INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH AND KNOWLEDGE
ISSN-2213-1356 www.ijirk.com

INFLUENCE OF FINANCE SCHEMES IN ELECTRONIC-WASTE DISPOSAL STRATEGIES BY UTILITY COMPANIES IN KENYA

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ABSTRACT

The Electronics industry is the largest and fastest growing enterprise globally generating huge amounts of electronic waste (e-waste) throughout the world. The waste has hazardous components with negative consequences to the environment and human health. E-waste management is not yet well researched in Kenya considering the unique needs of the under developed world. The regulations adequacy has been questionable with incidents of industrial poisoning and explosions. Examples include Uhuru Owino Village lead battery exposures and the subsequent children lead poisoning at Mombasa in year 2012. This study addressed e-waste disposal issues in utility firms in the context of Kenya in an economic perspective and also the associated environmental

challenges. Utility firms are large generators of e-waste. The study focused on various factors including Finance Schemes. The research was a survey design. A random sample of 290 respondents was drawn from employees in the firms. Data analysis comprised of descriptive statistics and inferential statistics using regression models. Results revealed that Finance scheme influenced 46.2 % of e-waste disposal practices which increased to 47.2% with regulations enforcement moderator. The results will assist policy makers in drafting fact-based policies, environment managers in creation of green jobs and organizational strategy formulation in waste management.

Key words: *e-waste, hazardous components, utility firms, finance scheme*

1.0 INTRODUCTION

1.1 Background of the Study

Globalization has been realized through the growth of Information and Communication Technology (ICT) worldwide which in turn has resulted into huge amounts of e-waste because of the amount and dynamic short-life nature of the equipment. Electronic waste (E-waste) is now viewed as a huge pollution challenge globally. A wide variety of toxic substances are contained in E-waste with a potential to affect the environment and human health if poorly disposed and managed (Peernart, Ravi & Ming, 2013). This challenge from E-waste is relatively new and presents business opportunities. The huge volumes of valuable materials as well as their toxic nature can be exploited to create lifetime occupations (Widmer, Heid, Deepali, Scheneilillmann & Heinz, 2005).

Management of e-waste involves a complex of decision-making variables when choosing the disposal method. It requires analysis of the intended disposal method by a firm to arrive at the most efficient and acceptable strategy to dispose e-waste. The decision maker has to do some evaluation by either assigning a quantitative value to each alternative or by providing information which clarifies properties of the alternatives.

1.1.1 E-waste in Kenya

Kenya similar to developing countries has encompassed ICT in the public and private segments. Despite the National Environment Management Authority (NEMA) making a draft e-waste management policy in 2011 its enforcement has never been implemented. As such, the country is facing the challenge of accumulated e-waste whose handling and disposal has not been substantively addressed by the present environmental laws.

Lack of segregation and poor disposal systems has led to mixing of e-waste with ordinary waste in Kenya's dumpsites (Onderi, 2010). A study by Okeyo and Wangila (2012) at the Kenyan coast established that a battery refurbishing factory produced toxic effluent to a neighbouring village which affected children's health whose Blood Lead Levels (BLL) was found to be as high as 23 µg/dl against the World Health Organization (WHO) levels of 5 µg/dl. The consequences of such high magnitudes of lead have the undesirable effects of lethal lead poisoning among many other health hazards.

1.1.2 Utility Companies in Kenya

The utility companies in the study consisted of Safaricom Plc, Airtel Kenya ltd, Telkom Kenya limited (TKL), Kenya Power & Lighting Company (KPLC), Kenya Transmission Company (KETRACO), Kenya Generating Company, (KenGen), Geothermal Development Company (GDC) and Rural Electrification Authority (REA). Except Safaricom, none of these companies has made any environmental commitments in the website nor shown efforts addressing electronic waste.

1.2 Statement of the Problem

E-waste contains toxic substances such as lead, mercury and cadmium which are harmful to both human beings and the environment. The rapid growth of the amount of e-waste and the ineffectiveness of legislation has led to inappropriate management of e-waste disposal in Kenya with profound impacts on the environment and human beings. In 2014 it was estimated that Kenya generated 1 kg/inhabitant (kg/inh) of e-waste annually (Baldé, Wang, Kuehr & Huisman, 2015). E-waste contaminates soil, water and air. Poor recycling and disposal methods lead to poisoning of many local people engaged in the recycling process.

Okeyo and Wangila (2012) investigated toxic effluent in Mombasa from a battery recycling factory situated next to Owino-Uhuru village. The pollutants affected children's health whose Blood Lead Level (BLL) was found to be as high as 23 µg/dl against the World Health Organization (WHO) levels of 5 µg/dl. A summary of detailed health effects of e-waste elements is shown in Appendix 1. Effects of the poisoning will be felt long into the future.

For utility firms in Kenya, disposal of e-waste is haphazard and not well managed. Most methods used are usually those that are cheap, less involving and utilizing least time. Inventories are not updated. Most utility firms usually donate e-waste to schools. The donated computers do not work for long before being dumped in stores and dumping sites. Commonly used methods which utility firms use are public auction, destruction, dumping, burying, donation and trade. The Kenya government and its people will have to use more resources in health-related issues in additional to dealing with environment degradation if the hazardous components end up in dumpsites. Considering this, the study aimed at investigating the underlying reasons for e-waste disposal strategies adopted by utility companies in Kenya some of which are large generators.

1.3 Research Objectives

1.3.1 General Objective

To examine determinants of e-waste disposal strategies by utility companies in Kenya

1.3.2 Specific Objectives

i. To determine the influence of finance scheme on e-waste disposal by utility companies in Kenya.
ii. To investigate the moderating effect of regulations enforcement on e-waste disposal by utility companies in Kenya.

1.4 Research Hypotheses

(i) H_{o1}: Finance scheme has no significant influence on e-waste disposal by utility companies in Kenya.
H_{A1}: Finance scheme has significant influence on e-waste disposal by utility companies in Kenya.

(ii) H_{o2}: Regulations enforcement has no significant moderating effect on e-waste disposal by utility companies in Kenya.
H_{A2}: Regulations enforcement has significant moderating effect on e-waste disposal by utility companies in Kenya.

1.5 Scope of the Study

The study focused on utility companies in Kenya which include companies and organizations which provide services to the public especially water, electricity and telecommunications. The employees who deal with e-waste in these companies formed the population of the study. The study samples were drawn from these individuals.

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter considered theoretical as well as empirical literature and conceptual framework. Theories put forward by various writers were explored. The chapter reviewed literature on Finance Schemes in relation to e-waste disposal by utility companies. The chapter concluded with the discussion of the research gap.

2.2 Theoretical Review

Three theories were reviewed which included waste management theory, Game theory and Resource Based View theory.

2.2.1 Waste Management Theory

Waste Management Theory (WMT) is a conceptual description of waste management, providing definitions of all waste-related concepts, and suggesting a methodology of waste management. A domain-specific set of problems is put forward, described and their relationships explained, thus providing a system of logically interconnected knowledge sets. Waste management should be understood as a system composed of physical things, human activities, and links between and within the former and latter. In such a system, the physical things would refer to waste-related materials and processing devices, while the human activities would include any activities which are affected by or have an effect on these physical things. Pohjola and Pongrácz (1998) named this system a Waste Management System (WMS).

2.2.2 Game Theory

In game theory the prisoner's dilemma is explained where two prisoners who partners in a crime were questioned in separate rooms. Each prisoner has a choice of confessing to the crime and thereby implicating the other or denying participation in the crime. The aim is to make one prisoner confess, then promise him freedom. The other prisoner would then be jailed. If both prisoners denied being involved, then both would be held for fewer months on a technicality. Each scenario is analyzed for gains in cooperation versus gains in noncooperation.

Rajendra and Arvind (2013) used game theory in the analysis to find the optimal strategies for e-waste management in India. The study revealed that since e-waste management involved several stakeholders (Regulatory agencies, manufacturers, consumers and recyclers), game theory could be applied to determine the profits for each stakeholder in cooperative and non-cooperative schemes. Each stakeholder considered the positive and negative payoffs in cooperation or when they acted individually. The study concluded that cooperation by stakeholders was better than working individually in e-waste management.

2.2.3 Resource-Based View Theory

According to Resource-Based View (RBV) theory, organizations wish to maintain a distinctive product (competitive advantage) and will plug gaps in resources and capabilities in the most cost-effective manner (Krim, 2003). This theory emphasizes that resources internal to the firm are the principal driver of a firm's profitability and strategic advantage (Barney, 1991).

E-waste handling has social complexity in the form of environmental sustainability due to the toxicity of some of the elements used in their manufacture. This means that, firms will try to use any method to ensure ICT equipment perform to the maximum without costing the firm pronounced disposal expenses once they reach Enf of Life (EoL). A firm will therefore try to make e-waste disposal choice based on minimum acceptable environmental requirements to minimize social complexity on the resource and maintain competitiveness for the moment.

2.3 Empirical Review

2.3.1 Finance Scheme Construct

From the theory of Game theory and RBV, the construct of finance scheme will consider predictors illustrated in Table 2.1.

Table 2.1: Predictors of Finance Scheme

Predictor (feature)	Description/ Theory applied	Reference
Resource (r_f)	E-waste as a resource. Recovery of precious metals and other materials from e-waste (Resource Based View theory)	OECD (2001), Widmer et al.(2005), Soderstrom (2004), Korin (2014), Rajendra and Arvind(2013), Gathuka (2013)
Advance fee paid for e-waste handling ($a_{f)}$	Extended Producer Responsibility (EPR), Advance collection fee, drop-off fee (DF), Advance Recycling Fee (ARF), Take back schemes. (Polluter pays principle).	Takayoshi et al. (2011), OECD (2001), Liao (2009), Widmer et al. (2005).
Transaction fee (tc_f)	Labour fee paid to employees of other third-party e-waste handlers	Wídmer et al.(2005)
Storage of e-waste (st_f)	Space occupied by E-waste. Expensive warehousing,	Tocho and Waema (2013), Drayton (2011), Saphores et al. (2009), Widmer et al.(2005)
Transportation of e-waste (tp_f)	Moving e-waste from source to destinations such as collection points, recycling centres or to a storage location.	Tocho and Waema (2013), Drayton (2011), Saphores et al. (2009), Widmer et al.(2005)
Incentives (I)	Government incentives to e-waste stakeholders in form of fee waivers, tax reduction and an enabling environment. (Game theory)	Williams (2005), Anuj et al. (2014)

2.4 Conceptual Framework

The conceptual framework depicted by Figure 2.2 illustrates the relationships that exist between the dependent and independent variables under study. The dependent variable is the disposal of e-waste. The Independent variable to be investigated in this study and establish level of influence on the dependent variable is the finance scheme and regulations enforcement as a moderating determinant.

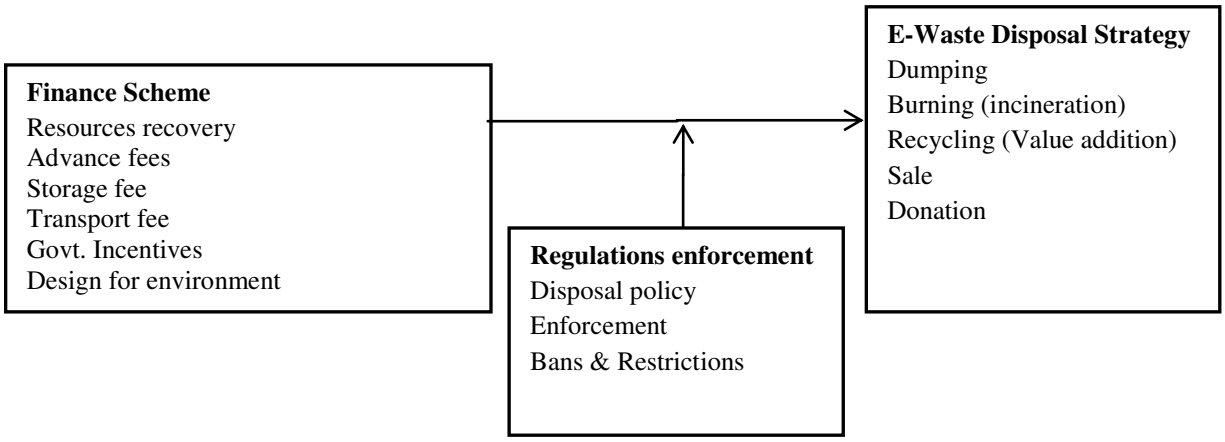

Figure 2.2: Conceptual Framework

2.5 Research Gaps

E-waste research in Kenya has mostly investigated e-waste management from the point of view of regulatory and policy frameworks. This is demonstrated through research work by Waema et al. (2008), Tocho and Waema (2013), Gathuka (2013) and, Ndolo and Omwenga (2015). E-waste management and its implication to the strategic competitiveness of a firm has not been investigated as a distinct subject.

Despite disposal methods being regulated in Kenya by the procurement and disposal act, 2015, the government departments and corporates including utility firms have the leeway of dumping waste as one of several alternatives when deciding on disposal of e-waste. The method of decision making is not specifically driven by the fact that e-waste is hazardous. Research carried out in Kenya has not addressed finance schemes and limited research data is available on the concept as applied Kenya. This creates a gap which this study attempted to bridge.

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter covered research design, population, sample and sampling techniques, data collection instruments and pilot test. Each of these sections was discussed in relation to the proposed study objectives.

3.2 Research Design

The research philosophy used in this study was positivism where hypotheses are generated from existing theories and tested through data analysis. Both qualitative and quantitative methods were used. Descriptive statistics were used to establish the relationship between the dependent variable of e-waste disposal and the independent variables of awareness and regulations enforcement as shown on the conceptual framework.

Survey design was employed to establish these relationships. According to Saunders, Lewis, and Thornbill (2009) survey design is a popular method to answer who, what, where and how questions. Quantitative data analysis using questionnaires was used to find out the relationship between the dependent and independent variables. Various analytical tools were used to establish the required statistics.

3.3 Target Population

The study focused on utility companies in Kenya which included companies and organizations that provide services to the public specifically water, electricity and telecommunications. The population of the study comprised utility companies in water, electricity and telecommunications sectors in Kenya. Water utility companies are in county governments in all the forty-seven counties. Utility companies that deal with electricity are KPLC, KETRACO, KENGEN, REA and GDC. Public telecommunication companies are Telkom Kenya, Safaricom and Airtel. The individuals who deal with e-waste in these companies formed the target population of the study.

Since the study sought to examine e-waste disposal strategies in Kenya it was necessary to target employees who make e-waste related decisions in the utility companies. The research therefore focused on the employees who dealt with e-waste within these organizations. The employees formed the target population. The designations of the employees included Directors, Managers, Engineers, Technicians, Accountants and Employees. The category of officers constituted systems administrators, ICT, Billing and Commercial, Clerks and meter reading employees.

3.4 Sampling Frame

The sampling frame proposed for this study constituted the employees involved in e-waste handling for each utility company. The interviewees were employees including functional and operational employees in the departments within the utilities. The employees were considered to be key informants for the research. In addition, the departments in which the intended respondents work were the key departments in which e-waste was generated and processed. The interviewees were expected to be involved in e-waste disposal process. Sample frame is shown in Table 3.1.

Table 3.1: Sampling Frame

Utility Firm	Number of Employees
GDC HQ	46
Kengen HQ	14
Ketraco HQ	23
KPLC HQ	142
REA HQ	71
Airtel	52
Safaricom HQ	37
Telkom Kenya	34
County HQ (47)	765
TOTAL	1184

3.5 Sample Size and Sampling Technique

The sample for this study constituted employees drawn from individuals who dealt with e-waste directly in each of the public utility companies.

3.5.1 Sample Size Formula for Finite Population

When the target population is finite, the formula (Krejcie & Morgan, 1970) used to determine the sample size is as shown in Equation 3.1.

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)} \quad \ldots\ldots\ldots\ldots\ldots Equation\ 3.1$$

$$S = \frac{1.96^2 \text{x} 1184 \text{ x } 0.5(1-0.5)}{0.05^2(1184-1) + 1.96^2 \text{x} 0.5(1-0.5)}$$

$$S = \frac{1137.1136}{2.9575 + 0.9604}$$

$$S = \frac{1137.1136}{3.9179} = 290.235 \approx 290$$

Where;	
R	Required sample size
X	Z value (e.g. 1.96 for 95% confidence level
N	Population size
P	Population proportion (expressed as decimal) (assumed to be 0.5 (50%)
d	Degree of accuracy (5%), expressed as a proportion (0.05); It is a margin of error

3.5.2 Sampling Technique

The study applied simple random sampling technique to arrive at the sample size of 290 determined in Section 3.5.1. Random sample spacing = 1184/290 ≈ 4. Proportional stratified random sampling was used to allocate strata sample size using Equation 3.2.

$$n_i = \frac{nN_i}{N} \quad \ldots\ldots\ldots\ldots\ldots Equation\ 3.2$$

Where n= Sample size =290, N= Total population = 1184, N_i = Strata Population, n_i = Strata sample size. This is illustrated in Table 3.2

Table 3.2: Strata Sample Size

Utility Firm	Strata Population (N_i)	Strata Sample size (n_i)
GDC HQ	46	11
Kengen HQ	14	4
Ketraco HQ	23	6
KPLC HQ	142	35
REA HQ	71	17
Airtel	52	12
Safaricom HQ	37	9
Telkom Kenya	34	9
County HQ (47)	765	187
TOTAL	1184	290

Note. HQ=Headquarter, N_i = Population of strata and, n_i is the sample size of the strata

3.6 Research Instruments

The instruments used included questionnaires, and open-ended questions. The questions implored demographic data that sought to explain the experience of the respondent on e-waste issues. Open ended questions assisted to collect data that allowed content analysis to prod the respondent to give wider views on e-waste issues. These questions were included in the last section of the questionnaire.

3.7 Data Collection Procedure

The study used primary data which were collected through face-to-face interviews with the researcher and by the use of questionnaires. Review of secondary data contained in company documents especially the inventories were explored. Mugenda and Mugenda (2003 p. 86) define an interview guide as "a set of questions that the interviewer asks when interviewing". The respondents interviewed were those involved with formulation and implementation of organization's strategy that deal with disposal of e-waste.

The instruments made it possible to obtain data required to meet specific objectives of the study (Yabs, 2010). Observations made that concern e-waste disposal were recorded. The data collected provided an insight in understanding how utilities decide on e-waste disposal process.

3.8 Pilot Test

The pilot test used in this study involved developing and testing the adequacy of the research instruments which were administered on a small scale to a group of selected respondents. The pilot group was as similar as possible to the target population and the size was at most 10% or 29 respondents of the target study sample. The actual study used 20 respondents which was approximately 6.9% of the sample size. The pilot assisted in assessing the feasibility of the final study and whether the research protocol was realistic and workable. The pilot helped to determine whether the sampling frame and techniques used for sampling were effective.

This approach assessed the likelihood of occurrence of logistical problems when using the proposed methods. The pilot assisted to estimate variability and reliability of the research instruments. The outcomes helped to determine suitable sample size while collecting preliminary data (Teijlingen, Rennie, Hundley, & Graham, 2001). The pilot test was used to develop fine-tuned research questions and research methodology.

4.0 RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This chapter covered research findings and analysis of the data collected from the Utility firms which comprised of water companies in the forty-seven counties, electricity utility companies, and the major telephone companies in Kenya. The chapter has subsections on response rate and the descriptive statistics. The chapter covered analysis of the assumptions of Ordinary Least Squares (OLS) in regression analysis with and without the moderating factor. Discussions on the findings are also included in this chapter.

4.2 Response rate

The response rate was analyzed as shown in Table 4.1. The study surveyed 203 respondents out of the expected 290 which was equivalent to 70%. This was deemed adequate as Saunders and Lewis (2009) recommend an average response rate as low as 30% for survey research.

The researcher examined the questionnaires for the fullness of data completion. Three (3) questionnaires were found to have been poorly filled up with a lot of missing data and inconsistent content. The questionnaires were therefore rejected and omitted from further analysis. 203 questionnaires had been filled correctly and accurately.

Table 4.1: Response Rate for Data Collected Per Strata

Utility Firm	Strata Population N_i)	Strata Sample size (n_i)	Actual Data Collected	% Data Collected Per Strata
GDC HQ	46	11	6	54.5
Kengen HQ	14	4	3	75
Ketraco HQ	23	6	5	83.3
KPLC HQ	142	35	26	74.3
REA HQ	71	17	9	52.9
Airtel	52	12	0	0
Safaricom HQ	37	9	8	88.9
Telkom Kenya	34	9	9	100
Water Utilities in County HQ (47)	765	187	137	73.3
TOTAL	1184	290	203	70.0

Note: HQ=Headquarter, N_i = Population of strata and, n_i is the sample size of the strata

4.3 Background and General Information

Background and general information responses were in the first section of the questionnaire. The questions were in three sections. The first question required respondents to name the organization in which they work, the second question was the town or county name, the third question was the designation in the company, fourth question the department or section in which the respondent worked and finally the duration of working in the organization. This set of questions sought an insight into how relevant and experienced the respondent was in giving the required opinions.

As shown in Table 4.1, eight (8) utility firms responded out of the expected 9. Airtel limited did not respond. The counties surveyed were 33 out of the expected 47 counties. The response rate of 70.2 %. According to Mugenda and Mugenda (2003) response rates of 70 % and above are excellent when used in a survey.

4.3.1 Position in the Organization

The study sought respondents view regarding their positions in the organization. Results were as indicated in Table 4.2. The respondents were grouped into six categories. Table 4.2 shows the response frequency per group that included Directors (3%), Managers (12.3%), Engineers (10.8%), Technicians (5.4%), Accountants (6.9%) and officers (61.6%).

The officer group consisted of systems administrators, ICT support, Billing and Commercial, Office clerks and meter reading employees. The distribution closely follows the pyramidal nature of organizational hierarchal structures in most organizations with few directors on top and most employees at the bottom of the pyramid.

Table 4.2: Position in the Organization

	Frequency	Percentage
Director	6	3
Manager	25	12.3
Engineer	22	10.8
Technician	11	5.4
Accountant	14	6.9
Officer	125	61.6
Total	203	100.0

4.3.2 Department of the Respondent in the Organization

Respondent's view regarding their departments was as indicated in Table 4.3. 32.5% of the respondents worked in ICT department, 3.9% in Procurement and Stores, 26.1% in Technical, 11.3% in Commercial, 11.8% in Finance, 6.9% in Planning, and 7.5 % in Administration. ICT and Technical Department made the bulk of the respondents. The two groups were more involved in ICT equipment handling in the organizations.

The respondents' observations are deemed to be more objective and experienced due to the frequent interaction with ICT equipment and e-waste at the technical level.

Table 4.3: Department of Respondent

	Frequency	Percent
ICT	66	32.5
Procurement & Stores	8	3.9
Technical	53	26.1
Commercial	23	11.3
Finance	24	11.8
Planning	14	6.9
Administration	15	7.5
Total	203	100.0

4.3.3 Duration of Working in the Organization

The study established respondents view regarding working duration in the organization. Findings from descriptive analysis were as shown in Table 4.4. The results indicated that 48.8% of the respondents had worked for less than five years, 26.1% of them had worked for between 5 years to 10 years while 25.1% of the respondents worked for more than 10 years. This pattern is indicative of the fast-growing nature of ICT processes and structures in most organizations. Overall, the study had 51.2% who had worked for more than 5 years compared to 48.8% who were below five years which mean they had experience in the field of handling e-waste.

Table 4.4: Duration of Working in the Organization

		Frequency	Valid Percentage
Valid	Less than five years	99	48.8
	5 to 10 years	53	26.1
	More than 10 years	51	25.1
	Total	203	100.0

4.4 Descriptive Statistics on the Constructs

Responses on each question were analyzed using SPSS. The response on each Likert scale question was tabulated and the percentage out of 203 shown.

4.4.1 Finance Scheme Influence on Disposal of e-waste

The researcher sought to establish the respondents' views regarding finance scheme. Findings were summarized in Table 4.11. Results indicated that respondents disagreed that the company has arrangement with suppliers to take back used electronics gargets. 59.2% of the respondents strongly and/or disagreed with a (Chi Square 48.502, with df of 4, p=.000). The results satisfy the Chi Square goodness of fit test.

The responses indicate that there are no finance schemes in organizations. There were no arrangements with suppliers to take electronic goods back as they became obsolete. This supports studies by Tocho and Waema (2013), Ndolo and Omwenga (2015), Gathuka (2013), Korin (2014) and Widmer et al. (2005), who found that finance scheme was crucial as a determinant in e-waste management. However, in this study descriptive, most organizations lack the any financing systems for funding e-waste disposal.

Table 4.11: Descriptive Statistics on Finance Scheme

	SA (%)	A (%)	U (%)	D (%)	SD (%)	Chi Square	P value
The company has arrangement with suppliers to take back used electronics gargets	13(6.4)	21(10.3)	49(24.1)	60(29.6)	60(29.6)	48.502	0.000
The suppliers charge a fee in recovery of used electrical and electronic gadgets from the company	8(3.9)	30(14.8)	50(24.6)	55(27.1)	60(29.6)	45.498	0.000
The suppliers pay the company a fee in recovery of used electrical and electronic gargets	10(4.9)	28(13.8)	52(25.6)	47(23.2)	66(32.6)	47.074	0.000
The company incurs the cost of recycling the used electrical and electronic gargets	12(5.9)	32(15.8)	46(22.7)	52(25.6)	61(30.0)	36.138	0.000
The company sells used electronic equipment to third parties	26(12.8)	50(24.6)	39(19.2)	46(22.7)	42(20.7)	8.256	0.083
The company repairs its electronics using internal staff and other agents	44(21.7)	95(46.8)	23(11.3)	27(13.3)	14(6.9)	102.788	0.000
The government encourages proper disposal of e-waste through giving disposal incentives to companies	21(10.3)	43(21.2)	47(23.2)	51(25.1)	41(20.2)	13.281	0.010
The company minimizes the cost of disposing e-waste by donating used electronic gadgets to third parties	16(7.9)	43(21.2)	44(21.7)	59(29.1)	41(20.2)	23.675	0.000
The company has clear disposal funding policy of used electrical and electronic gargets	10(4.9)	43(21.2)	44(21.7)	60(29.6)	46(22.7)	33.478	0.000
The company uses resources in used up electronics to repair others	37(18.2)	58(28.6)	30(14.8)	48(23.6)	30(14.8)	14.660	0.005
Valid N (listwise)	203						

4.4.2 Regulations Enforcement Influence on Disposal Strategy

Results on regulations enforcement illustrated in Table 4.7 established that respondents were undecided whether the company has appropriate mechanisms for enforcing policy on e-waste handling. 31.1% of the respondents agreed, 28.1% of them were undecided while 40.9% of the respondents disagreed registering a (Chi Square 30.276, with df of 4, p=.000) which satisfies Chi Square goodness of fit test.

The respondent's views on Regulations enforcement were also sought through use of open questions. For this variable a total of 130 responses were received. The respondents' views concentrated on the general lack of any knowledge of the presence of regulations governing e-waste disposal in the organization.

The results are similar to the study by Anuj, Tara, Pandey and Nisha (2014) whose investigations in India observed that 64 % of respondents had no knowledge of policies on e-waste. In Kenya, Tocho and Waema (2013) observed that only 20% of the respondents had policies in place. Gathuka (2013) had also observed that 45 % of the respondents at the University of Nairobi had indicated that there were not aware of any e-waste policies in the institution.

Table 4.7: Descriptive Statistics on Regulations enforcement

	SA (%)	A (%)	U (%)	D (%)	SD (%)	Chi Square	P value
The company has appropriate mechanisms for enforcing policy on e-waste handling	19(9.4)	44(21.7)	57(28.1)	57(28.1)	26(12.8)	30276	0.000
The policy specifies bans restrictions on certain materials and disposal methods for e-waste	15(7.4)	37(18.2)	55(27.1)	62(30.5)	34(16.7)	33.921	0.000
Valid N (listwise)	203						

4.4.3 E-waste Disposal Strategy

Finally, respondents' views regarding e-waste disposal were established. The analysis findings were compiled and presented as shown in Table 4.8. The respondents disagreed that more than 50% of e-waste is disposed through recycling. 50.7% strongly and/or disagreed with disposal through recycling with (Chi Square 23.773, with df of 4, p=.000) which satisfies Chi Square goodness of fit test. On the contrary, respondents were neutral on the statement that the company upgrades much of its electronic systems instead of buying new ones. 45.3% of the respondents agreed, 17.2% of them were undecided while 37.4% of the respondents disagreed. The results recorded a (Chi Square 35.695, with df of 4, p=.000) which satisfy Chi Square goodness of fit test.

Contrary to this study where only 29.4% reported disposal was done in designated dumping sites. Okoye and Chijioke (2014) on the research carried out at Onitsha, Southeastern Nigeria observed that 36.4 % of the respondents reported that disposal was done in designated dumping sites. 9.1% noted that disposal was by way of selling to recyclers in Onitsha as compared to 39.4 % in this study. 18% reported that disposal is in any available dumping site in Onitsha while none of the respondents reported dumping by burning or incineration or dumping into the sea or river bank in Nigeria.

Table 4.8: Descriptive Statistics on E-waste Disposal

	SA (%)	A (%)	U (%)	D (%)	SD (%)	Chi Square	P value
More than 50% of e-waste is disposed through recycling	14(6.9)	41(20.2)	45(22.2)	52(25.6)	51(25.1)	23.773	0.000
The company upgrades much of its electronic systems instead of buying new ones	23(11.3)	69(34.0)	35(17.2)	50(24.6)	26(12.8)	35.695	0.000
Old systems refurbished for further usage	17(8.4)	71(35.0)	38(18.7)	48(23.6)	29(14.3)	41.310	0.000
More than 50% of e-waste is disposed through dumping	25(12.3)	49(24.1)	49(24.1)	52(25.6)	28(13.8)	16.581	0.000
Valid N (listwise)	203						

4.5 Tests for Ordinary Least Squares (OLS) Assumptions

4.5.1 Test for Normality

To test for normality of the dependent variable (E-waste disposal), the study employed the Kolmogorov-Smirnova (KS) and Shapiro-Wilk test (SW). This assisted in establishing the appropriate tests to be conducted and ensure that assumptions of normal distribution are upheld. Following the Sharpiro and Wilk (1965), the tests reject the normality hypothesis if the p-value is less than or equivalent to 0.05. The findings from the test were as presented in Table 4.9.

The analysis show that KS and SW statistics were 0.069 and 0.989 respectively. The p-values were 0.019 and 0.115 for KS and SW respectively. The KS test p-value was less than the 0.05 level of significance thus suggesting that the hypothesis for normality of data should be rejected indicated that the data was somehow skewed. However, the p-value for SW test of 0.115 was greater than 0.05 level of significance indicating that the hypothesis for normal distribution of data should fail to be rejected concluding that the data is normally distributed.

Findings from Yap and Sim (2011) upon comparisons of various normality tests concluded that in case skewness is suspected as in the case in this study, then the SW test is the best test to confirm the skewness. Mendes and Pala (2003) as well as Keskin (2006) had also concluded that SW test is the most powerful normality test. In this regard, based on SW test the study concluded that the data on the dependent variable was normally distributed.

Visual examination of the distribution of independent variables on the dependent variable was as shown in Figure 4.1 and Figure 4.2. It is observed that minimal deviations from normality can be depicted though not very pronounced therefore the conducted significance test on the data was accurate (Shlin & Miles, 2010).

Table 4.9: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
E-WASTE DISPOSAL	.069	203	.019	.989	203	.115

a. Lilliefors Significance Correction

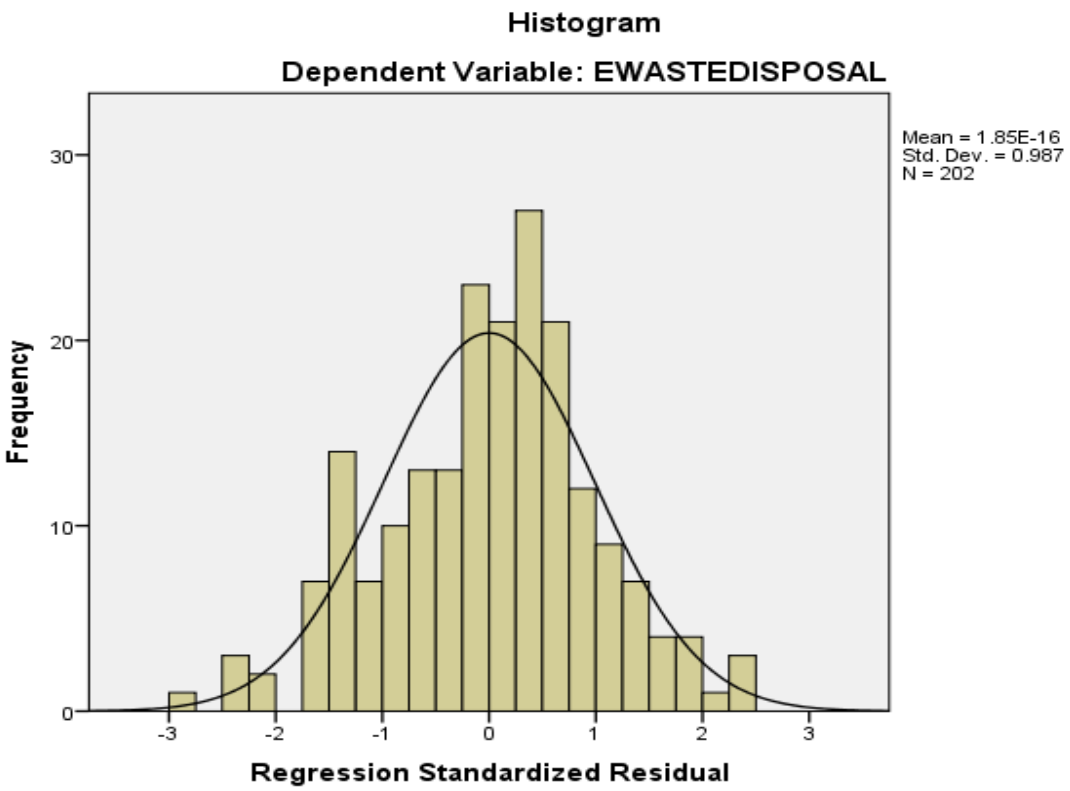

Figure 4.1: Histogram on Normality

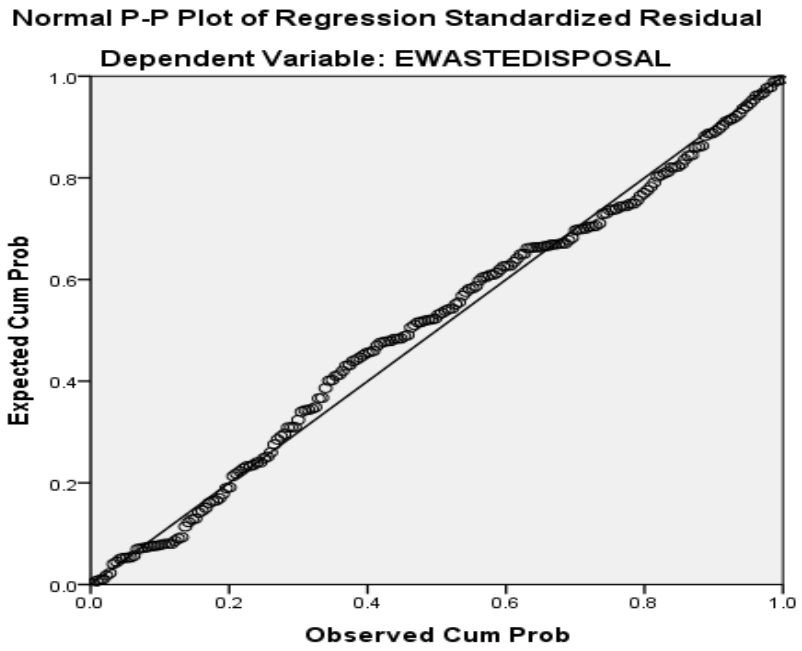

Figure 4.2: Normal PP plot

4.5.2 Linearity Test

The study employed the comparison of means to test for linearity. This was done with the following decision-making rule:

i. If the value of sig. deviation from linearity is greater than 0.05, then the relationship between the independent variables are linearly dependent.
ii. If the value of sig. deviation from linearity is less than 0.05, then the relationship between independent variables with the dependent is not linear.

The findings indicated that the Deviation from linearity was 0.821. This value was greater than 0.05 indicating that the relationship between the independent variable and the dependent variable (stakeholder awareness) are linearly dependent. As such, the study concluded that the data for e-waste disposal and stakeholders' awareness met the requirement for the linearity assumption.

4.5.3 Test for Heteroskedasticity

The study utilized Breusch Pagan (BP) test to examine whether the data was heteroskedastic or homoscedastic. In this study the null hypothesis for homoskedasticity failed to be rejected. As such, the data for dependent and independent variables was concluded to be homoskedastic.

4.6 Correlations Analysis

Pearson product moment correlation coefficient was used to indicate the relationships between the independent and dependent variables. The responses were first computed into a composite score of their means. This was possible because the responses were in a Likert scale making it possible to compose them together into a composite score. The scores for the independent variables were then correlated with composite scores of the dependent variable.

4.7 Hypothesis Testing

The study set to test the hypothesis of the study in examining the determinants of e-waste disposal by utility companies in Kenya. The study used the analysis of variance (ANOVA) at a level of significance of $p<.05$. If the level of significance is greater than the p-value, the null hypothesis fails to be rejected and when level of significance is less than the p-value the null hypothesis is rejected.

The hypothesis H_{02} indicated that Finance scheme has no significant influence on e-waste disposal by utility companies in Kenya. Simple regression analysis on this hypothesis gave the results shown in Table 4.12.

Table 4.12: Model Summary on Finance Scheme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.680[a]	.462	.459	.73527

a. Predictors: (Constant), Stakeholders Awareness

R-squared from the model summary was 0.462. Stakeholders' awareness could only count for 46.2% of the total variance. The remaining 53.8% could be accounted for by factors not included in this model. Findings from analysis of variance gave the results shown in Table 4.13.

Table 4.13: ANOVA: Finance Scheme

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	93.335	1	93.335	172.643	.000 [b]
Residual	108.665	201	.541		
Total	202.000	202			

a. Dependent Variable: E-waste Disposal

b. Predictors: Constant, Finance

From the table, the F-statistic value ($F_{(1,200)} = 172.643$, p=.000) was found to be significant at $p<0.05$ level of significance. Therefore, the study observed that Finance Scheme had a significant influence on e-waste disposal by utility companies in Kenya. Finance Scheme plays a significant role in determining e-waste disposal.

Model Coefficients

Model		Unstandardized Coefficients		Std Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.958E-016	.052		.000	1.000
	Finance Scheme	.680	.052	.680	13.139	.000

Model: $Y = 8.96E\text{-}016 + 0.680X_1 + 0.735$ … equation 4.1

The null hypothesis $\mathbf{H_{01}}$ that, Finance scheme has no significant influence on e-waste disposal by utility companies in Kenya was rejected.

The second hypothesis $\mathbf{H_{02}}$ indicated that regulations had no significant influence on e-waste disposal by utility companies in Kenya. Simple regression analysis on this hypothesis gave the results shown in Table 4.14.

Table 4.14: Model Summary on Regulations

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.402[a]	.161	.157	.59661

a. Predictors: (Constant), Regulations

The R-squared value obtained from the model summary was 0.161. Regulations could only account for 16.1% of the total variance in e-waste disposal. This means that regulations had a little significant influence on e-waste disposal by utility companies in Kenya. Results from the analysis of variance were as shown in Table 4.15.

Table 4.15: ANOVA[b] on Regulations

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.760	1	13.760	38.657	.000[a]
	Residual	71.545	201	.356		
	Total	85.305	202			

a. Predictors: (Constant), Regulations
b. Dependent Variable: E-Waste Disposal

The table gave an F-value of ($F_{(1,201)}$ =38.657, p=.000) for regulations which was significant at p<.05 level of significance. Findings indicated that regulations significantly influenced e-waste disposal by utility companies. Thus, regulations determined e-waste disposal by utility companies in Kenya.

The null hypothesis **H_{02}** that, regulations have no significant influence on e-waste disposal by utility companies in Kenya was rejected.

4.8 Moderation Effect of Regulations Enforcement

4.8.1 Regulation Enforcement as an Intercept Shifter

Multiple regression analysis was undertaken for the data to establish the extent to which the independent variable (including the moderating valuable) predict the dependent variable. The findings from the analysis were as presented in Table 4.15. The model gave an R-squared value of 0.471.

Table 4.15: Multiple Regression Model with Regulations Enforcement as Intercept Shifter

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.686[a]	.471	.466	.73079

b. Predictors: (Constant), Regulations enforcement

ANOVA gave the results shown in Table 4.16. From the findings an F-value of ($F_{(2, 200)}$ =89.119, p=.000) was established and was significant at p<.05. The study observed that the independent variables (Finance scheme and Regulations enforcement) had a positive influence and vital role on e-waste disposal by utility companies in Kenya.

Table 4.16: ANOVA[a] For Independent Variables Including Regulations Enforcement

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	95.189	2	47.594	89.119	.000[b]
Residual	106.811	200	.534		
Total	202.000	202			

a. Dependent Variable: E-waste Disposal, b. Predictors: (Constant), Regulations, Finance Scheme

Table 4.17: Coefficients of Model with Regulations Enforcement as Intercept Shifter

Model	Unstandardized Coefficients		Std. Coefficients	t	Sig.
	B	Std. Error	Beta		

	(Constant)	7.802E-016	.051		.000	1.000
1	Finance Scheme	.629	.058	.629	10.827	.000
	Regulations enforcement	.108	.058	.108	1.863	.064

a. Dependent Variable: E-Waste Disposal

Model: $Y = 7.802E\text{-}016 + 0.629X_1 + 0.108X_2 + 0.731$ …equation 4.2

4.8.2 Regulations Enforcement as Both Intercept and Slope Shifter

Findings on Table 4.18 demonstrated that R-squared value of 0.217 was established. The study observed that the independent variable in presence of moderating variable as both an intercept and slope shifter explained 21.7 % of the total variation in the dependent variable. Therefore, the inclusion of the moderating variable as both an intercept and slope shifter changed R squared by 0.002. The moderating variable enhances the ability of the independent variable to explain the changes in dependent variable.

Table 4.18: Summary of the Model with Moderating Variable

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.687[a]	.472	.464	.73202

The results from analysis of variance were as shown in Table 4.19. The ANOVA gave an F-value of ($F_{(3, 199)}$ = 59.325, p=.000) which was significant at $p<0.05$ level of significance. As such, the independent variable (Finace schem) in presence of moderating variable was found to have significant influence on e-waste disposal. Thus, the independent variable significantly influenced e-waste disposal by utility companies in Kenya.

Table 4.19: ANOVA[a] for Summary of the Model with Moderating Variable

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	95.367	3	31.789	59.325	.000[b]
Residual	106.633	199	.536		
Total	202.000	202			

Table 4.20: Coefficients of the Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.013	.056		.227	.821
	Finance Scheme	.630	.058	.630	10.823	.000
	Regulations	.106	.058	.106	1.808	.072
	X3M	-.027	.047	-.030	-.576	.565

a. Dependent Variable: E-waste Disposal

Model: $Y = 0.013 + 0.630X_1 + 0.106X_2 - 0.030X_3M + 0.732$ …equation 4.3

Finance scheme variable is significant as shown in equation 4.1, 4.2 and 4.3. A constant behavior was observed when the regulations enforcement moderating variable was introduced. In this study, finance scheme is therefore an important influencer of e-waste disposal strategy with or without the regulations enforcement.

H_{A1}: Finance scheme has significant influence on e-waste disposal by utility companies in Kenya.

This closely relates to studies by Waema et al. (2008) who observed that the government did not have any incentives to encourage stakeholder to manage e-waste properly.

5.0 RESEARCH CONCLUSION AND RECOMMENDATIONS

5.1 Finance Scheme

Findings indicated that respondents agreed no incentives were paid by stakeholders. Findings further established that finance scheme had a strong positive relationship with e-waste disposal. This study concludes that finance scheme is significant in influencing e-waste disposal by utility companies in Kenya.

5.2 E-Waste Disposal

Findings indicated that respondents disagreed that more than 50% of e-waste is disposed through recycling. On the contrary, they were neutral on the statement that the company upgrades much of its electronic systems instead of buying new ones. This study concludes that utility companies are not consistent in their e-waste disposal procedures.

5.3 Recommendations

The study was focused on influence of finance scheme on utility companies in Kenya. The study investigated the regulatory policy influence on the disposal of e-waste. The study recommends that further research be carried out to establish incentives on e-waste disposal by the government. Further, the focus should be expanded to include actual fees paid by e-waste handlers in Kenya.

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