Drivers and Inhibitors of Sustainable Electronic Waste Collection and Disposal Behavioural Intentions in a Developing Country

Sonny Juma Nyeko[1], Samali Mlay[2], Bosco Amerit[3], Abdallah Ibrahim Nyero[4]

Abstract

Rapid urbanization has led to the dramatic generation of electronic waste (E-waste) with societal severe socio-economic and environmental implications. The situation is providing a daunting responsibility for Governments in developing countries in ensuring sustainable E-waste management. Thus, sustainable E-waste management becomes indispensable, especially when collection and disposal targets are unknown. The study aimed to examine the drivers and inhibitors of sustainable collection and disposal of E-waste in 10 Ugandan cities. Behavioural reasoning theory (BRT) was a theory employed to understand Government employees' behaviour better and identify the drivers and inhibitors of sustainable E-waste collection and disposal. By way of a questionnaire survey from 346 city employees, data were collected and analysed through the partial least squares structural equation modelling - (PLS-SEM). Results largely support the developed and proposed framework while confirming its robustness in determining sustainable E-waste collection and disposal behavioural intentions. In the BRT context, the study contributes to theory by providing a more comprehensive behavioural understanding of drivers and inhibitors of E-waste collection and disposal based on "reasons against and for" in a sustainable manner. Besides, one of the rarest studies in an E-waste management context manifests the importance of the PLS-SEM approach in successfully analysing two dependent variables. The study provides practical implications and recommendations to all E-waste stakeholders.

Keywords: E-waste, Behavioural reasoning theory, collection, disposal, sustainable, PLS-SEM

Introduction

The rapid technological advancement and the mounting requirements of households have ensued in more considerable consumption of natural resources, resulting in correspondingly rapid electronic waste (E-waste) growth worldwide (Mmereki *et al.,* 2016). Dias *et al.* (2019) state that E-waste entails electrical and electronic equipment (EEE), subassemblies, as well as components already discarded by their owners. At an annual growth rate of 4 – 5% (Islam *et al.,* 2016), E-waste is one of the pollutants causing severe threats to both human health and the environment (Echegaray & Hansstein, 2017; Dias *et al.,* 2018). The pollutants comprise toxic and hazardous components harmful to human health and the environment mainly due to lack of appropriate recycling technology and expertise for treating the massive E-waste volumes generated yearly

[1] Makerere University Business School – Uganda
Email: snyeko@mubs.ac.ug
[2] Makerere University Business School – Uganda
[3] Makerere University Business School – Uganda
[4] Makerere University Business School – Uganda

(Jujun *et al.,* 2014; Dias *et al.,* 2018). Wang *et al.* (2016) assert that in 2014 about a 42million metric tons of E-waste were generated at a global scale. In contrast, Peng *et al.* (2018) highlighted a scenario of anticipated massive E-waste volume to surpass a 50million metric tons mark in 2018 and beyond 52million metric tons in 2021 (Nguyen *et al.,* 2020). These scenarios call for serious global consideration of ways to address the challenge.

Extant studies have generally focused on comprehending the motives for recycling E-waste (Wang *et al.,* 2018; Nduneseokwu *et al.,* 2017). In other words, existing studies mainly concentrated on facilitators or reasons for engaging in recycling E-waste and rarely studied the equally vital barriers or inhibitors that contribute to customer resistance to engaging in E-waste recycling. Meanwhile, Sahu *et al.* (2020) and Claudy *et al.* (2015) recommended that scholars focus on understanding facilitators and inhibitors to action, behaviour, and generally any innovation. Zhong and Huang (2016) have stressed that the user's unwillingness to recycle E-waste was one of the main challenges requiring scholars' urgent research attention. Despite E-waste recycling and proper disposal having several societal and environmental benefits, consumers are habitually engaged in illegal and open dumping of residues of E-waste and non-functional parts (Forti, Kuehr, Baldé, & Bel, 2020). Open and unlawful dumping of E-waste is attributed to lack of awareness, lack of monetary incentives, unenforceable and weak laws and regulations, non-availability of recycling, disposal, and collection sites, and convenience of the action (Forti *et al.,* 2020). Echegaray and Hansstein (2017) suggest that users get motivated to indulge in E-waste recycling and disposal for proper E-waste management. Consequently, it's imperative to comprehend the consumer behavioural issues associated with E-waste recycling as well as disposal toward ensuring successful E-waste management (Liu *et al.,* 2019; Borthakur & Govind, 2017; Kumar, 2019; Wang *et al.,* 2018) and in a sustainable manner. The developing economies may fail to attain sustainable development goals (SDGs), especially (SDG 7 relevant in this study) as stipulated by United Nations, unless policies/mechanisms are put in place to achieve them. Sustainable development practices emphasize social sustainability, environmental sustainability, and economic sustainability (Abrahams, 2017).

In a bid to address E-waste management problems, several electrical and electronic equipment (EEE) producers have established collection and disposal centres for obsolete or outdated electronic equipment from consumers (Bovea *et al.,* 2017; Agrawal *et al.,* 2015). The collected products and devices can be recycled, repaired, reused, or disposed of appropriately (Bovea *et al.,* 2017; Agrawal *et al.,* 2015). However, despite the availability and readiness of recycling and collection centres, consumers of old EEE ignore using the E-waste and instead dump them in open spaces or sell them in second-hand stores (Forti *et al.,* 2020; Dixit & Vaish, 2013). Moreover, the collection and disposal targets are unknown. Uganda, a developing country, is faced with problems related to the disposal of EEE waste (E-waste Guideline, 2016). These gadgets pose environmental and health concerns at the end of their useful life (NEMA, 2020). In Uganda's urban centres, there is a practice of disposing of electronic gadgets with household garbage. As a result, the toxins pose a significant threat to the health and gradual decay of biodiversity in the environment. Workers in the E-waste scrap yards are all exposed to the toxic chemicals from the EEE (E-waste Policy, 2012). Consequently, the Government of Uganda is establishing a national collection site, yet no study on behavioural intentions on collecting and disposal of E-waste has been conducted. Moreover, the study contends that no prior investigational study within a single framework has examined the relative effect of the various

factors determining the resistance and adoption of E-waste collection and subsequent disposal, a focus of this study. Therefore, the study outcomes are of exceptional significance to policymakers, scholars, service providers, and practitioners engaging in E-waste collection and disposal efforts.

Behavioural reasoning theory (BRT)

Scholars recognize the increasing importance of better understanding whether, when, and why consumers consider accepting and using EEE as an innovation (Sahu *et al.*, 2020). To this end, various theoretical agendas and frameworks are available and discussed to enable researchers and consultants to understand the uptake of some innovations. Significant examples include the technology acceptance model (TAM), diffusion of innovation theory (DOI), the theory of planned behaviour, as well as the theory of reasoned action (TRA). However, these frameworks mainly focus on the acceptance of interrelated drivers, whereas consumer resistance is typically ignored (Sahu *et al.,* 2020; Claudy *et al.,* 2015). Sahu *et al.* (2020) aver that BRT is an evolving consumer behaviour theory that broadens the various behavioural aspects concerning consumer intentions. BRT advocates for the associations between values (that ideally represent the norms and beliefs) and reasons (that define drive and restrict), as well as the attitude and the intentions to utilize a specific innovation (Westaby, 2005). BRT enables researchers to investigate the relative effects of both 'reasons against' that (contributes to resistance) and 'reasons for' (related to acceptance) of an action. The study employed the BRT with its four main components as our baseline theory for research framework development to better understand the E-waste collection and disposal behaviour. These components include reasons for and against as well as collection and disposal behavioural intentions. Kim *et al.* (2018) view behavioural intentions as the consumer's tendency to engage in a behaviour, task, or action.

In contrast, attitude is understood by (Sahu *et al.,* 2020) as the degree or level of assessment towards the behaviour of a negative or positive outcome. For example, when an attitude results in a negative evaluation behaviour, it will likely become non-engagement. Conversely, if an attitude is favourable to a given behaviour, it's more likely or probable that the consumer will expect to engage or indulge in that behaviour (Sahu *et al.,* 2020; Kumar, 2019). Claudy *et al.* (2015) assert that BRT suggests that reasoning takes the focal point and stage in individual's cognitive processing behaviour. In comparison, Westaby (2005) stated that reasons stood to be the significant attitude predictors towards behavioural intention, in consistence with explanation-based decision-making theory as well as the reasons theory. Thus, reasoning theories postulate that should people have strong reasons for and against engagement in some behaviour, it will somehow assist them in justifying their actions. Moreover, this will primarily activate other factors related to behavioural intention. Westaby (2005), also utilized by Dhir *et al.* (2021), demonstrated that BRT categorizes "reasons" hooked on two opposite sub-dimensions 'reasons for' and labelled as 'reasons against' also symbolized as facilitators (adoption) as well as inhibitors (resistance), or cons and pros in past literature. In light of this, reasons cover a wide range of context-specific factors that can help in improving the understanding of behavioural intentions (Westaby, 2005; Sahu *et al.,* 2020). The study evaluated the drivers and inhibitors of E-waste collection and disposal intentions. In this study, "reasons for" are considered drivers, whereas "reasons against" are regarded as inhibitors of sustainable E-waste collection and disposal. In addition, the study examined the user's E-waste collection and disposal behaviour

due to the increased consumption of electronic devices resulting in the dramatic generation of E-waste in Uganda.

Hypotheses development

'Reasons for' and sustainable E-waste collection and disposal intentions

E-waste personal benefits and environmental benefits

In light of a particular behaviour, it perceived that 'reasons for' represented the facilitators or motivators that can prompt positive perceptions amongst customers or end-users. The study regards 'reasons for' as composed of environmental and personal benefits as supported by the extant studies (Dhir *et al.,* 2021; Dwivedy & Mittal, 2013; Botelho *et al.,* 2016) about E-waste recycling that emphasized the significance of the two variables. In the study, human health benefits are one of the reasons for factors. Non-economic benefits here are non-economic benefits accruing to the consumers of electronic and electric devices should they participate and engage in E-waste collection and disposal. However, previous research has also regarded a personal benefit, like reduced human health hazards and threats that consumer's experience, as being non-economic, if they engage in recycling. Thus, in this case, the study regards non-economic benefits as one of those main 'reasons for' participating in E-waste collection and disposal. Manaktola and Jauhari (2007) refer to environmental benefits as an aspect that enhances energy conservation, helps during pollution reduction, and then supports the product life extension, among other things. Economic gain is the most widely researched factor and well-thought-out as the main driver for changing consumer or individual intentions (Dwivedy & Mittal, 2013; Botelho *et al.,* 2016). Assuredly, Borthakur and Govind (2018) and Dixit and Badgaiyan (2016) noted that the likelihood of receiving cash on return of obsolete products or E-waste makes economic benefits, which is a noticeable factor. Scholars have underlined the business and financial aspects of E-waste recycling because processing or handling of E-waste can be lucrative and rewarding. After all, it contains valuable metals that can be reused after recovery by employing the proper techniques (Baxter *et al.,* 2016; Dias *et al.,* 2018). Further, Baxter *et al.* (2016) state that E-waste recycling can also eliminate the necessity to produce virgin materials.

The rationale of E-waste recycling is geared towards effectively and efficiently recovering precious metals, and safely disposing of hazardous substances to avoid posing risks to the environment and human health (Schluep *et al.,* 2009). Furthermore, recycling has a social impact because it creates sustainable businesses and generates employment opportunities through recycling businesses (Schluep *et al.,* 2009). Tandon *et al.* (2020); Westaby *et al.* (2010); Claudy *et al.* (2015); Sahu *et al.* (2020) all opined that previous research put forward that 'reasons for' was a vital measure for influencing consumer's behaviour in various contexts, for instance, the 'reasons for' organic food consumption was positively linked with customer attitude and intentions. As a result, the 'reasons for' in the context of E-waste are expected to be positively related to attitude and intentions to E-waste collection and disposal. The rationale of E-waste recycling is geared towards the effective and efficient recovery of precious metal and safe disposal of hazardous substances to avoid posing risks to the environment and human health (Schluep *et al.,* 2009). As highlighted by Baxter *et al.* (2016), E-waste recycling leads to the recovery of precious metals and appropriate disposal of harmful materials, bringing environmental benefits. Therefore, the study hypothesizes that:

Hypothesis 1a (H1a). Benefits arising out of E-waste are positively associated with proper E-waste collection intentions.

Hypothesis 1a (H1b). Benefits arising out of E-waste are positively associated with E-waste disposal intentions.

Baxter *et al.* (2016) assert that E-waste recycling removes the necessity for virgin metals production, thereby reducing the environmental problem through safe disposal. Researchers contend that the ecological advantage is neither the critical incentive nor the benefit perceived by the consumer or users (Manaktola and Jauhari, 2007). However, Zhang *et al.* (2018) stated that consumers were concerned about environmental advantages and were eager to make choices or selections in the environment's favour. Furthermore, the aspect regarding the ecological benefits turned into prominence in the situation of E-waste disposal. So, in evaluating the perceived significance of the environmental gains for the consumers in E-waste disposal, the environmental gain were considered the second component to be included in the 'reasons for' measures or attributes as indicated in the conceptual framework.
Thus, the study hypothesizes that:

Hypothesis 2a (H2a). The benefits accruing to the environment due to E-waste are positively associated with E-waste collection intentions.

Hypothesis 2b (H2b). The benefits accruing to the environment due to E-waste are positively associated with ***E-waste disposal intentions.***

Environmental concerns and sustainable E-waste collection and disposal intentions
Park and Lin (2020) define environmental concerns as the extent to which consumers are troubled and worried about environmental degradation. Meanwhile, Ellen *et al,* (1991) described environmental concerns about the consumers' perception of environmental problems mitigation. Extant literature opined that environmental concerns positively correlate with attitude, intentions, and to the willingness to participate in pro-environmental behaviour. Trivedi *et al.* (2018) also reported that ecological concerns, particularly consumer awareness of eco-friendly problems, positively link with attitude. Dwivedy and Mittal (2013) highlighted that environmental concerns positively influence consumers' willingness to indulge in E-waste recycling. Similarly, Dienes (2015) found that environmental concerns about climate change significantly and positively impacted pro-ecological intentions for the individuals to willingly pay for the mitigation of climate change. In the same way, Kushwah *et al.* (2019a, 2019b) put forward that individuals who are worried about environmental concerns are more likely to engage in a pro-environmental intention than those who are not. This assertion is more prevalent in the E-waste recycling context (Dhir *et al.,* 2021). Therefore, the study utilizes the environmental concerns to the BRT model's consumer value of E-waste collection and disposal and hypothesize that:

Hypothesis 3a (H3a). E-waste environmental concerns are positively associated with E-waste collection intentions.

Hypothesis 3b (H3b). E-waste environmental concerns are positively associated with E-waste disposal intentions.

'Reasons against' and sustainable E-waste collection and disposal intentions

Sahu *et al.* (2020) referred to 'reasons against' as the resistors with the power for creating negative perceptions and insights among individuals, collectively, towards participating in a particular behaviour. A pilot study involving ten consumers proposed that the traditional barrier cannot concern society (Dhir *et al.,* 2021); thus, the study considered the four barriers: usage, risk, image, and value.

Value barrier and sustainable E-waste collection and disposal intentions.

Talwar *et al.* (2020) highlighted that the value barrier is commonly linked with perceived monetary value added by the consumer. Indeed, in the online travel agencies context, Talwar *et al.* (2020) asserted that the value barrier did share a significant negative relationship with the purchase or buying intentions. Likewise, Kushwah *et al.* (2019a) reported that the value barrier did negatively affected consumers' consumption of organic food intention. Ultimately, when the individuals perceive that participating in the formal recycling of E-waste process attracts an extra cost, then the consumers' /individuals' willingness to indulge in the E-waste recycling process possibly will be negatively affected (Wang *et al.,* 2016; Liu *et al.,* 2019; Dwivedy & Mittal, 2013). Also, Wang *et al.* (2016) submitted that the E-waste recycling cost will negatively affect consumer's recycling intentions. Consequently, consumers may favour disposing of their E-waste informally or home storage or dispose of ordinary garbage. Indeed, these factors put forward that the value barrier, in the conceptual framework, is a crucial component of 'reasons against'. The study hypothesizes that:

Hypothesis 4a (H4a). The E-waste value barrier is negatively associated with E-waste collection intentions.

Hypothesis 4b (H4b). The E-waste value barrier is negatively associated with E-waste disposal intentions.

Usage barrier and sustainable E-waste collection and disposal intentions.

Scholars including (Kaur *et al.,* 2020; Talwar *et al.,* 2020; Lian & Yen, 2014) have stressed that novelties that contradict the customers' typical values, routines, and traditions suffer due to persons who do not have a positive adoption intention. The inconvenience of using an innovation influences its use and, accordingly, becomes a barrier. Likewise, increased task complexity also decreases the individuals' willingness to perform the act (Taylor & Todd, 1995). For example, Kaur *et al.* (2020) confirm the negative relationship between usage barriers and intention. Considering E-waste recycling, improving the recycling convenience positively influences the user's behavioural intention (Zhang *et al.,* 2019; Kochan *et al.,* 2016). The study considered the usage barrier regarding the users' perceived recycling inconvenience and information accessibility on E-waste recycling. Therefore, usage barrier is also a vital 'reasons against' component. Therefore:

Hypothesis 5a (H5a). The E-waste usage barrier is negatively associated with E-waste collection intentions.

Hypothesis 5b (H5b). The E-waste usage barrier is negatively associated with E-waste disposal intentions.

Risk barrier and sustainable E-waste collection and disposal intentions

Consumers generally regard the different types of risks in a particular activity. The perceptions regarding risks act as a significant barrier in influencing consumer behaviour (Talwar *et al.*, 2020). Kaur et al. (2020) reported that the risk barrier does share a significant negative relationship with intentions to use mobile payment systems. Mobile phones, laptops, and cameras are examples of the electronic and electrical equipment comprising a consumer's individual confidential data and information (Tan *et al.*, 2018), which possibly will be recovered from obsolete or outdated products (Liu *et al.*, 2019; Kumar, 2019). So, theft or stealing of such private information raises a risk barrier concern in the E-waste recycling context. Thus the risk barrier serves as a key 'reason against' behaviour component. The study measures the risk barrier by way of fear related to the possible mishandling of the stored data in the custody of the collection centre. Thus:

Hypothesis 6a (H6a). The E-waste risk barrier is negatively associated with E-waste collection intentions.

Hypothesis 6b (H6b). The E-waste risk barrier is negatively associated with E-waste disposal intentions.

Image barrier and sustainable E-waste collection and disposal intentions

Scholars such as (Lian & Yen, 2014; Kaur *et al.*, 2020; Talwar *et al.*, 2020) have emphasized the role of psychological factors that include creating image barriers that arise whenever the consumers have negative perceptions and insights of the process, product, brand, or innovations repercussions. Scholars have highlighted time-consuming, poor delivery service, and complexity as leading to image barriers concerning online grocery shopping (Rudolph *et al.*, 2004). Equally, Wang *et al.* (2016) report that E-waste recycling may also be influenced by aspects that generate a negative image, for example, people's unwillingness to take some time for recycling and the task performing perceived difficulty. For instance, individuals could sense that a substantial or reasonable time is required to deliver electronic products from their residences to the collection centre or perhaps wait in a queue at or close to the collection centre. Also, the perceived difficulty is viewed in consumers' perception efforts required to transport or ship the bulky electronic products such as washing machines and refrigerators from home to recycling centres. Past studies have empirically demonstrated that 'reasons against' are negatively related to consumer intentions (Tandon *et al.*, 2020; Claudy *et al.*, 2015). For instance, a negative relationship was reported between car-sharing solutions (Claudy *et al.*, 2015) and organic food purchasing (Tandon *et al.*, 2020). Similarly, the negative relationships are likely and probable to be shared in the E-waste collection and disposal context. Hence, the study hypothesizes that:

Hypothesis 7a (H7a). The E-waste image barrier is negatively associated with E-waste collection intentions.

Hypothesis 7b (H7b). The E-waste image barrier is negatively associated with E-waste disposal intentions.

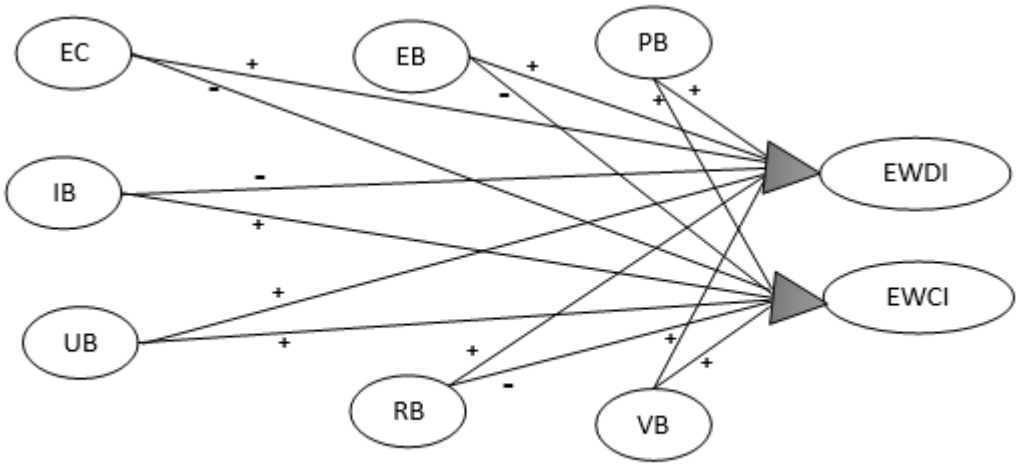

Figure 1: Proposed model for E-waste Collection and Disposal

Note: EWCI – E-waste Collection Intentions, EWDI – E-waste Disposal Intentions, EB – Environmental Benefits, EC – Environmental Concerns, IB – Image Barriers, PB – Personal Benefits, RB – Risk Barrier, UB – Usage Barrier and VB – Value Barrier. The diagonal indicate AVE square root.

Methodology

Development of survey and data collection

The proposed study hypotheses were appraised through a cross-sectional survey through 456 employees working across Government entities, including Ministries, Departments and Agencies (MDAs), and self-accounting Government institutions, in 10 Ugandan Cities. The unit of analysis was Government entities. A total of 109 Government entities were selected for the study, but 84 entities were considered as sample size based on (Krejcie & Morgan, 1970). From 5 to 6 employees were targeted per organization. The convenience sampling approach was adopted in the study; due to the difficulty in finding respondents due to lockdown imposed due to Covid-19 pandemic. Employees in the MDAs and top managers, head of institutions/entities and administrators were targeted in the organizations. As such, 346 (75.9% response rate) usable questionnaires were realized, and deemed acceptable for further analysis. Before data collection, the questionnaire on a 7point Likert scale from strongly disagree-(1) to strongly agree-(7), was evaluated for language appropriateness by three experts. Consequently, a few changes were duly made. The study measurement constructs and items were mainly drawn from the BRT model and current literature, as shown in Table 2.

Demographic characteristics of the sample

Table 1 exhibits the demographic profiles. 186 (53.8%) and 160 (46.2%) were males and females, respectively. The majority of the respondents 102 (29.5%) and 100 (28.9%) were aged between 31-40years and 41-50years, respectively. Those with undergraduate and postgraduate qualifications were 144 (41.6%) and 150 (43.4%), respectively. This is so because out of the 10 Cities, 9 were created in 2019/2020 financial year.

Table 1: Participants' demographic profile

Variable	Description	Frequency (Percentage)	Percentage
Gender	Male	186	53%
	Female	160	46.2%
Age	20 to 30 years	60	17.3%
	31 to 40 years	102	29.5%
	41 to 50 years	100	28.9%
	51 to 60 years	54	15.6%
	Above 60 years	30	8.7%
Level of Education	Diploma	46	13.3%
	Undergraduate Degree	144	41.6%
	Postgraduate	150	43.4%
	Ph.D.	6	1.7%
City work experience	Below 5 years	186	47%
	5 – 10 years	80	20.6%
	11 – 20 years	51	13.2%
	Above 21 years	29	7.5%

Data analysis

The partial-least-squares structural equation modelling (-PLS-SEM-) utilizing the SmartPLS software was employed to test the proposed conceptual model for E-waste behavioural intentions in E-waste collection and disposal. Compared to the covariance-based-structural equation-modelling (CB-SEM), the PLS-SEM is merited to determine the most influential factors on the dependent variable. Besides, it's a more appropriate data analysis technique once a normality test is unavailable. Also, the PLS-SEM allows constructs with three questions or even less and avoids the difficulties encountered with approximating stable factor scores.

The Measurement Model

Construct Reliability and Validity

To evaluate construct validity and reliability of the PLS-SEM measurement model, the study examined the discriminant validity and convergent indicators and the reliability of the constructs. The composite reliability and convergent validity tests links amongst indicators belonging to the same constructs, consequently guaranteeing that all survey questionnaire items measuring the same construct ought to be highly related or linked with each other. The internal reliability was tested by following the outcomes of Fornell's measure of composite reliability (CR) and Cronbach's alpha (CA) (Fornell & Larcker, 1981). In Table 2, factor loadings, CA, and CR are all above the criteria or threshold of 0.7. For instance, factor loadings range from 0.742 – 0.948 (also shown in figure 1), CA range from 0.708 – 0.924, and CR from 0.873 – 0.950, respectively, thus demonstrating the suitability of all constructs for data analysis. Meanwhile, the AVE constructs were above 0.5 (ranging between 0.688 – 0.864) thus, confirming all constructs weighed an adequate convergent validity for further analysis.

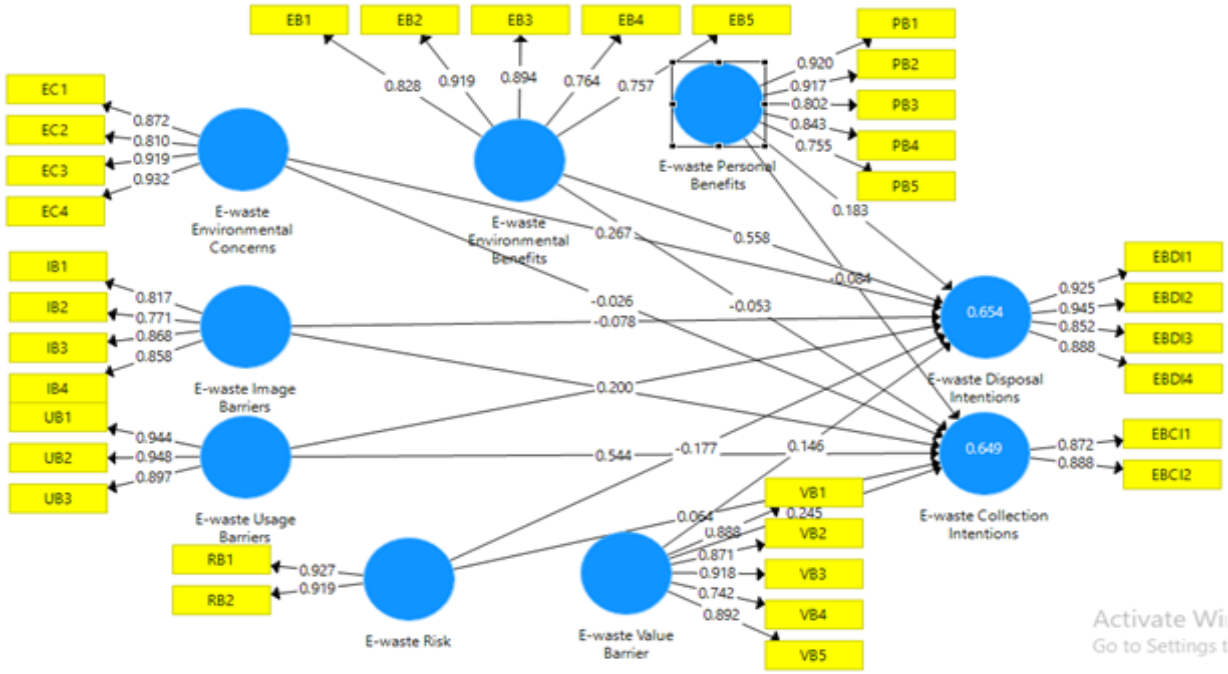

Figure 2: Model fit-(Measurement model)

Table 2: The Measurement Model

Model constructs and references	**Indicators /Measurement items**	**Loadings**	**CA**	**CR**	**AVE**
Personal Benefits (Claudy *et al.*, 2015)	**PB1:** By use of E-waste collection, the health hazards from E-wastes are reduced.	0.920	0.902	0.928	0.722
	PB2: By use of E-waste disposal, the health hazards from E-wastes are reduced.	0.917			
	PB3: Using E-waste collection for recycling reduces the chances of accidental or unintentional damage in a home environment.	0.802			
	PB4: Using E-waste disposal reduces the chances of accidental or unintentional damage in a home environment.	0.843			
	PB5: Using E-waste disposal reduces the chances of accidental or unintentional damage in an office environment.	0.755			
Environmental Benefits (Claudy et al., 2015)	**EB1:** By use of proper E-waste disposal, the environment is protected from toxic chemicals.	0.828	0.890	0.920	0.697
	EB2: E-waste disposal is everyone's responsibility to reduce the volume of e-waste generated.	0.919			
	EB3: E-waste collection is everyone's responsibility to reduce the volume of e-waste generated.	0.894			
	EB4: Using proper E-waste disposal drastically reduces the risk of polluting the environment.	0.764			
	EB5: Using proper E-waste disposal cut down greenhouse gases emission.	0.757			
Environmental Concerns (Tarrant & Cordell, 1997)	**EC1**: I have read newsletters, magazines or other publications written by environmental groups.	0.872	0.907	0.935	0.782
	EC2: I have signed a petition in support of protecting the environment.	0.810			
	EC3: I have given money to an environmental group.	0.919			
	EC4: I have boycotted or avoided buying a company's product because I felt the company was harming the environment.	0.932			
Usage Barrier (Tandon et al., 2020)	**UB1:** In my opinion, it is not easy to find information on e-waste collection.	0.944	0.921	0.950	0.864
	UB2: In my opinion, it is not easy to find information on e-waste disposal.	0.948			

	UB3: In my opinion, it is not easy to find an e-waste collection center.	0.897			
	RB1: I fear that upon transfer of electronic device for recycling, my stored information in the device may be misused.	0.927	0.826	0.920	0.852
Risk Barrier(Kaur et al., 2020)	**RB2:** I fear that upon transfer of electronic device for recycling, the device might be misused in the collection center.	0.919			
	VB1: I feel that the traffic expenses of e-waste disposal are high.	0.888	0.915	0.936	0.747
	VB2: I feel that the traffic expenses of e-waste collection are high.	0.871			
	VB3: I feel that the handling charges of e-waste disposal are high.	0.918			
	VB4: I feel that the handling charges of e-waste collection are high.	0.742			
Value Barrier	**VB5:** I think expenditure on transportation of E-waste to the collection center is high.	0.892			
	IB1: In my opinion, e-waste collection is often too complicated to be useful.	0.817	0.849	0.898	0.688
	IB2: In my opinion, e-waste disposal is often too complicated to be useful.	0.771			
Image Barrier (Kaur et al., 2020)	**IB3:** I have an image that e-waste disposal is difficult to adopt.	0.868			
	IB4 I have an image that e-waste collection is difficult to adopt.	0.858			
E-waste Collection Behavioral Intentions(Holland et al., 2006)	**EBCI1:** I am willing to speak to my friends about appropriateness of collecting E-waste.	0.872	0.708	0.873	0.774
	EBCI2: I'm willing to spend some time taking my old electronic appliances for drop collection points.	0.888			
	EBI1: I am willing to speak to my friends about appropriate modes of disposing of electronic appliance.	0.925	0.924	0.946	0.816
	EBI2: I'm willing to spend some time taking my old electronic appliances for disposal.	0.945			
E-waste Disposal Behavioral Intentions(Holland et al., 2006)	**EBI3:** I am willing to contact formal E-waste disposal organizations to deal with e-waste in the future.	0.852			
	EBI4: I intend to drop-off my E-waste if formal disposal systems are available.	0.888			

Discriminant Validity

The test or assessment on the discriminant validity of the measured variables is usually performed to make sure that variables around different constructs are not related whatsoever (Campbell & Fiske, 1959). That is, survey questionnaire items that measure those other constructs shouldn't be correlated. A better parameter for evaluating discriminant validity is to ensure the AVE square root is higher than the correlations between those constructs and other factors within the model (Fornell & Larcker, 1981). Thus, Table 3, shows all the AVE square root values for the constructs along the diagonal to be greater than the correlations amongst the constructs below the diagonal. Hence, the discriminant validity test result is passed.

Table 3: Fornell-Larcker Criterion **(Correlation matrix and AVE square root)**

Variables/Model Constructs	EWCI	EBDI	EEB	EC	IB	PB	RB	UB	VB
EBCI	**0.880**								
EBDI	0.388	**0.903**							
EB	0.317	0.643	**0.835**						
EC	0.443	0.530	0.223	**0.884**					
IB	0.629	0.447	0.356	0.541	**0.830**				
PB	0.329	0.420	0.103	0.515	0.494	**0.850**			
RB	0.346	0.295	0.454	0.383	0.367	0.216	**0.923**		
UB	0.674	0.393	0.205	0.282	0.394	0.253	0.158	**0.930**	
VB	0.433	0.585	0.508	0.672	0.532	0.469	0.509	0.112	**0.865**

Note: EWCI – E-waste Collection Intentions, EWDI – E-waste Disposal Intentions, EB – Environmental Benefits, EC – Environmental Concerns, IB – Image Barriers, PB – Personal Benefits, RB – Risk Barrier, UB – Usage Barrier and VB – Value Barrier. The diagonal indicate AVE square root.

Structural model

To determine the E-waste behavioral collection and disposal intentions model, the dependent variables (EWCI and EWDI), R-squared (R^2) value, including the path coefficients produced as a result of previous PLS algorithm calculations, are considered and shown in figure 2. The R^2 values for EWCI and EWDI are 0.649 and 0.654, indicating that 64.9% and 65.4% of the variation of behavioral intentions of E-waste collection and disposal respectively in the model as explained by those exogenous latent variables being used in the model. The structural model determines the relationships amongst the study model constructs. In order to test the underlined research hypotheses, the study utilized the PLS-SEM bootstrapping technique to convert the gradient coefficients to t-Statistics used to test for the significance of the association between the independent (or exogenous) latent variables and also the dependent (endogenous) latent variables as hypothesized. This led to the establishment of the standard errors and t-statistics of the parameters represented in Table4. The threshold value for t-Statistics is 1.96 for the hypotheses results to be supported.

Table 4: Path Coefficient, R-Squared (R^2) Values & T-Statistics for E-waste Behavioural Intentions

Path Coefficient			B	T-Statistics	P(two-tailed)	Decision
H1a: PB	⇒	EWCI	-0.084	2.179	0.030	Supported
H1b: PB	⇒	EWBI	0.183	5.498	0.000	Supported
H2a: EB	⇒	EWCI	-0.053	1.220	0.223	Not Supported
H2b: EB	⇒	EWBI	0.558	8.671	0.000	Supported
H3a: EC	⇒	EWCI	-0.026	0.517	0.605	Not Supported
H3b: EC	⇒	EWBI	0.267	6.010	0.000	Supported
H4a: VB	⇒	EWCI	0.245	4.571	0.000	Supported
H4b: VB	⇒	EWBI	0.146	2.454	0.014	Supported
H5a: UB	⇒	EWCI	0.544	17.886	0.000	Supported
H5b: UB:	⇒	EWBI	0.200	4.924	0.000	Supported
H6a: RB:	⇒	EWCI	0.064	1.344	0.180	Not Supported
H6b: RB:	⇒	EWBI	-0.177	4.080	0.000	Supported
H7a: IB:	⇒	EWCI	0.335	8.558	0.000	Supported
H7b: IB:	⇒	EWBI	-0.078	1.664	0.097	Not supported
				EWCI - R-Squared (R^2)		64.9%
				EWDI - R-Squared (R^2)		65.4%

Note: Significant at $P < 0.05$. Also, PB – Personal Benefits, EB – Environmental Benefits, EC: Environmental Concerns, VB – Value Barrier, UB – Usage Barrier, RB – Risk Barrier, IB – Image Barriers and EWCI – E-waste Collection Intentions, EWDI – E-waste Disposal Intentions.

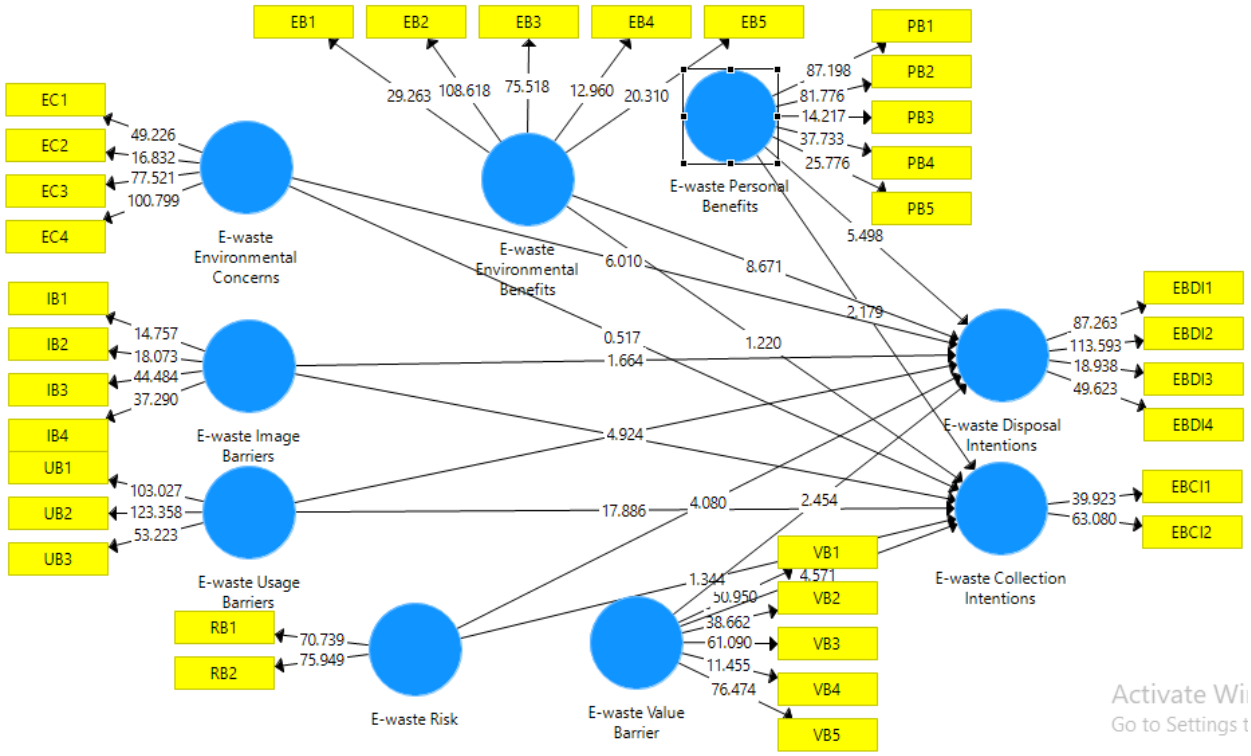

Figure 3:-Model fit test-(Structural model)

The results determined that the associations between PB and EWCI (t = 2.179, β = -0.084, P < 0.05), PB and EWDI (t = 5.498, β = 0.183, P < 0.05), EB and EWDI (t = 8.671, β = 0.558, P < 0.05), EC and EWDI (t = 6.010, β = 0.267, P < 0.05), and VB and EWCI (t = 4.571, β = 0.245, P < 0.05), VB and EWDI (t = 2.454, β = 0.146, P < 0.05), were significant. Also, UB and EWCI (t = 17.886, β = 0.544, P < 0.05), UB and EWDI (t = 4.924, β = 0.200, P < 0.05), RB and EWDI (t = 4.080, β = -0.177, P < 0.05), IB and EWCI (t = 8.558, β = 0.335, P < 0.05), were significant. Thus, hypotheses H1a, H1b, H2b, H3b, H4a, H4b, H5a, H5b, H6b and H7a were supported. Meanwhile, the relationships between EB and EWCI (t = 1.220, β = -0.053, P > 0.05), EC and EWCI (t = 0.517, β = -0.026, P > 0.05), IB and EWCI (t = 1.664, β = -0.078, P > 0.05) and RB and EWCI (t = 1.344, β = 0.064, P > 0.05) were not significant, thus H2a, H3a, H6a and H7b not supported.

In a nutshell, the study findings show that E-waste personal benefits, E-waste value barriers and E-waste usage barriers fully have a significant behavioural E-waste collection and disposal intentions while E-waste image barriers, environmental benefits, environmental concerns and E-waste risk barriers partially support behavioural E-waste collection and disposal intentions.

Discussion of results

Annually, the world witnesses the generation of millions of E-waste, thereby rousing the worries on escalating environmental and public health adverse impacts. The study employed the BRT with its four main components as our baseline theory for research framework development to better understand the E-waste collection and disposal behaviour. Specifically, the relationship between motives against and for and behavioural intentions to

collect and dispose of waste was tested. PLS-SEM was applied to analyse the established research model with 346 government employees in a position of policy formulation and double as potential EEE consumers. According to the results, out of the fourteen (14) proposed hypotheses, ten (10) are supported (that is, H1a, H1b, H2b, H3b, H4a, H4b, H5a, H5b, H6b, and H7a. Whereas H2a, H3a, H6a and H7b are not supported.

The results indicate the H1a, and H1b, which examined the relationship between E-waste personal benefits and behavioural intentions towards E-waste collection and E-waste disposal, respectively, are supported and, thus, consistent with prior studies (Botelho *et al.*, 2016; Tandon *et al.*, 2020; Claudy *et al.*, 2015; Zhang *et al.*, 2018). These findings suggest that a positive behavioural intention towards E-waste collection and disposal would result in positive intents for employees to participate in the collection and disposal of E-waste. H2a that examined the relationship between E-waste environmental benefits and behavioural intentions towards E-waste collection is not supported, whereas H2b, the relationship between E-waste environmental benefits and behavioural intentions towards E-waste disposal is supported. H2a is inconsistent with (Zhang *et al.*, 2018; Wang *et al.*, 2019; Botelho *et al.*, 2016) who found environmental benefits positively related to behavioural intentions. The reasons for (environmental and personal benefits including health) can easily motivate the public towards E-waste collection and disposal and related engagements. However, based on H2a, it seems the study does not agree with the notion that E-waste collection is everyone's responsibility to reduce the volume of E-waste generated.

H3a results which investigated the association between E-waste environmental concerns and behavioural intentions towards E-waste collection is not supported whereas H3b which investigated the association between E-waste environmental concerns and behavioural intentions towards E-waste disposal is supported. Indeed, Hughes (2019) and Dixit and Badgaiyan (2016) stress that environmental degradation is a matter of concern. The public needs to be motivated to engage in disposal activities that lead to best management practices.

The study suggests that environmental campaigns towards support to disposal of E-waste is important. This includes signing petitions to protect the environment, financial support to protect the environment, and the media's role in disseminating information regarding dangers of E-waste to the environment. However, H3a did not support perhaps because employees do not believe in boycotting or avoiding buying a company's products because it's harming the environment. H4a, H4b, H5a, H5b, H6a, H6b, H7a, and H7b all investigated the negative association between E-waste value barrier, E-waste image, E-waste risk and E-waste usage as 'reasons against' behavioural intentions towards participation in E-waste collection and disposal.

The study results supported six hypotheses out of 8 with the except for H6a and H7b. Those in support are consistent with prior literature (Gupta & Arora, 2017; Claudy *et al.*, 2015). The study results also suggest E-waste risk (H6a) and E-waste value barrier (H7b) will not influence E-waste collection and disposal decisions, respectively. E-waste risk (H6b) and E-waste value barrier (H7a) will become more influential with behavioural intentions to dispose of and collect E-waste, respectively. Firstly, the E-waste value barrier was found to be negatively associated with E-waste collection and disposal. Implying that when the traffic and transportation expense,

and the handling charges of E-waste collection and disposal are high, the population will not feel comfortable engaging in activities towards collection and disposal of E-waste.
Similarly, it's essential to have E-waste collection centres accessible to the general public based on the findings. In other words, accessibility to information on E-waste collection and disposal points is vital for sustainable E-waste management. The public will have the conviction about the destination of E-waste without fear of misuse, thus encouraging increased engagement in activities related to collection and disposal. The study supported the suggestion that the E-waste image barrier is negatively associated with E-waste collection. More so, in the context of the BRT theory that is viewed as specific by scholars (Claudy *et al.*, 2015). Disposal of E-waste requires assertiveness due to environmental and health concerns (Tandon *et al.*, 2020).

Theoretical and practical implications

In the first instance, in the behavioural reasoning theory (BRT) context, the study contributes to theory by providing a more comprehensive behavioural understanding of drivers and inhibitors of E-waste collection and disposal based on "reasons against and for" in ensuring E-waste management sustainability. The study also contributes theoretically to the existing E-waste management stream of literature on drivers and inhibitors of E-waste collection and disposal towards sustainability of E-waste management. Besides, one of the rarest studies on E-waste management manifests the importance of the PLS-SEM approach in successfully analysing two dependent variables (E-waste collection and E-waste disposal) in a single study. Moreover, it provides essential insights into city Government employees' behavioural intentions concerning E-waste collection and disposal participation, thereby a stepping stone to motivate further similar studies amongst households in the cities and entire country. Practically, this study will be helpful to all E-waste stakeholders, especially producers, handlers, consumers, civil society organizations, government, recyclers, and refurbishes for better appreciation of those drivers and inhibitors of collection and disposal of E-waste. Government employees will be acquainted with the driving forces and impediments that explain engagement and non-engagement in E-waste collection and disposal. Also, the study is necessary to policymakers and government to develop policies and relevant laws to motivate all EEE users to engage in the collecting and disposing of E-waste.

Recommendations

Government can also ensure the collection and disposal costs concerning handling charges, traffic, and transport costs are reduced to levels that will encourage sustainable E-waste management practices. The results also show that high expenditure could deter employees from collection and disposal of E-waste. Similarly, Government should develop a communication strategy geared towards encouraging collection and disposal of E-waste. This could also include establishing E-waste code of conduct at organizational level that will provide valuable contribution in fostering desirable behaviour for sustainable management of E-waste. The code of conduct may also promote efforts that reduce on resistance to collection and disposal tendencies but rather accelerate an acceptance. On the other hand, the government can highlight personal and environmental benefits and environmental concerns in their human resource management strategies for health and safety. As Government implements the national E-waste collection centre, it's vital that it pays close attention to some important considerations such as proper and convenient collection and disposal procedures right from households, and the general public to eliminate the associated usage barriers. Thus, a consumer or end-user may well be

willing to collect and dispose of E-waste since it is less time-consuming, easy, and has human health and environmental benefits.

Government also through an appropriate authority can ensure information related to risks such as security and privacy concerns are addressed to avoid possible misuse of personal and organizations information. Similarly, all the aspects related to E-waste inhibitors can be addressed so that the public can actively engage in E-waste collection and disposal. Ugandan laws and regulations to control and manage E-waste are yet to be enforced. As such, appropriate arm of Government should oversee the entities entrusted with E-waste management and penalize violating agencies and authorities. Under the (NEMA Act, 2020), the E-waste management system indicates the precise roles of all relevant stakeholders. For instance, consumers are required to discharge electrical and electronic appliances properly, bear the collection and disposal costs and are deterred from selling E-waste to informal collectors. Rather than independent legislation, all E-waste stakeholders' responsibilities should be incorporated in only one country legislation to manage E-waste collection and disposal successfully. Besides, the taking-back systems suggested in the existing relevant laws and regulations require enforcement and improvement where a proper E-waste collection and disposal model is needed to address E-waste problems.

References

Abrahams, G. (2017), "Constructing definitions of sustainable development", *Smart and Sustainable Built Environment*, Vol. 6 No. 1, pp. 34-47.

Agrawal, S., Singh, R. K., & Murtaza, Q. (2015). A literature review and perspectives in reverse logistics. *Resources, Conservation and Recycling*, *97*, 76-92.

Baxter, J., Lyng, K. A., Askham, C., & Hanssen, O. J. (2016). High-quality collection and disposal of WEEE: Environmental impacts and resultant issues. *Waste management*, *57*, 17-26.

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.

Borthakur, A., & Govind, M. (2018). Public understandings of E-waste and its disposal in urban India: from a review towards a conceptual framework. *Journal of Cleaner Production*, *172*, 1053-1066.

Botelho, A., Ferreira Dias, M., Ferreira, C., & Pinto, L. M. C. (2016). The market of electrical and electronic equipment waste in Portugal: Analysis of take-back consumers' decisions. *Waste Management & Research*, *34*(10), 1074-1080.

Bovea, M. D., Pérez-Belis, V., & Quemades-Beltrán, P. (2017). Attitude of the stakeholders involved in the repair and second-hand sale of small household electrical and electronic equipment: Case study in Spain. *Journal of environmental mgtt*, *196*, 91-99.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological bulletin*, *56*(2), 81.

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*(4), 528-544.

Dhir, A., Koshta, N., Goyal, R. K., Sakashita, M., & Almotairi, M. (2021). Behavioral reasoning theory (BRT) perspectives on E-waste recycling and management. *Journal of Cleaner Production*, *280*, 124269.

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.

Dias, P., Bernardes, A. M., & Huda, N. (2019). Ensuring best E-waste recycling practices in developed countries: An Australian example. *Journal of Cleaner Production*, *209*, 846-854.

Dienes, C. (2015). Actions and intentions to pay for climate change mitigation: Environmental concern and the role of economic factors. *Ecological Economics*, *109*, 122-129.

Dixit, S., & Badgaiyan, A. J. (2016). Towards improved understanding of reverse logistics Examining mediating role of return intention. *Resources, Conservation and Recycling*, *107*, 115-128.

Dixit, S., & Vaish, A. (2013). Sustaining environment and organisation through e-waste management: a study of post consumption behaviour for mobile industry in India. *International Journal of Logistics Systems and Management*, *16*(1), 1-15.

Dwivedy, M., & Mittal, R. K. (2013). Willingness of residents to participate in e-waste recycling in India. *Environmental Development*, *6*, 48-68.

Echegaray, F., & Hansstein, F. V. (2017). Assessing the intention-behavior gap in electronic waste recycling: the case of Brazil. *Journal of Cleaner Production*, *142*, 180-190.

Electronic waste Guidelines of Uganda, 2016

Electronic Waste (E-Waste) Management Policy for Uganda August 2012

Ellen, P. S., Wiener, J. L., & Cobb-Walgren, C. (1991). The role of perceived consumer effectiveness in motivating environmentally conscious behaviors. *Journal of public policy & marketing*, *10*(2), 102-117.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, *18*(1), 39-50.

Forti, V., Baldé, C. P., Kuehr, R., & Bel, G. (2020). The Global E-Waste Monitor 2020: Quantities. *Flows and the Circular Economy Potential*, 120.

Gupta, A., & Arora, N. (2017). Consumer adoption of m-banking: a behavioral reasoning theory perspective. *International Journal of Bank Marketing*.

Holland, R. W., Aarts, H., & Langendam, D. (2006). Breaking and creating habits on the working floor: A field-experiment on the power of implementation intentions. *Journal of Experimental Social Psychology*, *42*(6), 776-783.

Hughes, R. (2019). Amazon fires: What's the latest in Brazil?. *BBC (Oct, 2019)*.

Islam, M. T., Abdullah, A. B., Shahir, S. A., Kalam, M. A., Masjuki, H. H., Shumon, R., & Rashid, M. H. (2016). A public survey on knowledge, awareness, attitude and willingness to pay for WEEE management: Case study in Bangladesh. *Journal of cleaner production*, *137*, 728-740.

Jujun, R., Yiming, Q., & Zhenming, X. (2014). Environment-friendly technology for recovering non-ferrous metals from e-waste: Eddy current separation. *Resources, conservation and recycling*, *87*, 109-116.

Kaur, P., Dhir, A., Singh, N., Sahu, G., & Almotairi, M. (2020). An innovation resistance theory perspective on mobile payment solutions. *Journal of Retailing and Consumer Services*, *55*, 102059.

Kim, M. J., Lee, C. K., Petrick, J. F., & Hahn, S. S. (2018). Factors affecting international event visitors' behavioral intentions: the moderating role of attachment avoidance. *Journal of Travel & Tourism Marketing*, *35*(8), 1027-1042.

Kochan, C. G., Pourreza, S., Tran, H., & Prybutok, V. R. (2016). Determinants and logistics of ewaste recycling. *The International Journal of Logistics Management*.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, *30*(3), 607-610.

Kumar, A. (2019). Exploring young adults'e-waste recycling behaviour using an extended theory of planned behaviour model: A cross-cultural study. *Resources, Conservation and Recycling*, *141*, 378-389.

Kushwah, S., Dhir, A., & Sagar, M. (2019a). Understanding consumer resistance to the consumption of organic food. A study of ethical consumption, purchasing, and choice behaviour. *Food Quality and Preference*, *77*, 1-14.

Kushwah, S., Dhir, A., & Sagar, M. (2019b). Ethical consumption intentions and choice behavior towards organic food. Moderation role of buying and environmental concerns. *Journal of Cleaner Production*, *236*, 117519.

Lian, J. W., & Yen, D. C. (2014). Online shopping drivers and barriers for older adults: Age and gender differences. *Computers in human behavior*, *37*, 133-143.

Liu, J., Bai, H., Zhang, Q., Jing, Q., & Xu, H. (2019). Why are obsolete mobile phones difficult to recycle in China?. *Resources, Conservation and Recycling*, *141*, 200-210.

Manaktola, K., & Jauhari, V. (2007). Exploring consumer attitude and behaviour towards green practices in the lodging industry in India. *International journal of contemporary hospitality management*.

Mmereki, D., Li, B., Baldwin, A., & Hong, L. (2016). The generation, composition, collection, treatment and disposal system, and impact of E-waste. *E-waste in Transition-from Pollution to Resource*, 65-93.

National Environment (Waste Management) (NEMA) Regulations, 2020, Arrangement of Regulations, Statutory Instruments Supplement 2020 (No. 49) *to The Uganda Gazette No. 18, Volume CXIII, dated 20th March, 2020*

Nduneseokwu, C. K., Qu, Y., & Appolloni, A. (2017). Factors influencing consumers' intentions to participate in a formal e-waste collection system: A case study of Onitsha, Nigeria. *Sustainability*, *9*(6), 881.

Nguyen, L. V., Gravel, S., Labrèche, F., Bakhiyi, B., Verner, M. A., Zayed, J & Diamond, M. L. (2020). Can Silicone Passive Samplers be Used for Measuring Exposure of e-Waste Workers to Flame Retardants?. *Environmental Science & Technology*, *54*(23), 15277-15286.

Park, H. J., & Lin, L. M. (2020). Exploring attitude–behavior gap in sustainable consumption: Comparison of recycled and upcycled fashion products. *Journal of Business Research*, *117*, 623-628.

Peng, B., Tu, Y., & Wei, G. (2018). Governance of electronic waste recycling based on social capital embeddedness theory. *Journal of Cleaner Production*, *187*, 29-36.

Rudolph, T., Rosenbloom, B., & Wagner, T. (2004). Barriers to online shopping in Switzerland. *Journal of International Consumer Marketing*, *16*(3), 55-74.

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 (AMJ)*, *28*(4), 145-159.

Schluep, M., Hagelüken, C., Meskers, C., Magalini, F., Wang, F., Müller, E& Sonnemann, G. (2009). Market potential of innovative e-waste recycling technologies in developing countries. In *R'09 World Congress, Davos, Switzerland*.

Talwar, S., Dhir, A., Kaur, P., & Mäntymäki, M. (2020). Barriers toward purchasing from online travel agencies. *International Journal of Hospitality Management*, *89*, 102593.

Tan, Q., Duan, H., Liu, L., Yang, J., & Li, J. (2018). Rethinking residential consumers' behavior in discarding obsolete mobile phones in China. *Journal of cleaner production*, *195*, 1228-1236.

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

Tarrant, M. A., & Cordell, H. K. (1997). The effect of respondent characteristics on general environmental attitude-behavior correspondence. *Environment and behavior*, *29*(5), 618-637.

Taylor, S., & Todd, P. (1995). An integrated model of waste management behavior: A test of household recycling and composting intentions. *Environment and behavior*, *27*(5), 603-630.

Trivedi, R. H., Patel, J. D., & Acharya, N. (2018). Causality analysis of media influence on environmental attitude, intention and behaviors leading to green purchasing. *Journal of cleaner production*, *196*, 11-22.

Wang, S., Wang, J., Zhao, S., & Yang, S. (2019). Information publicity and resident's waste separation behavior: An empirical study based on the norm activation model. *Waste management*, *87*, 33-42.

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.

Wang, Z., Guo, D., Wang, X., Zhang, B., & Wang, B. (2018). How does information publicity influence residents' behaviour intentions around e-waste recycling?. *Resources, Conservation and Recycling*, *133*, 1-9.

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

Westaby, J. D., Probst, T. M., & Lee, B. C. (2010). Leadership decision-making: A behavioral reasoning theory analysis. *The Leadership Quarterly*, *21*(3), 481-495.

Zhang, B., Du, Z., Wang, B., & Wang, Z. (2019). Motivation and challenges for e-commerce in e-waste recycling under "Big data" context: a perspective from household willingness in China. *Technological Forecasting and Social Change*, *144*, 436-444.

Zhang, X., Bai, X., & Shang, J. (2018). Is subsidized electric vehicles adoption sustainable: Consumers' perceptions and motivation toward incentive policies, environmental benefits, and risks. *Journal of Cleaner Production*, *192*, 71-79.

Zhong, H., & Huang, L. (2016). The empirical research on the consumers' willingness to participate in E-waste recycling with a points reward system. *Energy Procedia*, *104*, 475-480.