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CRITICAL SUCCESS FACTORS FOR E-WASTE MANAGEMENT AMONG GOVERNMENT OF KENYA MINISTRIES

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Abstract

This study main objective was to determine the critical success factors (CSFs) for e-waste management among government of Kenya ministries. The specific objectives were: to establish the influence of existing legal framework on e-waste management in Government ministries in Kenya and to establish the influence of infrastructure facilities in enhancing e-waste management in Government ministries in Kenya. The study was anchored on the Critical Success Factors (CSFs) theory, The Zero waste theory, the Resource Dependency theory and the Stakeholder theory to conceptualize the study. Descriptive research design was adopted with a target population of all the 22 ministries comprising of 312 ICT officers who were the respondents. The respondents sample size was determined through the Krejcie and Morgan table which resulted to 169 ICT officers. They were then chosen through proportionate stratified random sampling based on 7 strata of ICT cadres for the administering of the semi-structured questionnaires used to collect both qualitative and quantitative primary data. A pilot study involving 17 (10%) respondents was done to check reliability and correct the research instruments. At the end, out of 169 sample, only 131 participated in the study, thus resulting into a response rate of 77.5%. The 131 questionnaires data was then analyzed into both descriptive and inferential statistics using SPSS. The study's findings revealed that e-waste legal framework factors, and e-waste infrastructure status factors had a significant influence on e-waste management. The Study established that legal framework factors had the highest influence with the value of t=4.763, followed by e-waste infrastructure=2.475. The study recommends the formulation of a standalone e-waste ICT standard policy for use among government agencies to effectively manage e-waste and continuous audit of government agencies on compliance with ICT standards for the successful e-waste management

Keywords
Critical success factors, e-waste management, infrastructure facilities, legal framework Implementation

INTRODUCTION

According to the United Nations (UN, 2021), sustainability means achieving current needs without jeopardizing the potential of fulfilling future needs and towards this end, seventeen

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goals, known as the Sustainable Development Goals (SDGs), have been introduced to ensure sustainability. However, the rapid growth in Information Society has led to mass production of Information Communication Technology (ICT) and telecommunication devices all over the world to meet the rapidly growing demand for utilization (Otieno & Omwenga, 2016; Ibrahim & Elijah, 2015) hence affecting their sustainability. According to Agamuthu, Kasapo & Nordin (2015), the lifespan of computers and peripherals reduced from 5–10 years previously and now ranges between 3–4 years as this equipment is built with a focus on replacement instead of repairing (Agamuthu et al., 2015). This high technology advancement and rapid increase in the replacement of electrical and electronic equipment (EEE) is due to their limited short life which is estimated to soon hit a record of less than two years for computers and mobile phones (Bhutta, Omar & Yang, 2011). This trend has already led to accumulation of high levels of obsolete EEE waste, which is universally referred to as e-waste or waste electrical and electronics equipment (WEE) according to Agamuthu et al., (2015).

Guarnieri, Xavier, and Chaves (2020) claim that because of the potential risks to the environment and human health associated with managing e-waste using conventional methods, managing electronic waste has become a serious socioeconomic-technical challenge due to the widespread use of electronic devices. According to Otieno & Omwenga (2016), industrialized countries have been compelled to use scientific methods of e-waste treatment as a result of legislative interventions, consumer awareness, and active environmentalist roles. Additionally, the high cost of treatment and rising volume have made developing countries, such as India, more desirable and simple targets for the dumping of e-waste (Leclerc and Badami, 2020). The UN has tried to address this problem by linking e-waste to three of its SDGs and supporting the sustainable consumption and quantification of e-waste (Bhutta, Omar & Yang, 2011). Goal 12 (ensure sustainable consumption and production patterns) is highly relevant to the product/system life cycle. Two of the remarkable sub-goals of goal 12 are as follows: 1) by 2030, achieve sustainable management and efficient use of natural resources. 2) By 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse. Whether or not these sub-goals are achieved can be ensured by measuring the indicators called material, energy, and product efficiencies (Leclerc and Badami, 2020). Nevertheless, other indicators can be considered to make sustainability more meaningful (Guarnieri, et al., 2020).

According to Agamuthu et al., (2015), there is no standard definition of electronic waste (e-waste). However, e-waste has been defined by the European Commission Directive 2002/96/EC (2003) as ‘electrical or electronic equipment which is a waste including all discarded components, sub-assemblies and consumables which are part of the product at the time of discarding’ (European Commission, 2012). This e-waste according to Lundgren (2012), are made of components like Lead, Mercury among others that are harmful to the environment and health of human life when discarded improperly. According to ILO (2014), the concept covers a broad spectrum of electrical and electronic products that have reached their end of life. These products contain valuable substances (non-precious metals, including iron, steel, copper, aluminium; and precious metals, such as gold, silver, palladium and platinum) and hazardous elements (examples include: lead-containing glass, mercury, cadmium, batteries, flame retardants, chlorofluorocarbons and others.) that can have detrimental effects on human health and the environment, if not handled properly (Wang et al., 2012). Some devices are refurbished for reuse and others are dismantled to recover the valuable materials for recycling.

According to Guarnieri, et al. (2020), over the past few years, devices using either a battery or electricity as a source of power have increased in both developing and developed countries, increasing the amount of electronic waste that is at its end of the life cycle. According to Ibrahim & Elijah (2015), rapid growth and development of the Information

Communication Technology (ICT) field is the main reason for this occurrence. In this regard, therefore, according to Guarnieri, et al. (2020), the European Commission's WEEE Directive (European Commission, 2012) and the Basel Convention1 provide frameworks for identifying and quantifying e-waste for proper management. Today, several countries are in the process of formulating their own definition and regulations, as the stream of e-waste rapidly increases, turning into the fastest growing waste stream in the world (UNEP, 2007). According to the UN's Global E-waste Monitor latest report (2020), a record 53.6 million metric tonnes (Mt) of electronic waste was generated worldwide in 2019, up 21 percent in just five years. The report also predicts that global e-waste (discarded products with a battery or electrical plug) will reach 74 Mt by 2030 — almost a doubling of e-waste tonnage in just 16 years. This makes e-waste the world's fastest-growing domestic waste stream, fueled mainly by higher consumption rates of electric and electronic equipment, short life-cycles, and few options for repair as also observed by Agamuthu et al., (2015) and Ibrahim & Elijah (2015). Sadly, only 17.4 per cent of 2019's e-waste was collected and recycled. This means that gold, silver, copper, platinum, and other high-value, recoverable materials conservatively valued at US $57 billion — a sum greater than the Gross Domestic Product of most countries — were mostly dumped or burned rather than being collected for treatment and reuse (ITU, 2021).

Leclerc and Badami (2020) claim that because of its dangerous content, e-waste is typically classified as special or hazardous waste, and as such, its treatment and recycling must be governed by specific rules and regulations made at the local, national, and international levels. According to ITU (2021), both formal and informal stakeholders, particularly in poor countries, should be a part of a successful e-waste management value chain. In general, from the e-waste generation phase through the manufacture and manufacturing of new items, the government and informal stakeholders should be included, according to several academics, who also agree that their involvement is crucial (Guarnieri, et al., 2020; Leclerc and Badami, 2020; ITU, 2021).They are prevalent in the stages of collection, dismantling, pre-processing, processing, and, to a lesser degree, in the production of secondary raw materials. In most developing countries – which do not have formal e-waste recycling systems in place – informal recyclers (or collectors) act as the main e-waste suppliers to the recycling industry (Leclerc and Badami, 2020). In industrialized countries, most, if not all, value chain stakeholders operate in the formal economy (ITU, 2021).

According to Otieno & Omwenga (2016), in Kenya, a number of e-waste management guidelines and Acts have been developed. For example, the e-waste management guidelines (NEMA,2010) provide a basis for development of a regulatory framework for identification, collection, sorting, recycling and disposing of e-waste, according to the Environment Management and Coordination Act (EMCA,1999). In addition, the waste management regulation 2006 and the Procurement and Disposal Act 2015 are other legal instruments that have been developed to address the e-waste menace in Kenya. However, Otieno & Omwenga (2016) argue that most of these guidelines act as a basis for the development of policies and regulatory framework but do not yet offer solutions on proper disposal of e-waste in Kenya. For instance, the Public Procurement and Disposal regulation 2020 merely obligates institutions to acquire ICT equipment that are new and meeting the standard specifications in terms of environmental friendliness, cost of servicing, maintenance and disposal. The regulation further states that the lifespan of assets shall be in tandem with the policy set out by the Cabinet Secretary of finance under section 165 (5) of the Procurement and Disposal Act 2015. However, the policy is yet to be developed (Otieno & Omwenga (2016). This lack of clear disposal mechanisms has resulted in excessive accumulation of obsolete electronic devices by Ministries, Departments and Agencies (MDAs) (NEMA, 2010).

According to the Procurement and Disposal Act 2015, MDAs have to bond unserviceable goods where unserviceable ICT devices are part of such goods with competitive tenders for disposal of obsolete invited (NEMA, 2010)and yet there is very little evidence of this happening, close to ten years after the Act. According to Otieno & Omwenga (2016), this process is also slow in Kenya and often results to tonnes of decommissioned ICT equipment lying in stores, especially in the public institutions thus posing health issues to public servants. These researchers further observe that initiatives by reputable organizations such as Nokia, Computer for Schools Kenya (CFSK) to dispose of the e-waste have not been successful. Yet, according to the e-waste guidelines by NEMA (2010), the main institutions and stakeholders that have been identified in e-waste generation and management are listed as Government/policy makers, Private sector (manufacturers and distributers) and civil society (refurbishment centres and collection recyclers). However, according to Otieno & Omwenga (2016), there seems to be a gap as most of e-waste is dealt by informal sector begging the question what is the role of the user government institutions in e-waste disposal? Do they really understand the Critical Success Factors (CSFs) of e-waste disposal process in Kenya?

Statement of the Problem

Research has clearly shown that Kenya is not the only country in the world to struggle with e-waste management, therefore disposing of this garbage remains a significant problem for many nations worldwide (ITU, 2021; NEMA, 2019). For instance, according to recent study, just 20% of the 44.7 million metric tonnes that were produced in 2016 were recycled securely (Balde et al., 2017), with developed economies accounting for the majority of this recycling. Only 17.4% of e-waste was correctly collected and recycled three years later, in 2019. (Forti et al., 2020). Additionally, according to the most recent e-waste figures, 82.6% (or 44.3 Mt) of worldwide e-waste flows remain unreported (Forti, 2020).

According to the Global e-waste monitor (2020) the failure to dispose e-waste is majorly caused by lack of regulatory framework, inadequate policy, lack of research data and awareness among others. Also, many researchers conclude that studying the challenges facing e-waste management is very critical today as it would help to identify and evaluate targets for sustainability, and is useful when developing legislation and policies, especially in the areas of health, the natural environment, and workers' rights (Forti et al., 2020; Leclerc and Badami, 2020; ITU, 2021). This is critical now than ever before because policies and laws to address hazardous e-waste flows are more effectively enforced on the foundation of reliable data, and detailed insights into the e-waste industry (Forti et al., 2020). Limited research and a lack of national effort in effective management of e-waste in most developing countries have been further identified as the causes for the unavailability of information on e-waste volumes generated in these countries, which is a great danger to the health of people (ITU, 2021). This study posits that lack of identification and understanding of the few CSFs of e-waste management process is the cause of the current bad and deteriorating e-waste management situation in Kenya and most other developing countries. Therefore, in order to unlock the best practices in Kenya, we should start by first identifying and understanding the few CSFs of e-waste management process which need all stakeholders' attention and strategic considerations and monitoring.

In Kenya, very few studies have been done in the area of e-waste management. No study has been done in Kenya to determine the critical success factors (CSFs) for successful e-waste management among government of Kenya ministries. Such study was important in not only revealing the CSFs of e-waste management but also in unravelling the public sector institutional challenges facing e-waste disposal since the government is expected to lead by example in the effective e-waste management endevours. This study therefore, sought to fill this knowledge gap by determining the critical success factors (CSFs) for successful e-waste management among government of Kenya ministries.

Specific objectives

The objectives of the study are:

i. To establish the influence of existing legal framework on e-waste management in Government ministries in Kenya.
ii. To establish the influence of infrastructure facilities in enhancing e-waste management in Government ministries in Kenya.

LITERATURE REVIEW

Theoretical Review

Critical Success Factors (CSFs) Theory

The CSFs theory was developed by Daniel in 1961. The developer posits CSFs as a small number of factors that are key to an organization in achieving its goals. It comprises of environmental, competitive strategy and selective reporting of internal data (Ahmed, Shaikh, & Sarim, 2017). The theory was later advanced by Rockart (1979), where he emphasised that leaders and executives of an institution who are conversant with the key information needs at the corporate level are mostly likely to achieve the goals of their organization. Bullen and Rockart (1981) further identified the following key constructs underlying CSF theory: (a) industry, environmental, and internal factors; (b) corporate strategy and goals; and (c) managerial or project-level goals. Leaders can apply the CSFs and focus their activities on limited areas that will ensure success in meeting the organization goals.(Ahmed, Shaikh, & Sarim, 2017).

The CSFs approach according to Napitupulu (2017) has been applied in the field of ICT, in support of ICT project management (Napitupulu, 2017. Using CSFs to improve outcomes in ICT projects has become a common practice (Ahmed et al., 2017). Baporikar (2017) proposed that generic CSFs could apply to organizations within the same industry. However, Huang, Lin, and Liao (2015) differed with him and argued that industry-specific CSFs change over time, evolve under different environmental and geographical conditions, and vary based on the distinct characteristics of organizations thus mitigating the usability of standardized CSFs. In conclusion, while researchers may gain insights into CSFs from prior ICT studies, they must constrain the presumption of direct applicability in other contexts.

Many researchers, including Fitriani et al. (2016), Mokone et al. (2018), and Ziemba et al. (2015), have used CSF theory in their research of successful e-Government implementations. Fitriani et al. (2016) used CSF theory in a study of the external CSFs that influence the success of the Audit Board of Indonesia website. While CSFs can vary from one organization to another and differ from one project to another within the same firm, relevant to this study, Childs (2017), argued that the success of any e-Government eService project is dependent on the project leader's awareness of CSFs (Childs, 2017). Mokone et al., (2018), on the other hand, argue that organizational leaders who are unable to address the CSFs of a corporate initiative will be challenged to achieve the expected project outcomes. These sentiments by Daniel (1961), Childs (2017) and Mokone et al., (2018), are applied in this study in which CSFs of e-waste management would be explored.

Zero waste Theory

The Zero waste theory according to Mauch (2016) was coined by Paul Palmer in 1970 who was the director of Zero waste Institute in California. His Interest in this theory was informed by high tech businesses in the Silicon Valley that were discarding valuable clean chemicals that could be reused (Mauch, 2016). Palmer's concept of Zero waste was that each article should be re-used instead of only using once and discarding. His Strategy focuses on recovery of all resources instead of land filling or burning. Other scholars expanded the definition that waste disposal could be avoided through the 3Rs, reduce, reuse and recycle. It is a concept geared towards reducing waste disposal with a goal of avoiding it wholesome (Manomaivibool & Penate ,2016).

The definition of this theory in relation to e-waste has attracted varied discussions on its applicability but according to Mauch (2016), Zero Waste means that e-waste should be eliminated through design standards that allow re-use of all materials to avoid disposing by either burning or burying which would affect the environment. On Zero waste other scholars have advocated for shift in policy by adopting green computing standard through virtualisation, cloud computing, reduction in hazardous components in electronic devices and energy consumption (Debnath & Roychoudhuri 2015). This theory of achieving 100% through reuse means that a concrete institutional and regulatory framework to minimise the accumulation of e-waste need to be developed in Kenya.

Conceptual Framework

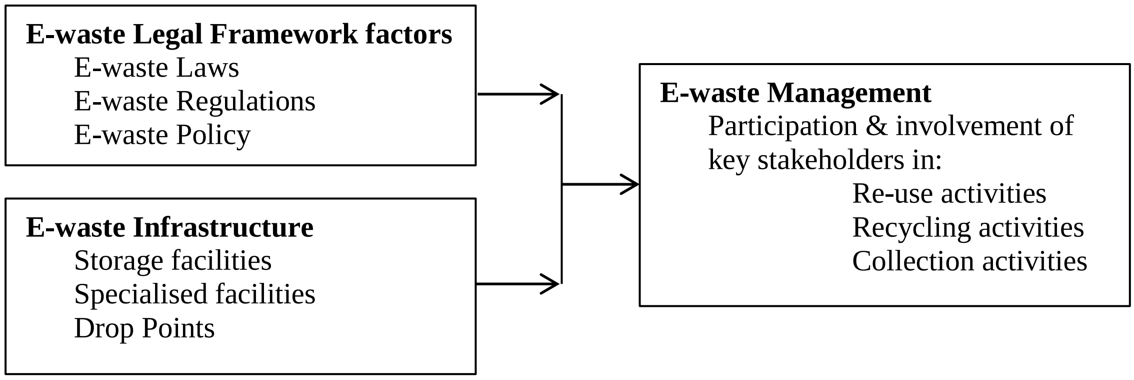

Figure 1: Conceptual Framework

Empirical Review

Singh, Dasgupta & Routary (2021) conducted a study on analysis of CSF to design e-waste collection policy in India. The study applied cause and effect interrelationship. In the findings technology involvement, green practices, certification and licensing were cited as key CSFs in e-waste collection policy. This CSF are paramount in the management of e-waste as many regulatory bodies around the world have pointed laxity in implementation of policies and lack of enforcement as barriers to effective management of e-waste (Anyango & Mwololo, 2013).

In Kenya Kimeli, (2014) used cross sectional Survey design to study the factors influencing e-waste management in Kenya with focus on mobile phone disposal in Nairobi County Kenya. The target population of the survey was mainly consumers of telecommunications, manufactures service centres, regulatory bodies and County council of Nairobi. The findings of the study established that currently there are no clear legislations / laws on e-waste management. The same was pointed by Anyango & Waema (2013) in the study on towards an e-waste management framework in Kenya they identified gaps in e-waste policies, awareness levels, e-waste management technologies, financing and stakeholder collaboration as key contributing factors that may influence effective e-waste management in Kenya. They further aver that there are no specific laws on e-waste in Kenya however, the study was carried out nine years ago and there is need to establish the influence of existing legal framework on e-waste management in Government Ministries in Kenya.

Songa & Lumbanga (2015) did an exploratory study on health risk of electronic waste in Kenya where they analysed data from many countries including Kenya. They identified infrastructure as a challenge as many institutions lack dedicated special rooms and space to store EEE that have reached there end of life. This is contrary to standard operating procedures which dictate separation of such waste as EEE contain hazardous substance which need special handling. Otieno and Omwenga (2016) have also identified lack of infrastructure as a key challenge in the Management of e-waste in Kenya. They further recommend the government to come up with a robust sustainable infrastructure for effective e-waste management.

RESEARCH METHODOLOGY

This study adopted a descriptive research design, which is defined as a scientific research inquiry that attempts to obtain answers as to what, who, where, and when of a phenomenon under investigation (Blumberg, Cooper & Schindler, 2014). The composition of the respondents for the study mainly composed of three hundred and twelve (312) ICT officers drawn from the all the 22 Government Ministries in Kenya as they act as the focal point for development, implementation and evaluation of a number of policies and strategies hence conversant with e-waste management CSFs in Kenya. The sample size was determined by employing the Krejcie and Morgan table (1970) where assuming a population proportion of 0.5 with confidence level of 95% and margin error (e) of 0.05 then the appropriate sample size for target population of 312 ICT officers was 169 ICT officers as per the Krejcie and Morgan table. The 169 respondents were picked for administering of the questionnaires using proportionate stratified sampling.

Primary data was collected using a semi-structured questionnaire consisting of both open ended and close-ended questions in order to gather facts for revealing answers to the research problem from targeted respondents. Raw data was cleaned and coded before capturing it into Statistical Package for Social Sciences (SPSS) for analysis purposes. The analysis entailed both descriptive and inferential statistics. The inferential analysis was done through the multiple linear regression model. The quantitative data was analysed and presented as percentages, mean, standard deviation and frequencies and was split according to different aspects of CSFs of public sector institutional e-waste management. The information collected was presented using tables

RESEARCH FINDINGS

Out of 169 samples expected, only 131 participated in the study, thus resulting into a response rate of 77.5%. According to Mugenda & Mugenda (2003) a response rate of 50% and above is considered adequate for analysis, 60% is considered good while a response rate above 70% is excellent.

Descriptive Analysis

Information Related to infrastructure facilities

Infrastructure has been identified as a key factor in the management of e-waste. This section highlights respondents' views on this CSF. About four in ten (37%) of the respondents disagreed that there was dedicated room to store obsolete ICT equipment, while 18% were neutral as majority (45%) agreed there was room set aside for storage of end- of-life ICT equipment. In addition, 53% majority, of the respondent said there was no designated drop point in the institution for the obsolete ICT devices, 24% were neutral and 22% agreed that there was a drop point to keep the devices. A majority (67%) of the respondents reported that there are no specialized tools to handle the ICT hazardous materials from e-waste. However, majority 68% of the respondents strongly reported that there are inventories for all obsolete ICT devices. Mean and standard deviation showed good distribution of infrastructure facilities on e-waste management since no variation less than one.

Table 1: Influence of Infrastructure facilities on e-waste management

Statement	Disagree	Neutral	Agree	Mean	Std Dev
There is a dedicated room for storage of end-of-life ICT equipment	36.6%	18.3%	45.0%	3.76	1.21
There are designated drop points in the institution for obsolete ICT devices	53.4%	24.4%	22.2%	3.45	1.18
There are specialised tools and equipment for handling hazardous materials from e-waste	67.7%	18.5%	13.8%	3.05	1.44
There is an inventory of all obsolete ICT devices	13.7%	18.3%	67.9%	3.69	1.38

Correlation Analysis

To determine the relationship between two variables a Pearson correlation analysis was computed. A a relationship where r=±0.1 to ±0.29 was regarded as weak, a relationship where r±0.3-±0.49 was considered medium, a relationship where r=±0.5 to ±0.74 was considered strong while a relationship where the value of r= ± 0.75 and above was considered to be very strong. The findings of the analysis are as shown in Table 2. From the findings Legal framework had r=0.696, Infrastructure facilities r=0.606, indicating a strong positive relationship between the dependent variable and the independent variable. The relationship were also found to be significant as P value, which is (0.00), is less than the selected level of significance of (0.005).

Table 2: Correlations Matrix

		e-waste management	Legal framework	infrastracture
e-waste management	Pearson Correlation (r)	1		
	Sig. (2-tailed)			
	N	131		
Legal framework	Pearson Correlation (r)	.696**	1	
	Sig. (2-tailed)	.000		
	N	131	131	
Infrastructure	Pearson Correlation (r)	.606**	.627**	1
	Sig. (2-tailed)	.000	.000	
	N	131	131	131
	Sig. (2-tailed)	.000	.000	.000
	N	131	131	131

Regression analysis

The study computed multiple regression to evaluate the relationship between the dependent variable (DV) and independent variable (IV).This was carried out through the regression model summary in table 3.

Statistical Model

This section adopts the model that was proposed in chapter three in determining the relationship between the dependent variable (e-waste management) and the independent variables.

The generated results are represented in table 3 below. This table provides the *R* and R^2 values. The correlation coefficient *R* value is a simple correlation which represents the relationship strength between the variables and is 0.772 which indicates a moderate degree of correlation. The adjusted R^2 value indicates how much of the total variation in the dependent variable (e-waste management) can be explained by changes in the independent variables (e-waste legal framework, Training and e-waste awareness, e-waste infrastructure and ICT standards). In this case, 58.3% of the dependent variable (e-waste management) can be explained by changes in the Independent variable (IV), which is moderate. The remaining 41.7% shows that other factors can be associated to variation in the DV (e-waste management) that were not covered in the study.

Table 3: Model Summary for regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.772	.596	.583	1.281

a. Predictors: (Constant), Background (Age, Length of service: Position, Education level,), e-waste legal framework, Training and e-waste awareness, e-waste infrastructure and ICT standards factors.

ANOVA for regression analysis

The next table 4 is the Analysis of Variance (**ANOVA**) table, which reports how well the regression equation fits the data (i.e., predicts the dependent variable).The findings indicates that the regression model predicts the dependent variable significantly well, *p*= 0.000, which is less than 0.05, and indicates that, overall, the regression model statistically significantly predicts the outcome variable (i.e., it is a good fit for the data).

Table 4: Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	P-value
Regression	295.297	4	73.824	45.020	0.000
Residual	200.058	122	1.640		
Total	495.354	126			

a. Dependent variable: e-waste Management

Coefficients of regression Analysis

The regression in table 5 results depict how outcome variable associates with the explanatory variables. E-waste management significantly relates with E-waste legal framework (B=0.249, t=4.763, p=0.000), e-waste infrastructure (B=0.124, t=2.475, p=0.015). The model of the study Y=βo+β1X1+β2X2 + ε can now be written as:

E-waste management=-1.019 + 0.124(e-waste infrastructure) + 0.249(E-waste legal framework)

In this model, E-waste legal framework, and infrastructure are significant CSFs in explaining the effective e-waste management, p< 0.05. In terms of ranking e-waste legal framework was ranked highly followed by e-waste infrastructure.

Table 5: Coefficients of Regression Analysis

Model	B	t	p-value	(Upper 95%CI, Lower 95%CI)
Constant	-1.019	-2.168	0.032	(-1.95, -0.089)
E-Wastelegal framework	0.249	4.763	0.000	(0.145, 0.352)
E-waste Infrastructure	0.124	2.475	0.015	(0.025, 0.222)

Conclusions

This study concludes that there are valid regulations set in the country to govern e-waste management. Organizations were found to adhere to the e-waste legal framework. Issues to do with laws, regulations and policies on e-waste are necessarily important for the effectiveness of e-waste management. Based on the findings, the study concludes that there was significant influence of existing legal framework on e-waste management in Government ministries in Kenya.

On infrastructure, storage facility for obsolete equipment is relevant as well as having an inventory record for obsolete devices and equipment.

Recommendations

The following recommendations can be made; The Government should come up with a standalone e-waste ICT standard policy document for the effective management of e-waste. Under this standard document, an institution should be set aside with a mandate of overseeing effective management and disposal of e-waste. This study also recommends that a licensed organization should be in place to manage the e-waste. The Institutions should collaborate with the Government and all stakeholders in the ICT device product chain from design to End of Life as well as have an extended producer responsibility (EPR) approach. This would reduce the pile up of the e-waste from the organization as seen from the study findings. There is need to invest in e-waste infrastructure and specialized equipment to aid in storage, handling and drop points of End of life ICT devices. This would lead to effective management of e-waste in Government ministries in Kenya as observed in the study findings.

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