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ASSESSMENT OF CHALLENGES AFFECTING MANAGEMENT OF ELECTRONIC WASTE IN TANZANIA: A CASE OF POSTAL CORPORATION

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Abstract: **This study assessed the challenges affecting management of electronic waste (E- waste) in Tanzania, especially in postal industry so as to make workable recommendations for enhancing management of electronic waste. Specifically, the study focused at studying the roles management system, technological advancement, financial capacity and staff competence on management of e- waste at the Postal industry. The study generally, recommends for authorities involved to re-evaluating the approaches applied in dealing with e waste in a collaborative manner by involving key stake stakeholders.**

Keywords: **Electronic waste, Management, Disposal, Recycling.**

I. INTRODUCTION

Electronic waste is a term used to cover almost all types of electrical and electronic equipment (EEE) that cannot be upgraded or repaired for re-use and finally enter the waste stream. Although e- waste is a general term it can be considered to cover televisions, computer, mobile phones, white goods for instance: fridges, washing machines, dryers and its accessories (Robison, 2009). In other words, the term e-waste is a generic term encompassing various forms of electrical and electronic equipment (EEE) that are old and have reached their end-of-life, or electronic appliances and have ceased to be of any value to their owners (UNEP, 2011).

Over time, Information Communication Technology have transformed and revolutionized the world in all facet of the socioeconomic fabric of life through the use of communication gadgets, electronic commerce, electronic banking, electronic government, tele-medicine and electronic health among others coupled with changes in cities and rapid urbanization (UNSEAR, 2000). The world Information Telecommunication Union (ITU) illustrates that the combination of a number of issues such as unexpected population growth, rural urban migration which is escalating to unprecedented urbanization, human capacity growth, economic growth, modified lifestyle, and highly globalized world as the result, it is anticipated that developing countries will triple their electronic waste production over the next few years (UNSEAR, 2000).

Among the major challenge which goes together with rapid urbanization is the generation of waste and the most recent type of waste which is caused by the rapid adoption of the electronics which is related with the rapid changes of new innovations hence rendering many products outdated at a short span of time therefore leading to generation of e - Waste (Pearson, 2013). Urbanization and economic development have brought unprecedented crisis disposal of electronic wastes both in urban and rural areas (Chen and Wang 2013). It is reported by Zhenming and Bin, (2013) that the urban areas are becoming densely populated; hence its ecosystems are highly faced with environmental challenges such as increase of e-waste disposal caused by human activities The mounting of electronic wastes deposited has led to occurrences of health challenges to city dwellers as well as to the universe at large (McDonnell and Hahs, 2013). All these have fostered the

implementation of various initiatives such as reuse, repair, recycling, take back and green e-wastes control in various parts of the world.

Globally, the United States is the world leader in producing e-waste, tossing away about 3 million tons each year (Schluep et al., 2009). Not left aside, China is regarded also to be among the leading countries in the generation of e-waste amounting to 2.3 million tons domestically annually (Schluep et al., 2009). Despite having banned e-waste imports, China remains a major e-waste dumping ground for developed countries (Schluep et al., 2009). While this happening, a question can come in mind that are there neither global no national incentives to tack the incident? Provided a picture on that Agata (2014) demonstrated that technical solutions are available, but in most cases a legal framework, collection, logistics, and other services need to be implemented before a technical solution can be applied.

The survey made by Schluep et al., (2009) observed that barriers to the transfer of sustainable e-waste recycling in some of the developing countries are due to policy and legislation problems. Countries like India, China, South Africa, Colombia, Mexico and Brazil face this barrier in implementation of sustainable e-waste management systems when compared with countries such as Sweden, Finland and Norway (Schluep et al., 2009 and Ylä-Mella et al., 2014).The pace has made African countries as well as developing countries in general to suffer a lot since most of them act as a depot area of the electronic material while the mechanism to combat the incident does not meet the rate of the material imported (Nnoron, 2007).

The UNEP report (2011) shows that majority of the African countries function as depot areas (dumping sites) for e-waste materials, due to both legal and illegal importation of e- waste regarded to be valuable products received from the developed world perceived and received as valuable second hand products. Sorted some areas in Africa, Jerie and Tevera (2014) showed that practice of waste management system in Zimbabwe are unsustainable in the long run that requires authorities to provide more resources for financing, training, and manpower to enable effective provision of an environmentally friendly solid waste management system in the available cities.

Tanzania is seemingly one of the victims and encounters the problem at a large extent. Though, Mataheroe (2009) asserted that the scale of the problem with e-waste was relatively small in comparison to solid waste problems especially in total amounts generated, Magashi and Schluep (2011) showed that e-waste in Tanzania will continue increasing due the fast adoptability of electronic at all facets of life. Their projection shows that the e-waste problem will keep on increasing. The then Deputy Minister of communication science and technology reported in the National assembly 2014 that the government was in the process of initiating the policies to control e waste, These facts shows that there is a gap in policies therefore the chance to intensification the problem is likely.

II. THE POSTAL INDUSTRY IN TANZANIA

Tanzania Ports Corporation (TPC) was established in 1994 to provide a national postal service within the United Republic of Tanzania the aim was to link Tanzania and the world. The TPC operations involves the collection and dispatching of the mails from within and outside the country through the use of different designated outlets which are both run by the corporation and other with partnerships with other stakeholders. To ensure efficiency in performance, Tanzania Posts Corporation has implemented Counter Automation Project, after acquiring software called Post global. This is an application designed specifically to automated services offered by TPC.

Generally, there have been progressive changes in communications moving from the physical to the digital world. With new technology, the speed and scope of communications have increased and propounded in use of electronic devices. However, this is the good move toward achieving global communication service standard; on the other hand the challenges exhibit in controlling the waste resulted from these devices considering the life span of the electronics equipment's being low hence the high adoption of electrical and electronics related goods will results to high generation of e waste.

III. STATEMENT OF THE PROBLEM

Due to increased urbanization and advancement in science and technology in different field including communication arena, the rate of e-waste materials or devices keeps accumulating at a fast speed and thus leading to harmful and devastating effects to land, air and atmosphere with adverse consequences to life. The alternative to worse scenarios created the electronic waste are coming up ways to curb the ill effect generated by e-waste and one of the initiative to

solve the problems electronic waste management was initiated as a world program or techniques aimed to control and manage environmental health. to propose e waste solutions other initiatives to control the e-waste have been established at different Levels in different jurisdiction in order to oversee the environment behind that, a number of studies have been conducted worldwide besides all these efforts the challenges to realize total e-waste control exists.

For instance in Tanzania, the rate of e-waste has kept increasing over time thus harming the life of human beings and the environment at large (Koloseni and Shimba, 2011). In residences and in offices the dwellers are surrounded by the e-waste materials which greatly affect their better stay. The conditions for why such scenario prevail to such extend have not yet given high attention in context of Tanzania. Therefore, to bridge that gap, this study assessed the challenges affecting management of electronic waste in Tanzania with a specific focus on Tanzania Postal Corporation (TPC) by considering the four aspects highlighted in study specific objectives.

IV. OBJECTIVES OF THE STUDY

A. General objective

To explore the challenges for Management of Electronic waste (e-waste) in Postal Industry so as to improve the e waste management in Tanzania

B. Specific objectives

i) To assess the influence of management support in handling e- waste in the Postal industry in Tanzania.

ii) To assess how technological capability affects the Management of e-waste in the Postal industry in Tanzania.

iii) To determine the influence of financial capacity on management of e-waste in the Postal industry in Tanzania.

iv) To explore how staff competence affects management of e- waste in the Postal industry in Tanzania.

C. Research question

i) What are the influences of the management in supporting in handling e -waste in the Postal Industry in Tanzania?

ii) What are the technological capabilities effecting the management of e -waste in the Postal Industry in Tanzania?

iii) How the financial capacity does affect the management of e -waste in the Postal Industry in Tanzania?

iv) How staff competence affects the management of e -waste in the Postal Industry in Tanzania?

V. SIGNIFICANCE OF THE STUDY

This study intends to develop awareness to the issues relating to e waste, specifically with Tanzania Postal Corporation in Managing and control of e-wastes. The study hopes to provide awareness about guidelines of managing electronics e-waste to local communities, and how to overcome or mitigate improper use of the environment. Again the study opts to provide a foundation for mitigating the environmental challenge due to dangerous outcomes from the e-waste deposited to the environment. The research gives insight and proposes friendly methods which will enhance the formulation of e waste policies and regulations.

This study expects to raise stakeholder's interests on e-waste controls processes and its necessity within our surroundings. It proposes better methods for handling and managing e-waste within the postal fraternity. The findings also aid in the design of interventions to help in the improvement of relationship between environmental bodies and e-waste management institutions and policy studies institutions.

VI. LIMITATION OF THE STUDY

The researcher encountered a number of challenges in accomplishing this study though were carefully attacked to fulfill the study demands. The limitation were

i) Limited time of respondents to provided information for distributed questionnaires. Here a researcher applied often fall up by reminding the respondents to fill the information via phone calling but sometimes a researcher made a visible visiting for insisting them to fill the questionnaires.

ii) Financial limit was also a challenge: Here a researcher asked assistance from various groups including his family members and friends that the needs of the study are fulfilled as planned.

iii) Limited time to undertake the study: Because of the confided time a researcher was forced to work intensively day and night so as to meet the allocated time frame. In time of writing a proposal, researcher made thorough reviews of the documents required in a systematic way within a reasonable time.

VII. EMPIRICAL LITERATURE REVIEW

The empirical literature review refers to studies that have been done before and it has either direct or indirectly the reflection or relationship with the research under study. Baffoe et al., (2014) investigated the nature of waste problem in Sekondi-Takoradi Metropolis in Ghana by using descriptive analysis. The key findings established that the factors affecting effectiveness of e- waste management in the metropolis are irregular solid waste collection, inadequate operational funding, inappropriate technologies, inadequate staffing, inadequate containers to keep e waste, and lack of cooperation among the local communities in managing waste . However, this study act as the benchmark in studying e waste, however there is need to study it in context of Tanzania because each country varies in matter of policy as well as management system that are dealing with e waste management.

Ongondo et al., (2011b) studied the potential logistical, financial, ethical and environmental impacts of the UK enacted a digital switchover policy (DSO) that switch to digital-only TV by 2012. The results further showed that the DSO had the potential to generate large quantities of TV and related equipment of WEEE (Whereas residents indicated their intention to dispose of their unwanted TVs via the established networks, smaller TV-related items such as remote controls and aerials would not warrant a trip to the household waste recycling centres (HWRCs). Residents also indicated they would keep their video cassette recorders (VCRs) despite their technological limitations once the switchover took place. The study has opened that shift in policy also accelerates to increase e-waste but still there is a need to look other factors indicated in specific objectives.

Another study by Schluep et al., (2009) studied how the recycling converts e-waste to resources in Kenya, Uganda, Senegal and Peru. The study revealed that barriers for the transfer of sustainable e-waste recycling technologies have been identified for each of the target countries for the different dimensions which are policy and legislation; technology and skills, business and financing. The listed barriers are also hindering the implementation of sustainable e-waste management systems in the countries under analysis. Moreover, this study revealed some components that hinder e-waste management but variable like financial capacity was not given high consideration in assessment.

On other hand Jordi (1995) did a study that examined the role of government in financing recycling activities in Switzerland. The study observed that although there have been some problems with free-rider, the use of an advanced recycling fee (ARF) has been successful. This study has just added the knowledge that government assistance is imperative in dealing with e-waste challenges. Odeyingbo (2011) made a socio-economic assessment on e-waste management in capital city of Ghana. His study emphasized the need for sustainable e-waste controls initiatives that are comprehensive in a way that is beneficial to all parties involved in e-waste management. In particular, the informal economy needs to benefit from these methods because of the significant role it plays in e-waste management in Ghana. However, this study recommended the same, but it has not shown the mandatory strategies required to ensure that there is sustainable e-waste management.

Innocent and Oladele (2007) done their study on e –waste control in Nigeria, they observed that the growth in electrical and electronic equipment (EEE) production and consumption has been exponential in the last two decades. Hence, it has resulted to rapid changes in equipment features and capabilities, decrease in prices, and the growth in Internet use generally the application of science and technology. This creates a large volume of waste stream of obsolete electrical and electronic devices (e-waste) in developing countries. This study has only shown the environments behind for increased e-waste but not given the techniques that are applied to control such move so as to measure their capability to deal with such devastating impact.

Moreover, Nnoron (2007) asserted that the rapid growth in ICT has led to an improvement in the capacity of computers but simultaneously to a decrease in the products lifetime as a result of which increasingly large quantities of waste electrical and electronic equipment (e-waste). The move has affected human life even in the most remote areas in most of developing countries. In the same vain Magashi and Schluep (2011) used exponential growth and descriptive analysis to

assess thee-waste management in Tanzania. Their study revealed that the factors affecting e-waste management in Tanzania are lack of specific policy on e-waste management, lack of disposal facilities for hazardous wastes, general lack of proper recycling activities for e-waste, weak enforcement of legislation, lack of public awareness on e-waste and its potential risks to the environment and human health, lack of infrastructure for formal collection and recycling of e-waste and illegal dumping of e-waste such as burning and burying. However, this study highlighted a number of issues which are incorporated in the management of waste, this study did not give emphasis on the impact of the allocated financial resources where by the deficiency of the financial requirement will led to unsuccessfulness of the project in question.

VIII. RESEARCH GAPS

Globally, the topic of e-waste management has been given high weight by various researchers in assessing issues pertaining to poor management of e-waste. The studies done by Stephen, et al., (2005), Mataheroe (2009), Koloseni and Shimba (2011), Magashi and Schluep (2011) in one way touched the phenomena. Tanzania being one of the countries which embraces adoption of electronics goods leading to the importation of both new and second hand electronic devices which are the main cause of e-waste, but there is no thorough studies that have been carried out concerning the phenomena touching the four aspects (management support, financial support, technological advancement and staff competence). Moreover, there is little research on the ways of address the e waste in the postal industry. Hence, this study will be carried to assess challenges affecting e-waste management in Tanzania using postal corporation as its case study.

IX. METHODOLOGY

A. Research design

A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems (Kumar, 2005). The plan is the complete scheme or programme of the research. It includes an outline of what the investigator will do from writing the hypotheses and their operational implications to the final analysis of data (Kerlinger, 1986). In other words, a research design can be regarded as procedures for data collection and analysis in relation to research purpose (Orodho, 2003). Generally, the purpose of a research design is to help a researcher control method of data collection and data interpretation (Kothari, 2004). Specifically the research employed a cross-sectional study design.

Cross-sectional studies, also known as one-shot or status studies and are the most commonly used design in the social sciences (Kumar, 2005). This design is best suited to studies aimed at finding out the prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population. They are useful in obtaining an overall 'picture' as it stands at the time of the study. They are 'designed to study some phenomenon by taking a cross-section of it at one time' (Babbie, 1989). Such studies are cross- sectional with regard to both the study population and the time of investigation. Further, the study employed a quantitative approach, whereas questionnaires were used to gather the information due to the fact that quantitative research meant for verifying whether the challenges on e-waste management by other researchers might be the case on postal industry in Tanzania.

B. Target Population of the study and Sample Size

The study population comprised the employees of the Tanzania Postal Corporation (TPC). Kombo and Tromp define a population as a group of individuals, objects or items from which samples are taken for measurement. TPC is chosen as a study case due to its recent initiatives of adopting new path of transforming its business process by automating them so as to be in line with the modern ways way doing business, the corporation have automated nearly all of its services hence expect a high concentration of electronic components. This situation make the TPC be one of the generators e waste this is why this study focus on beneficiaries and users of electronic equipment's at TPC. The target population of the study was three hundred and forty two 342 staffs. Out of that number, hundred and twenty (120) employees were chosen comprising of Management, Middle level managers and lower level staff. Yamane (1967:886) this formula provides a simplified calculation to sample size and find it appropriate to use for this study because provides a simplified formula to calculate sample sizes, as stated below

$$n = \frac{N}{1+Ne2}$$

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Where n is the sample size, N is the population size and e is the level of precision.

X. DATA COLLECTION METHODS

The instruments used for data collection were questionnaires and personal interviews. Babbie (1989) defines a questionnaire as an "instrument specifically designed to elicit information enriched the analysis. Self-administered questionnaire survey used in this study, this kind of questionnaire administration is arguably more precise and expected to generate higher response rates and provides more complete answers (Kothari, 2004). The questionnaires were pilot tested before the full administration in order to check the relevance, understandable and the proper use of terms in tandem with the study. Secondly, interviews carried out so as to ensure insight investigation of the study but mainly to bridge the gap that would have not be filled with data obtained through questionnaires. On this, senior officers were interviewed as a key policy implementers and strategy designers towards electronics control and management.

XI. DATA AND ANALYSIS METHODS AND TOOLS

Quantitative data were analyzed by using descriptive analysis that disseminated a frequency table. To examine the relationships among the studied variable (independent and depend variable) a linear regression was carried out. The questions were grouped based on research objectives goals according to the model of e-waste management: Further, a content analysis was used to analyzed data collected via interviews for the first and the third objective. On that, data of similar themes were coded together to see the alignment of respondents` response.

XII. RESEARCH FINDINGS, ANALYSIS AND DISCUSSION

A. The Socio Economic Profile of the Respondents

This study involved respondents of different characteristics so that to cover broad picture on the research problem. Doing so, respondents involved had different gender, age, occupation as well as different level of education. A further description is provided below.

B. Gender Profile

The data presented in table 4.1 show that 90 (75%) were male while 30(25%) respondents were female.

TABLE 1: GENDER PROFILE

Gender	Frequency	Percent
Male	90	75.0
Female	30	25.0
Total	120	100.0

Cumulatively, male respondents exceeded female respondents and this was expected because electronic activities are of operational in nature where females might not be interested. Again, it implies that despite the efforts towards gender balance in employment but still men exceed them which is probably a situation that prevails in many organizations in Tanzania. In addition, the condition has nothing to do but normally employers hire employees that have capabilities to accomplish organization goals (Lawler & Boudreau, 2012).

C. Relationship between Staff Competences and E-Waste Management

A test was taken to measure the relationship between staff competences versus e-waste management via regression analysis. The result of the analysis was as follows

TABLE 2: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	38.698	5	7.740	9.651	.000b
	Residual	91.427	114	.802		
	Total	130.125	119			

The analysis revealed that staff competence as a predictor variable influence e-waste management at the level of significant of (P= .000, r=54). Hence, the management needs to take extra efforts to improve the staff competence.

XIII. SUMMARY OF FINDINGS ACCORDING TO OBJECTIVES

The first objective aimed to assess the management support in handling e-waste in the postal industry. The findings showed that though the analysis showed a positive relationship between management factors and e-waste management at (P=0.000) but the postal industry lacks committed management system as the available management fails to implement incentives or initiatives that support the needs to handle e-waste within the corporation. The field evidences revealed that the management is not committed since, there is no effective communication among workers about the issue, staff have no skill related to e-waste management, chances are not provided to staff to extend their knowledge out of office, the management itself is not coordinated to deal the challenge as well as there is no clear direction focused to curb the problem.

The second objectives assessed technological capability in managing e-waste in the postal industry. The study findings showed that postal industry still lags behind in having modern technology that can enhance it to monitor e-waste challenges in the proper manner. The data showed that postal industry lacks efficient recycling facilities, no technology that can be used to detect the quality of the purchased devices; staff lags behind as they have no enough skill and knowledge that can enhance them to manage the waste in the sustainable manners. Again, the study observed that postal industry lacks conducive environments to support recycling process.

The third objective examined the influence of financial capability in supporting e-waste management initiatives. The field data revealed that, the management faces budget deficits as the allocated fund do not meet the requirements. Moreover, the study revealed that though, the budget allocated is limited but the other challenges occur that even for allocated budget no transparency in expenditure.

The last objective explored staff competence on management of e-waste. The study revealed that postal industry staff are not equipped with modern skill concern e- waste management. According to the field data, postal industry fails to bring green environment concern e-waste control due to the fact that, trainings are not provided to staff hence denied the opportunities to share skills from external sources. The incident has caused postal industry to lack competent staff who can bring new incentives and programs to deal the growing e- waste problem.

XIV. CONCLUSION

The conclusion of this study is made in relation to the findings of each objective used in this study. However any of the objectives discussed in this study can be fully addressed on its own or in combination with other variables this depends to the situation when handling the e waste. The first objective aimed to assess the management support in handling e-waste in the postal industry, the study showed a lot of weaknesses that hampers the program of e-waste management to be successful. Hence, on that the study calls the management to take further initiatives such that stated in waste management model, which emphasizes the need to incorporate many stakeholders in the program. For instance, the management needs to create conducive environments that facilitates a better communications among the management team as well as staff need to be trained. By doing so, the management will be in position to attack the challenge effectively and successfully. The second objectives wanted to assess technological capability in managing e-waste in the postal industry since there is increased rate of using electronic devices. Here, the study also showed that postal industry lags behind in implementing initiatives that cops with the ongoing changes in invention of electronic devices. From the findings, postal industry has no recycling facilities also no often checkup are made for in use devices so as to increase their sustainability. Hence, the study argues for the offices to seek better means to attack the challenge.

The third objective wanted to examine the influence of financial capability in supporting e-waste management initiatives. The study observed that the office faces with limited budget and also mismanagement of the allocated budget whoever is limited. To achieve successful e-waste management program, the management to prioritize financial resource and control it better for reaching a far milestone success. Transparences on budgeting issues need to be adhered so as to build trust among the employees. The last objectives explored staff competence on management of e-waste staff is the leading resource which run other resources hence in achieving the intended goal the human resources need to be equipped so as to be able to face the likely challenges and as for the case of e waste which is sophisticated in terms of composition, insufficient training offered to staff for capacity building lead to low response in action towards the management of e waste.

XV. RECOMMENDATIONS

Based on the findings which this study observed, the study recommends for the management to perform its responsibilities very closely so as to deal the problem of e-waste since the findings revealed weakness in the management system that act as the blocks toward successful e-waste management. Given the dynamic trends in electronics arena it is important to carry out regular studies and workers need to be trained so as to ascertain the existing position and adopt accordingly. Furthermore, the study recommends for enough fund to be allocated, so that the management can implement its responsibility accordingly. Finally, the study puts forward a point that e -waste concerns are crosscutting in nature so a number of stakeholders need to be taken on board for effective management in a sustainable manner.

XVI. AREAS FOR FURTHER STUDIES

The study concentrated only on postal industry challenges in dealing with e-waste, more studies are needed in studying the nature, Awareness and attitude towards management of e waste in other institutions. Further studies on what motivates people continue handling obsolete old gadgets knowingly that they are not in use hence needed designing best ways of handling due to the high uptake of ICT consequently the increase of the production of e-waste is likely to be observed. Moreover, another instrument such as experimental research to study the composition and toxicity level in the environment can be done so as to raise alarm to stakeholders on the effects of e waste.

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