant levels were assessed using p-values and t-statistics. Respectively using the p-values. Hypotheses are viewed as significant at a 95% or higher level of significance ($\geq 95\%$), that is

to say that p-value is ≤ 0.05 (Taimalu & Luik, 2019; Hayat, Shateri, Amini & Shokrpour, 2020). The t-statistics are expected to be greater than 1.96 for the proposed relationship to be deemed acceptable. The proposed hypotheses and path coefficients are provided first and followed by t-statistics and p-values – that indicate the significance level of the proposed relationship. Table 6 provides results for the nine hypotheses tested. All the nine hypotheses were proposed to be positive. Indeed, the results of the proposed hypotheses except one (H4) were positive as postulated.

Table 6: Path Analysis Results

Hypothesis	Path Co-efficient	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Rejected or supported
H1 EWH -> ATEWP	0.263	0.261	0.070	3.770	0.000	Supported
H2 EWH -> KEWP	0.157	0.162	0.064	2.458	0.014	Supported
H3 BEWP -> ATEWP	0.217	0.216	0.076	2.859	0.004	Supported
H4 BEWP -> KEWP	0.009	0.010	0.063	0.151	0.880	Insignificant
H5 EWPA -> ATEWP	0.367	0.372	0.068	5.437	0.000	Supported
H6 EWPA -> KEWP	0.254	0.255	0.061	4.175	0.000	Supported
H7 ATEWP -> KEWP	0.464	0.461	0.061	7.666	0.000	Supported
H8 ATEWP -> WPER	0.377	0.377	0.060	6.282	0.000	Supported
H9 KEWP -> WPER	0.477	0.478	0.057	8.331	0.000	Supported

Note: EWH- E-waste hazards; BEWP-Benefits of e-waste practices; EWPA- E-waste policy awareness; KEWP-Knowledge of e-waste practices; ATEWP-Attitude towards e-waste practices; WPER- Willingness to participate in e-waste recycling.

Nine hypotheses were proposed in the study. All hypotheses except H3 are statistically significant. The strongest relationship was between KEWP and WPER which has $\beta=0.477$; $t=8.331$; $p=0.000$ and the weakest relationship was between BEWP and KEWP which has $\beta=0.009$; $t=0.151$; $p=0.880$. A path coefficient of 0.263 was realized after testing H1($t=3.770$,

$p= 0.000$). This means that E-Waste Hazards (EWH) has a positive influence on Attitude Towards E-Waste Practices (ATEWP).

A path coefficient of 0.162 was realized after testing H2 ($t= 2.458$, $p=0.014$). This means that E-Waste Hazards (EWH) has a positive relationship with Knowledge on E-Waste Practices (KEWP). A path coefficient of 0.217 was realized after testing H3. This means that Benefits of E-Waste Practices (BEWP) has a positive influence on Attitude Towards E-Waste Practices (ATEWP). Furthermore, the results indicate that the relationship of Benefits of E-Waste Practices (BEWP) and Attitude Towards E-Waste Practices (ATEWP) is positively related in a significant way ($t=2.859$, $p= 0.004$).

The results obtained following the test of H4 confirmed that there is an association between Benefits of E-Waste Practices (BEWP) and Knowledge on E-Waste Practices (KEWP). A path coefficient of 0.009 was realized after testing H4. Moreover, the results indicate that the relationship of Benefits of E-Waste Practices (BEWP) and Knowledge on E-Waste Practices (KEWP) are positively related in an insignificant way ($t=0.151$, $p= 0.880$).

The results obtained following the test of H5 confirmed that there is an association between E-Waste Policy Awareness (EWPA) and Attitude Towards E-Waste Practices (ATEWP). A path coefficient of 0.367 was realized after testing H5 ($t= 5.437$, $p=0.000$). A path coefficient of 0.254 ($t=4.175$, $p= 0.000$) was realized after testing H6. This means that E-Waste Policy Awareness (EWPA) has a positive influence on Knowledge on E-Waste Practices (KEWP).

The results obtained following the test of H7 confirmed that there is an association between Attitude Towards E-Waste Practices (ATEWP) and Knowledge on E-Waste Practices (KEWP). A path coefficient of 0.464 ($t=7.666$, $p= 0.000$) was realized after testing H7. This means that Attitude Towards E-Waste Practices (ATEWP) has a positive influence on Knowledge on E-Waste Practices (KEWP).

A path coefficient of 0.377 ($t=8.331$, $p= 0.000$) was realized after testing H8. This means that Attitude Towards E-Waste Practices (ATEWP) has a positive influence on Willingness to Participate in E-Waste Recycling (WPER). The results obtained following the test of H9 confirmed that there is an association between Knowledge on E-Waste Practices (KEWP) and Willingness to Participate in E-Waste Recycling (WPER). A path coefficient of 0.477 ($t= 7.445$, $p=0.000$) was realized after testing H9. This means that Knowledge on E-Waste

Practices (KEWP) has a positive relationship with Willingness to Participate in E-Waste Recycling (WPER)

6.0. DISCUSSION AND IMPLICATIONS OF THE STUDY

6.1. Awareness of E-waste Hazards and Knowledge on E-waste Practices

Drawing from the structural equation modelling results using Smart PLS statistical software, it was concluded in the same chapter that awareness of e-waste hazards and knowledge on e-waste practices are positively related in a significant way. More specifically, awareness of e-waste hazards was found to influence 26.3% of the variations in knowledge on e-waste practices ($\beta=0.263$; $t = 7.183$; $p < 0.000$). Thus, the results confirm H1, implying that awareness of e-waste hazards is positively related to knowledge on e-waste practices in a significant way.

These findings support prior literature. Firstly, the study supports the findings by scholars such as Nowakowski (2019) and Borthakur and Govind (2019) that awareness of e-waste hazards has a positive effect on knowledge. Critically, the results of this study support the view that before consumers can form knowledge on e-waste practices, they need to be aware of the dangers imposed by not practicing proper recycling of e-waste (Kwatra, Pandey, Sharma, 2014; Kumar, Gaikwad, Sahajwalla, 2018; Dias et al., 2018). This assertion is buttressed by findings from a study conducted by Kwatra et al., (2014) in India's Delhi city. In this study, the scholars sort to examine the influence of awareness levels on the peoples' knowledge of e-waste practices regarding e-waste management. This survey revealed that significant fraction of middle-class population is still unaware about e-waste hazards. However, upon getting the information about e-waste hazards, they were able to link the impacts of improper management of e-waste with detrimental health outcomes and hence appreciated the need to adopt e-waste practices. Prior to the forgoing study finding, a research done by Tiep, Kin, Ahmed, and Teck, (2015) also confirmed the assertion that the high levels of the lack of e-waste hazards awareness among the 345 households surveyed in Melaka city of Malaysia, by and large accounted for their lack of knowledge associated with the existing collection and recycling program, and as such consequently explaining the failure of e-waste adoption in practice.

While such similar studies had hardly been done in the South African context, the current study findings give testimony to the fact that, e-waste hazards awareness campaigns by SMEs in the e-waste industry and perhaps too by the government of South Africa – are critically important

in spreading the knowledge on e-waste practices among the citizens. This contention is buttressed by the fact that there was a significant positive relationship between e-waste hazards awareness and knowledge on e-waste practices in the current study findings ($\beta=0.263$; $t = 7.183$; $p < 0.000$). Notwithstanding this, what is critical to note in this instance, is that e-waste awareness is only about consumers being aware of the existence of the e-waste hazards and not having knowledge of the intrinsic characteristics of the e-waste, i.e. e-waste knowledge. Thus, if e-waste awareness is not coupled with e-waste knowledge, it is likely that distorted willingness to participate in e-waste recycling will be realised (Peeranart, Naidu & Wong, 2013). The implication is that SMEs in the e-waste industry and the government need to focus on both e-waste awareness and e-waste knowledge. The influence of e-waste knowledge on willingness to e-waste recycling is discussed later in this study.

This study confirms the hypothesis that e-waste awareness is positively related to knowledge on e-waste practices. Again, these findings align with prior empirical literature, that e-waste awareness is positively related to e-waste practices knowledge (Kwatra, Pandey, Sharma, 2014; Tiep, et al., 2015; Kumar, Gaikwad, Sahajwalla, 2018; Dias et al., 2018; Nowakowski, 2019; Borthakur & Govind, 2019).

6.2. Awareness of E-waste Hazards and Attitude towards E-waste Practices

The current study results supported the postulated second hypothesis (H2). The results showed that awareness of e-waste hazards and attitude towards e-waste practices are positively related. Moreover, the structural equation modelling results using Smart PLS provided in Chapter 4, show that awareness of e-waste hazards and attitude towards are positively related in a significant way ($\beta=0.162$; $t = 2.458$, $p=0.014$). More specifically, awareness of e-waste hazards was found to influence 16.2% of the variations in attitude towards e-waste practices.

These findings align with the existing literature reviewed, which invariably showed that awareness of e-waste hazards has a positive influence on attitude towards e-waste practices. Scholars such as Sivathanu, (2016), Kangyang, Rampedi, Ifegbesan and Machete, (2020); and Singhal, Lyngdoh and Prabhakaran, (2021) investigated the influence of awareness of e-waste on attitude towards e-waste through e-waste behaviour, and concluded that e-waste awareness had a positive effect on attitude towards e-waste. One recent study that critically confirmed the relevance of e-waste hazards awareness and knowledge in shaping the attitude of people is one by Decharat and Kiddee (2022). Using a sample size of 272 participants in Southern Thailand, these scholars found out that the awareness and of respondents on hazardous waste was

associated with their positive attitude towards e-waste practices. In particular, the study found out that when the participants became aware of the dangers associated with e-waste that had high hazardous index (HI) – (e.g., values of indoor dust samples, drinking water samples, and personal air samples) – their attitude towards e-waste practices positively improved in a significant way. Premised on this finding Decharat and Kiddee (2022), therefore concluded that firm managers needed to promote educational and awareness programmes on e-waste hazards in order to transform the attitude of people towards e-waste practices. More so, the role of awareness programmes were noted to facilitate active information dissemination and hence leading to attitude changes in a positive or negative way. For instance, while numerous studies seem to support a positive relationship between awareness and positive attitude changes (Sivathanu, 2016; Kangyang, Rampedi, Ifegbesan & Machete, 2020; Singhal, Lyngdoh & Prabhakaran, 2021), a study conducted by Nwagwu and Okuneye, (2016) that focused on the effect of awareness on attitudes of Small-Scale Information Technology Business Operators in Lagos, Nigeria found a negative relationship. This finding was astonishing according to Nwagwu and Okuneye, (2016) given the high level of awareness about e-waste hazard done by the Small-Scale Information Technology Business Operators in Lagos. The scholars however, concluded that perhaps it was imperative for the Lagos State government to lead mass awareness programs encompassing all the stakeholders of e-waste in order to observe a positive attitude change towards e-waste practices (Nwagwu & Okuneye, 2016).

On the basis of this unique finding by Nwagwu and Okuneye, (2016), perhaps this makes the results on awareness of e-waste and attitude towards e-waste practices relationship inconclusive. Thus, it can be concluded too that the current study finding is a sharp contrast to the finding by Nwagwu and Okuneye, (2016). However, notwithstanding this – the implications of this study finding and as well as also noted and recommended by Nwagwu and Okuneye, (2016) in their finding – are that, both the SMEs in the e-waste industry and the governments should perhaps participate in mass awareness programmes on e-waste hazards that are targeted at positively influencing attitude and behavioural changes consequently.

6.3. Awareness of Benefits of E-Waste Practices and Attitude Towards E-waste Practices

Grounded on the structural equation modelling results – it was found that benefits of e-waste practices contribute to 21.7% of the variations in attitude towards e-waste ($\beta=0.217$). Thus, the results confirm and support the posited hypothesis – H3, hence, implying that benefits of e-

waste practices are positively related to attitude towards e-waste practices in a significant way ($t= 2.859$, $p= 0.004$).

A cross-examination of the state of literature in the reverse logistics space seem to support the current study findings. For instance, a study by Wang, Zhang, and Zhang (2011) in Beijing City, China found out that when the residents are aware of the benefits and the need to evade hazards caused by e-waste – they tend to adopt a positive attitude towards e-waste practices. This finding by Wang et al (2011) is further buttressed by a study done by Marques, and da Silva, (2017) in Portugal that examined the impact of students' awareness of the benefits of good e-waste disposal on their attitudinal and behavioral changes towards e-waste practices. In this study, Marques, and da Silva, (2017) found a positive and significant relationship, hence, further confirming the current study findings. Conversely, a survey and analysis of consumers' behaviour for electronic waste management in Bangladesh done by Ananno, Masud, Dabnichki, Mahjabeen and Chowdhury (2021) found that the lack of knowledge of the benefits of good e-waste practices negatively influenced the resident's attitudes towards e-waste practices in a significant way. By and large, it appears that the bulk of the studies the evaluated posited hypothesis H3 – seem to find a positive and significant relationship and therefore, supporting this study finding.

Deducing from the current study finding and the supporting empirical evidence from the extant literature, perhaps it can be submitted that the awareness on benefits of e-waste practices is a critical aspect in strengthening and making attitude towards e-waste practices in the context of SMEs operating in South Africa's e-waste industry. Perhaps too, premised on the current study finding it can further be deduced that in the event that the policymakers seek to improve the citizens' attitude towards e-waste practices such as the adoption of recycling – the adoption of awareness programmes that focus on highlighting the benefits of e-waste practices are imperative.

6.4. Awareness of Benefits of E-Waste Practices and Knowledge of E-waste Practices

As hypothesised, indeed a positive relationship between the awareness of benefits of e-waste practices and the knowledge of e-waste practice was found ($\beta=0.009$). This result implies that awareness of benefits of e-waste practices accounts for 0.09% of the variations in knowledge of e-waste practices. However, this relation although it is positive as proposed in the hypothesis – it was found to be insignificant ($t= 0.151$, $p= 0.880$). In other words, this finding implies that the effect of the awareness of benefits of e-waste practices on the knowledge of e-waste practice

may be regarded not important. It is hard to find supporting evidence in the empirical literature indicating a positive but insignificant relationship between the awareness of benefits of e-waste practices and the knowledge of e-waste practice. Thus, this study result is contrary to the bulk of the empirical findings that seem to provide a positive and significant relationship between the awareness of benefits of e-waste practices and the knowledge of e-waste practice (e.g., Sivathanu, 2016, Beleya, Bakar, & Chelliah, 2017; Arain, Pummill, Adu-Brimpong, Becker, Green, Ilardi, Van Dam, & Neitzel, 2020; Adeel, Nayab, Qureshi, & Channa, 2023). Surprisingly enough, the current study finding is supported by Sinclair-Maragh, Gursoy, and Vieregge, (2015) results in the tourism sector which conversely found a negative and insignificant relationship between perceived benefits from tourism exchange and unfavorable perceptions of knowledge of tourism.

Concisely, the current study finding assert that awareness of e-waste benefits does not translate to solid knowledge of e-waste practices in the context of SMEs in South Africa's e-waste industry. In other words, this implies that awareness of e-waste benefits is an insignificant factor in building positive knowledge of e-waste practices among the SMEs in South Africa's e-waste industry. This then might further imply that there is more to e-waste awareness factor to develop a solid knowledge of e-waste practices. For instance, perhaps practical exposure and experience of e-waste practices might contribute to a stronger experiential knowledge base of e-waste practices by SMEs in South Africa's e-waste industry.

6.5. Waste Policy Awareness and Knowledge on E-waste Practices

Drawing from the data analysis results using the structural equation modelling with Smart PLS statistical software – the results revealed that e-waste policy awareness positively influences knowledge on e-waste practices in a significant way as indicated by the acceptable *t statistic* and *pvalue* ($\beta = 0.367$; $t = 5.437$, $p = 0.003$). In other words, the path results suggest that variations in e-waste policy awareness account for just more than 36% of the variations in knowledge on e-waste practices.

This study finding is supported in the empirical literature. For example, several scholars proposed that consumers are more likely to develop knowledge on e-waste practices when they are aware of government policies governing it (Mejame et al., 2020; Li et al., 2015). According to Heeks, Subramanian and Jones (2015) and Nwagwu and Okuneye, (2016) when governments legislate policies governing e-waste and awareness campaigns are done to conscientise the citizens of it, there is high likelihood that the citizens will become more

knowledgeable of the hazards of not and benefits of adopting e-waste practices. Buttressing the same notion conversely, a specific study by Adediran and Abdulkarim, (2012) indicated that the lack of awareness of public policies governing e-waste disposal was a contributing factor of the lack knowledge on the inherent dangers of handling e-waste in Nigeria. Adediran and Abdulkarim, (2012) therefore, concluded that the government has to increase awareness of e-waste policies to both individuals and organisations such that the citizens gain the requisite knowledge on e-waste recycling practices. Besides, Cole *et al.*, (2018) and Garg, (2020) also arrived on the same conclusion when they recommended that the government of South Africa should embark on aggressive awareness programmes on e-waste disposal in order to increase the knowledge on e-waste hazards and adoption of e-waste practices such as e-waste recycling. Concurring with the same notion, Kaminsky, (2016), asserted that e-waste policy awareness of individuals or SMEs maybe turned into knowledge when the government prioritize the e-waste management system and policies. However, Kaminsky (2016) further noted that the e-waste policies alone are not good enough unless there is a concerted effort by government to foster and maintain high levels of e-waste policy awareness – that appeals to the hearts and minds of the consumers. Furthermore, discussing some e-waste practices, scholars such as Liddle (2013) emphasised the need for government to encourage customers to recycle and reuse products associated with e-waste.

Deducing from the current study's results, it can therefore, be submitted that awareness programmes of e-waste hazards and the benefits e-waste practices – makes the SMEs not only observe government e-waste policies out fear or obligation but also out of their conscious knowledge to preserve a clean environment in the country. To this end, premised on this finding, perhaps it can be concluded too that the government of South Africa should aim to create high levels of e-waste policy awareness in order to improve the level of SMEs knowledge of e-waste recycling practices in South Africa.

6.6. Waste Policy Awareness and Attitude towards E-waste Practices

The analysis of empirical data collected for this study presented in this study, revealed that e-waste policy awareness is positively related to attitude towards e-waste practices. More specifically, the relationship between e-waste policy awareness and attitude towards e-waste practices was found to be significantly positive ($\beta = 0.254$, $t = 4.175$, $p = 0.000$) – since, the p -value for this path coefficient is less than 0.05 as recommended Hair, Matthews, Matthews, and Sarstedt, (2017) hence, statistically significant.

Interestingly, a considerable number of scholars also found a significant positive relationship between e-waste policy awareness and attitude towards e-waste practices (e.g., Afroz, Masud, Akhtar, & Duasa, 2012; Akhtar, Masud, & Afroz, 2014; Sivathanu, 2016; Echegaray, & Hansstein, 2017; Kaijage¹, & Mtebe, 2017; Borthakur, & Govind, 2017; Shevchenko, Laitala, Danko, 2019; Arian et al., 2020; Islam, Dias, & Huda, 2021; Neto, Monteiro, Silva, Miranda, & Santos, 2022). These findings cut across all the continents of the world – that is, Africa (Tanzania), Australia, Asia (Malaysia and India), Europe (United Kingdom), Latin America (Brazil) and the United States of America. In addition, like the current study result, the findings from these studies obtained a positive and significant e-waste policy awareness on attitude towards e-waste practices.

Critically, the results of this study support the view that before SMEs can form an attitude towards e-waste recycling practices, they need to know that the policies governing e-waste (Bimir, 2020). To some extent, this is common sense because for individuals to form an attitude towards something, they need to know what that thing is and that it exists. Thus, to this end, the existence of e-waste policy awareness is particularly critical in helping SMEs to form an attitude towards e-waste recycling practices in South Africa. It is also important to note that such attitude formation can be either positive or negative depending on how the citizens perceive the government's e-waste police.

From the results relating to the objective, this study confirms the hypothesis that e-waste policy awareness is positively related to attitude towards e-waste recycling practices. Again, these findings align with prior empirical literature, that policy awareness is positively related to attitude towards e-waste. The implication is that in its strategy to improve attitude towards e-waste among SMEs, the government needs to focus on creating positive awareness of e-waste recycling practices. However, in the current study, a positive relationship was posited and indeed, the research finding supported a positive relationship between e-waste policy awareness and attitude towards e-waste recycling practices in a significant way.

6.7. Knowledge on E-waste Recycling Practices and Attitude towards E-waste Recycling Practices

A statistical test of this posited hypothesis using Smart PLS software for structural equation modelling in Chapter 4 – revealed that, indeed there is positive relationship knowledge on e-waste practices and attitude towards e-waste recycling practices ($\beta = 0.464$). Not only was this finding positive as postulated in the hypothesis – but that the relationship also was found to be

very significant statistically ($t=7.666$, $p=0.000$). Thus, it can be concluded that knowledge on e-waste practices has a strong influence on attitude towards e-waste recycling practices in South Africa's SMEs sector.

A cross-examination of the state of literature seem to provide numerous studies that have found a positive relationship between knowledge with environmentally sustainable behaviour – in general. Li et al. (2012), for instance, argued that high educational level (knowledge) appears to be the most significant aspect in raising the potential attitude towards e-waste recycling practices. More so, a study by Mahat, Hashim, Nayan, Saleh, and Norkhaidi, (2019) in Malaysia the relationship between knowledge on e-waste practices and attitude towards e-waste recycling practices. In their finding, Mahat et al., (2019) concluded that knowledge of e-waste practices influences the recycling behaviour via attitudinal effects. Decharat and Kiddee, (2022) in Thailand who in their study also found a very significant relationship between knowledge on e-waste practices and attitude towards e-waste recycling practices also further bolstered this finding. However, a study by Kwatra, Pandey, and Sharma (2014) in India, although the relationship between knowledge on e-waste practices and attitude towards e-waste recycling practices was positive – it was insignificant, contrary to the current research finding that was very significant ($\beta=0.464$; $t=7.666$, $p=0.000$).

Concisely, it can therefore, be submitted that an increase in knowledge among SMEs through for instance, health education related to the adverse effects of e-waste toxics, may strongly influence their attitude towards the adoption of e-waste recycling as a practice to protect the environment and human health in general. In the context of this study, the SMEs' knowledge on e-waste relates to the ability to practice the recycling of e-waste or dispose e-waste in the right way to help the environment and health of the public. This implies that SMEs knowledge and attitude towards e-waste can bring mutually benefits to health and environmental surroundings.

With this in mind, the government of South Africa and perhaps too in conjunction with the none-governmental organisation or pressure groups such those that lobby for “going green” or the “green revolution” may consider embarking on educational programmes that seeks to empower – not only those in the SMEs sector but also all the citizens with the requisite knowledge on e-waste dangers and the benefits of environmentally practice related to e-waste disposal. Such endeavours might have the power to influence the attitude towards e-waste recycling practices by those in the SMEs sector and the citizens at large.

6.8. Attitude towards E-waste Practices and Intention to Adopt E-waste Recycling

Based on the research findings provided in study, the path coefficient between attitude towards e-waste practices and willingness to participate in e-waste recycling relationship was $\beta=0.377$. This result shows that attitude towards e-waste practices positively influences the willingness to participate in e-waste recycling. In other words, this means that attitude towards e-waste practices was found to account for 37.7% of the variations in willingness to participate in e-waste recycling. In addition, the relationship was assessed through Smart PLS statistical software bootstrapping approach and the results revealed that attitude towards e-waste practices has a statistically significant positive effect on willingness to participate in e-waste recycling ($t= 8.331$, $p= 0.000$).

These results imply that the attitude of SMEs towards e-waste practices forms the basis upon which they might adopt e-waste recycling practices. Attitude towards e-waste practices in the context of this study was defined according to Vijayan, Krishnana, Parayitam, Duraisami, and Saravanaselvan (2023) who defined it as ‘a positive or negative feeling or mental state of readiness, learned and organised through experience, that exerts specific influence on a person’s response to people, objects, and situations’. It is worth noting that the finding on this hypothesis happen to be the most significant – that is, the relational effect between attitude towards e-waste practices and willingness to adopt e-waste recycling is the highest statistical significance ($t= 8.331$, $p= 0.000$) when compared to the other eight hypotheses. Thus, largely, these results can be interpreted as showing that when SMEs develop a strong positive attitude towards e-waste practices, they are likely to be willing to participate in the e-waste recycling practices.

A cross examination of the extant literature supports the assertion that e-waste attitudes play a paramount positive role in explaining a greater willingness to adopt e-waste recycling (Graham-Rowe et al., 2015; Stefan et al., 2013; Visschers et al., 2016; Wanget al., 2018; Zhang et al., 2018; Simamora et al., 2021; Vijayan et al., 2023). These studies therefore, support the current study hypothesis aforementioned. Based on the foregoing discussion, it can be concluded that by successfully changing the attitudes of the actors in the SMEs e-waste sector in positive way, the government of South Africa might witness a rampant adoption of e-waste recycling practices – and eventually building an environmentally friendly smart economy.

6.9. Knowledge on E-waste Practices and Intention to Adopt E-waste Recycling

The results provided in the data analysis chapter indeed confirm that knowledge of e-waste practices are positively related to the willingness to adopt e-waste recycling ($\beta=0.448$). This was in line with the postulated hypothesis – hence, confirmed the proposed hypothesis. Moreover, this positive relationship was found to be statistically very significant ($t=7.481$; $p=0.000$) since the p-value was less than the recommended 0.05 and the t-statistics was greater than the 1.96 threshold – hence too, the hypothesis is accepted in a significant way.

The results from the study support that knowledge of e-waste practices influence the SMEs' willingness to adopt e-waste recycling in South Africa. These findings are support by a previous study done in Nigeria - which indicated that most Nigerians from Lagos City are willing to participate in WEEE, provided that they are given appropriate knowledge on its safe disposal and recycling (Miner et al., 2020). Shaikh et al. (2020), in Pakistan, also mentioned that consumers indicate a willingness to pay to proper e-waste recycling mechanisms, given they have been adequately educated on available and convenient disposal system. In the current study, knowledge on e-waste refers to one's perception of how far the person knows about environmental issues such as e-waste in general (Mahat et al., 2019).

Needless to say, the implication of the study by and large is that knowledge of e-waste practices is a significant factor in building positive willingness to participate e-waste recycling by SMEs in South Africa. However, as noted by Simamora et al., (2021), this knowledge can be in the form of perceived knowledge, objective knowledge, and experience-based knowledge. In the current study, both perceived and objective knowledge can be anticipated to play a crucial role in enticing the SMEs to adopt e-waste recycling in South Africa.

Deducing from the forgoing assertion, perhaps the Government of South Africa need to implement e-waste promotion and marketing techniques that appeal to the SMEs psyche, since this determines firms' perception in participating in e-waste recycling. Furthermore, it creates the SME's mental association with the e-waste practices. SMEs can have different meaning of e-waste knowledge and, therefore, policies designed to create willingness to participate in e-waste recycling need to go beyond generic aspects that target all SMEs to include elements of knowledge. SMEs' minds need to be 'knowledgeable' about the e-waste benefits that make it unique and valuable. In that way, SMEs acquire appropriate objective knowledge of e-waste practices. In conclusion, this study has shed some light and, in the process, revealed that

knowledge on e-waste practices positively influences SMEs' willingness to participate in e-waste recycling in a significant way in South Africa's e-waste recycling industry.

7.0. LIMITATIONS OF THE STUDY AND RECOMMENDATIONS FOR FUTURE RESEARCH

The purpose of the current study as purported in previous sections is to investigate the influence of e-waste awareness factors (e-waste hazards, benefits of e-waste practices, and awareness of e-waste policy) on the sole behavioral intention factor (willingness to participate in e-waste recycling) and the mediating role of the perceptions factors (knowledge of e-waste practices, perceived e-recycling effectiveness, and attitude towards e-waste practices) in this posited relationship.

Firstly, the current study developed hypotheses based on a conceptualised research model with three predictor variables (e-waste hazards, benefits of e-waste practices, and awareness of e-waste policy), two mediators (knowledge of e-waste practices, perceived e-recycling effectiveness, and attitude towards e-waste practices) and one out variable (willingness to participate in e-waste recycling). Premised on this postulated conceptual model – the researcher was limited to nine (9) hypotheses. However, a study with more predictors, mediators and outcomes could perhaps yield more valuable insights and hence, contribute more new knowledge to the existing body of academic inquiry.

Furthermore, the present study employed a cross-sectional survey design (Bryman et al., 2017). This design involved the development and implementation of a structured questionnaire containing instruments to assess research variables and collect demographic data. Future research endeavors may benefit from conducting longitudinal studies that specifically focus on investigating the enduring relational effects among the variables of interest over an extended period of time. Therefore, conducting a study investigating the potential long-term impacts of predictor variables such as e-waste hazards, benefits of e-waste practices, and awareness of e-waste policy on the outcome variable of willingness to participate in e-waste recycling, as well as exploring the potential mediating factors of knowledge of e-waste practices, perceived effectiveness of e-recycling, and attitude towards e-waste practices, could offer valuable and novel contributions to the current academic literature.

Third, this study was limited to SMEs in the e-waste business in scope. Perhaps, a study that sought to compare the findings from SMEs and large size firms in the e-waste business using

the same proposed conceptual model – could have yielded more interesting research findings with over-arching managerial and policy implications to both business practitioners and policy makers respectively. In this token, perhaps future studies should be consider undertaking a comparative study between SMEs and large size firms in the e-waste business using the same conceptual model or a modified one.

Fourth, as indicated previously, this study is limited to South Africa in general. However, given that Southern Africa as a region lacks studies of this nature – perhaps, future studies can consider some comparative research on the same between South Africa and for instance, its neighboring Southern African countries such as Zimbabwe, Botswana, Mozambique, Lesotho and Eswathini. Such a comparative study will not only contribute new insights – but also increase research output and empirical evidence from an often-neglected research context of Southern African region on e-waste related studies.

Lastly, this study was a purely quantitative study informed by an objective ontology, a positivist epistemology and a deductive approach of conducting scientific academic research. Perhaps, future studies might consider using an abductive research approach that is meant for mixed method research which is informed by a critical realism research paradigm.

8.0. REFERENCES

- Alarcón, D., Sánchez, J. A., & De Olavide, U. (2015, October). Assessing convergent and discriminant validity in the ADHD-R IV rating scale: User-written commands for Average Variance Extracted (AVE), Composite Reliability (CR), and Heterotrait-Monotrait ratio of correlations (HTMT). In Spanish STATA meeting (Vol. 39, pp. 1-39).
- Antioco, M., & Kleijnen, M. (2010). Consumer adoption of technological innovations: Effects of psychological and functional barriers in a lack of content versus a presence of content situation. *European Journal of Marketing*, 44(11/12), 1700-1724.
- Barbera, J., Naibert, N., Komperda, R., & Pentecost, T. C. (2020). Clarity on Cronbach's alpha use. *Journal of Chemical Education*, 98(2), 257-258.
- Borthakur, A., & Govind, M. (2017). Emerging trends in consumers' E-waste disposal behaviour and awareness: A worldwide overview with special focus on India. *Resources, Conservation and Recycling*, 117, 102-113.

- Bryman, A. (2017). Quantitative and qualitative research: further reflections on their integration. In *Mixing methods: Qualitative and quantitative research* (pp. 57-78). Routledge.
- Cai, K., Song, Q., Peng, S., Yuan, W., Liang, Y., & Li, J. (2020). Uncovering residents' behaviors, attitudes, and WTP for recycling e-waste: a case study of Zhuhai city, China. *Environmental Science and Pollution Research*, 27, 2386-2399.
- Claudy, M. C., Garcia, R., & O'Driscoll, A. (2015). Consumer resistance to innovation—a behavioral reasoning perspective. *Journal of the Academy of Marketing Science*, 43, 528-544.
- Crego, C., & Widiger, T. A. (2015). Psychopathy and the DSM. *Journal of personality*, 83(6), 665-677.
- Dias, P., Bernardes, A. M., & Huda, N. (2018). Waste electrical and electronic equipment (WEEE) management: An analysis on the Australian e-waste recycling scheme. *Journal of cleaner production*, 197, 750-764.
- Esmaeilian, B., Wang, B., Lewis, K., Duarte, F., Ratti, C., & Behdad, S. (2018). The future of waste management in smart and sustainable cities: A review and concept paper. *Waste management*, 81, 177-195.
- Gupta, A., & Arora, N. (2017). Understanding determinants and barriers of mobile shopping adoption using behavioral reasoning theory. *Journal of Retailing and Consumer Services*, 36, 1-7.
- Hair, Jr, J. F., Sarstedt, M., Matthews, L. M., & Ringle, C. M. (2016). Identifying and treating unobserved heterogeneity with FIMIX-PLS: part I—method. *European business review*, 28(1), 63-76.
- Hayat, A. A., Shateri, K., Amini, M., & Shokrpour, N. (2020). Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: a structural equation model. *BMC medical education*, 20(1), 1-11.
- Imran, M., Haydar, S., Kim, J., Awan, M. R., & Bhatti, A. A. (2017). E-waste flows, resource recovery and improvement of legal framework in Pakistan. *Resources, Conservation and Recycling*, 125, 131-138.
- Kleijnen, M., Lee, N., & Wetzels, M. (2009). An exploration of consumer resistance to innovation and its antecedents. *Journal of economic psychology*, 30(3), 344-357.

Li, W., & Achal, V. (2020). Environmental and health impacts due to e-waste disposal in China—A review. *Science of the Total Environment*, 737, 139745.

Lu, S. Y., Li, Y. X., Zhang, J. Q., Zhang, T., Liu, G. H., Huang, M. Z., ... & Qiu, R. L. (2016). Associations between polycyclic aromatic hydrocarbon (PAH) exposure and oxidative stress in people living near e-waste recycling facilities in China. *Environment international*, 94, 161-169.

Murthy, V., & Ramakrishna, S. (2022). A review on global E-waste management: urban mining towards a sustainable future and circular economy. *Sustainability*, 14(2), 647.

Norman, R. E., Byambaa, M., De, R., Butchart, A., Scott, J., & Vos, T. (2012). The long-term health consequences of child physical abuse, emotional abuse, and neglect: a systematic review and meta-analysis. *PLoS medicine*, 9(11), e1001349.

Nowakowski, A. C., Sumerau, J. E., & Mathers, L. A. (2016). None of the above: Strategies for inclusive teaching with “representative” data. *Teaching Sociology*, 44(2), 96-105.

Pandey, P., & Govind, M. (2014). Social repercussions of e-waste management in India: a study of three informal recycling sites in Delhi. *International Journal of Environmental Studies*, 71(3), 241-260.

Pariatamby, A., & Victor, D. (2013). Policy trends of e-waste management in Asia. *Journal of Material Cycles and Waste Management*, 15, 411-419.

Purwanto, A. (2021). Education research quantitative analysis for little respondents: comparing of Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS. *Jurnal Studi Guru Dan Pembelajaran*, 4(2).

Rasoolimanesh, S. M., Seyfi, S., Rather, R. A., & Hall, C. M. (2022). Investigating the mediating role of visitor satisfaction in the relationship between memorable tourism experiences and behavioral intentions in heritage tourism context. *Tourism Review*, 77(2), 687-709.

Ravindra, K., & Mor, S. (2019). E-waste generation and management practices in Chandigarh, India and economic evaluation for sustainable recycling. *Journal of Cleaner Production*, 221, 286-294.

Sahu, A. K., Padhy, R. K., & Dhir, A. (2020). Envisioning the future of behavioral decision-making: A systematic literature review of behavioral reasoning theory. *Australasian Marketing Journal*, 28(4), 145-159.

Shaikh, S., Thomas, K., Zuhair, S., & Magalini, F. (2020). A cost-benefit analysis of the downstream impacts of e-waste recycling in Pakistan. *Waste Management*, 118, 302-312.

Shittu, O. S., Williams, I. D., & Shaw, P. J. (2021). Global E-waste management: Can WEEE make a difference? A review of e-waste trends, legislation, contemporary issues and future challenges. *Waste Management*, 120, 549-563.

Sürücü, L., & Maslakci, A. (2020). Validity and reliability in quantitative research. *Business & Management Studies: An International Journal*, 8(3), 2694-2726.

Taimalu, M., & Luik, P. (2019). The impact of beliefs and knowledge on the integration of technology among teacher educators: A path analysis. *Teaching and teacher Education*, 79, 101-110.

Tandon, A., Dhir, A., Kaur, P., Kushwah, S., & Salo, J. (2020). Behavioral reasoning perspectives on organic food purchase. *Appetite*, 154, 104786.

Wang, Z., Guo, D., & Wang, X. (2016). Determinants of residents'e-waste recycling behaviour intentions: evidence from China. *Journal of cleaner production*, 137, 850-860.

Westaby, J. D. (2005). Behavioral reasoning theory: Identifying new linkages underlying intentions and behavior. *Organizational behavior and human decision processes*, 98(2), 97-120.

Xu, X., Hua, Y., Wang, S., & Xu, G. (2020). Determinants of consumer's intention to purchase authentic green furniture. *Resources, Conservation and Recycling*, 156, 104721.

Yusoff, M., & Izhan, M. (2020). The use of system dynamics methodology in building a COVID-19 confirmed case model. *Computational and Mathematical Methods in Medicine*, 2020.

Zhang, S., Yao, L., Sun, A., & Tay, Y. (2019). Deep learning based recommender system: A survey and new perspectives. *ACM computing surveys (CSUR)*, 52(1), 1-38.