

Development of Electronic Waste Management Framework at College Of Engineering, Design, Art, and Technology

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Abstract

The worldwide use of information and communications technology (ICT) equipment and other electronic equipment is growing. There is growing amount of equipment that becomes waste after its time in use. This growth is expected to accelerate since equipment lifetime decreases with time and growing consumption. As a result, e-waste is one of the fastest-growing waste streams globally. The United Nations University (UNU) calculates in its second Global E-waste Monitor 44.7 million metric tonnes (Mt) of e-waste were generated globally in 2016. The objective of the study was to develop a framework for improving e-waste management at the College of Engineering, Design, Art, and Technology (CEDAT). This was achieved by breaking it down into specific objectives, and these included the establishment of the policy and procedures being used in e-waste management at CEDAT, the determination of the effectiveness of the e-waste management practices at CEDAT, the establishment of the critical challenges constraining e-waste management at the College, development of a framework for e-waste management.

The study population was 80 respondents, from which a sample of 69 respondents was selected using simple and purposive sampling techniques. This research was carried out to investigate the problem of e-waste and come up with a framework to improve e-waste management. The study reviewed the e-waste regulatory framework used at the college and then collected data, which was used to come up with a framework. The study also established that weak policy and regulatory framework, lack of proper infrastructure, improper disposal of e-waste and a general lack of awareness of the e-waste and the magnitude of the problem are the critical challenges of e-waste management. In order to appropriately address the issue, the policy and regulatory framework should be updated, localized, and strengthened. It will be helpful to launch awareness campaigns, create the necessary infrastructure, and conduct significant research to determine the scope and severity of the issues. The study suggests a framework for e-waste improvement

Keywords E-Waste, Treatment, Disposal, Computers, Model, Management Policy and Guidelines.

1. Introduction

The worldwide use of information and communications technology (ICT) equipment and other electronic equipment is growing and consequently, there is a growing amount of equipment that becomes waste after its time in use [1,2]. This growth is expected to tonnes of e-waste were generated in 2019 [7], of this amount generated, less than 13% was recycled and the rest ended up in landfills or incinerators creating enormous environmental and health concerns due to the presence of hazardous materials [8]. The consumption and use of EEE is probably most prevalent in the developed world, but developing countries show a rapid growth of consumption and use of EEE. Typically, developed countries have growth rates of 1% to 5 % annually on weight basis, developing countries typically range from 10% to 25% [5]. Some less-developed countries lack waste treatment infrastructure, waste management laws and enforcement [9]. As a result, the e-waste in those countries

will often be treated in sub-optimal ways by the informal sector [10]. This leads to severe consequences for the environment and human health [11]. To treat e-waste in an environmentally sound manner, it needs to be regulated [12]. This means that an appropriate system needs to be created and financed, a recycling infrastructure needs to be developed or improved, and workers' health and safety standards need to be implemented, to name a few prerequisites [2].

A quantitative and qualitative assessment of e-waste was carried out by United Nations Industrial Development Organization (UNIDO) in Uganda in 2008 [13]. Analysis of the data indicated that about 2,000 tons of e-waste is generated each year and not disposed in a well-planned and managed manner [9]. Equipment is dumped on outdoor garbage heaps and landfills, thus becoming a danger to human beings and the environment [14]. For developing countries such as Uganda, effective electronic

to facilitate an environmentally friendly e-waste management system and provide incentives for consumers to dispose their e-waste. However, the framework identifies a sound policy and a regulatory framework that tackles all components of e-waste management. Which should be implemented to reduce on the e-waste dumped and also push part of the responsibility to the producer organizations. The regulations should be applicable to all processes that involves e-waste.

Recommendations

Based on the conclusions, the following recommendations are proposed:

- The Government should bring to public awareness the existing policy and legislations in place, implement e-waste policy, formulate and enforce legislation that is specific to e-waste management.
- The college should adopt practices that comprehensively manage e-waste from generation to disposal. Designing modified EPR strategies based on the local economy and capacity to implement such schemes could come in handy. In addition, adopt modified EPR schemes that include regulatory approaches on electronic equipment to procure green products using less hazardous materials (i.e., implement DfE criterion or eco-design/cleaner production) and then, subsequent e-waste management processes will be cheap and easy.
- Consider adopting recycling as a strategy for managing e-waste, this can be through engagement in Private Public Partnerships, together they can create a solution for developing recycling infrastructure in e-waste, however they need to be designed carefully regarding Legislations and Regulations, Financial and Organizational Risks, Local Community Involvement and Financial Incentives.
- Invest in awareness and education campaigns, capacity building, training and knowledge sharing on e-waste management and carry out extensive research to establish the volumes, nature and potential environmental and human impact to bridge the knowledge gap about e-waste.

The adoption of a model where consumers in this case institutional users take e-waste to certified e-waste collectors who pay them (incentives). Then the collectors could sell to recyclers or refurbishers. This could drive e-waste collection, transportation, and its treatment, as is the case in Sweden.

Limitations of the Study

The rampart lockdowns due to Covid-19 in the country greatly affected the institute and hence the data collection process.

Another limitation to this research was inadequate time and money available to the researcher to conduct the study. Secondly, the tendency of many employees to paint a rosy picture of their organization, especially when they are communicating to strangers, and the resultant reluctance to disclose unfavorable information, lest they be construed as inefficient, must also have limited the scope of the data collected.

Future Perspectives

Researchers in e-waste should consider areas related to.

- i) Reduction of e-waste generation
- ii) Recycling of e-waste: cost vs benefit
- iii) Applicability of EPR schemes in the least developed countries

iv) Understanding e-waste disposal techniques: Determinants, policy implications, challenges, and prospects.

v) The impact of policy and Regulatory framework on e-waste management

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