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E-waste Generation, Awareness and Management in Third World Countries: Prospects and Challenges

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Abstract: The millions of tonnes of e-wastes being annually as a result of development od science and technology since the 20th is, to say the least, a time-bomb waiting for explosion with disastrous consequences, if left unchecked. This paper presents the outcome of a survey in e-waste generation, awareness and management in third world. Countries like Malaysia and Nigeria. The choice of these two countries (one from Africa and the other from Asia) is borne out of their strategic locations and activities in e-wastes generation cum management scale of preference. The paper examines the major present awareness level of e-wastes, individual, corporate and governmental contributions to e-wastes management and control, Using the Anchor University Lagos, Nigeria and the Universiti Malaysia Pahang, Kuantan, Malaysia as its locale, the paper investigates the awareness of e-wastes, hazards posed and efforts required to properly control and manage e-wastes in third world countries

Keywords: Awareness, Control, E-wastes, Management, Third world countries

Introduction

The impact of industrial revolution cum information, communication and telecommunication technology in world development, is to say the least, monumental. Industrial technology (ICT) revolutionized the way things are done in the world leading to enhanced efficiency, effectiveness and massive productivity (Odili, 2013). One can only imagine the sorry state the world would have been without industrial revolution. Emanating from industrial revolution is ICT which has so influenced the world beyond, practically, any other technology. Today, there is virtually no academic, scientific and industrial discipline that has not been affected by ICT. ICT has led to the development of several algorithms such as the Genetic Algorithm (Tohsato, Ikuta, Shionoya, Mazaki, & Ito, 2013), Particle Swarm Optimization (Kunna, Kadir, Jaber, & Odili, 2015), African Buffalo Optimization (Odili & Kahar, 2016; Odili, Kahar, & Anwar, 2015), among several others that has been successfully applied to transportation (Sadeghi, Sadeghi, & Niaki, 2014), electrical and electronics engineering (Liu, Fu, & Yang, 1999), telecommunications (Kershenbaum, 1993), etc to achieve great results that have enhanced human development.

In spite of these great achievements, ICT has just introduced a daunting challenge to the world: electronic wastes (popularly called e-wastes), which if not properly handled, may dwarf the monumental breakthroughs of

the ICT revolution (Qu, Zhu, Sarkis, Geng, & Zhong, 2013). E-wastes refers to unserviceable cum discarded electronic devices, sometimes reserved for recycling, resale or simply meant for the nearest dumpsite. Sometimes, e-wastes which are sometimes regarded as e-scraps include such electrical or electronic components as Central Processing Units (CPU) Cathode Ray Tube (CRT), cell phones etcetera contain non bio-degradable, human- and environmentally-harmful substances such as beryllium, lead, plastic additives, plastics, acids or cadmium (Kush & Arora, 2013).

The common toxic components in electronics such as computers includes the circuit boards that houses heavy metals such as lead & cadmium, mercury switches, mercury used in flat screens , brominated substances that are on printed circuit boards, connection cables and plastic casings, laptop batteries that contains cadmium; CRTs that contains barium and lead oxide (Yuan, Li, Zhang, & Saito, 2012)etc.

A potent challenge in e-waste management is that resale and recycling do not necessary solve the problem since in electronics engineering since there are frequent upgrades that tend to diminish and degrade the usefulness of the previous versions. As a result, resale do not seem to be viable solutions and recycling on its part may pose grave health challenge to the recycling staff as well as the adjoining communities due to the engineering processes involved in the recycling process. Outright dumping of these discarded hardware leads to materials leakages in incinerators and dumpsites. These challenges necessitates further research efforts, hence this research paper.

The rest of this paper is organized in the following ways: section two presents the research instrument and locale; section three examines the research findings and discusses the results obtained; section four draws conclusion on the study. These are followed by the acknowledgement of support for the study and references

Research Instrument And Locale

This research is carried out with the aid of structured and unstructured questionnaires aimed at obtaining relevant responses from the respondents. The questionnaires were administered to students and staff of Anchor University, Ayobo, Lagos, Nigeria and the Universiti Malaysia Pahang, Kuantan 26300, Malaysia. It must be observed that 47.41% out of the distributed 116 questionnaires were returned. The low returned could be a demonstration of the lack of knowledge of the subject matter of e-waste. Actually, many of the returned questionnaires had the respondents simply write ‘I don’t have any idea’ as the answers in many of the questions. This development is no wise seen as a limitation because it helped the underscore the need for the research work: many enlightened persons are unaware of the dangers posed by e-wastes.

Research Findings and Discussion of Results

To highlight the level of ignorance of e-wastes even among Computer Scientists, I hereby reproduce the responses of five postgraduate students of Computer Science in the Universiti Malaysia Pahang, Kuantan, Malaysia. The seventh question in the questionnaire (See appendix A) reads ‘IN YOUR OPINION, WHAT IS AN E-WASTE?’ The responses are:
Respondent A: I don’t have knowledge enough
Respondent B : Data generated by computers and electronic devices which are not safe
Respondent C: Reuse of electronic devices that are discarded
Respondent D: I don’t have any idea
Respondents E: Is the redesign, reuse, resale, salvage, recycling of electronic devices
The above responses underscore the problem of e-waste management when one understands that were the definitions of e-waste from research students of Computer Science in a fast developing country like Malaysia. The need for aggressive public enlightenment and aggressive mass education on e-wastes enlightenment and management cannot be over-emphasized.
In answer to the eighth question where respondents were required to list five common generators of e-wastes, the responses were rather ridiculous. The responses from the same five respondents are:
Respondent A: I don’t have any idea about e-wastes
Respondent B: Cameras (digital cameras), browsers, MS office, Download managers, IDEs
Respondent C: India, China, US, Japan
Respondent D: I don’t know
Respondent E: Computers, phones, robots, watches, communication towers

From the above responses, it is clear that it was only the fifth respondent that has a faint idea of what can generate e-wastes

Individual Contribution to E-Waste Control

In Question 9 of the questionnaire, respondents were asked to identify contribution of individuals in the e-waste control. The percentage responses are given in Table 1 below:

Table 1. Individual contribution to e-wastes control

Questions	Percentage
Spreading the news about e-waste	43.6
Highlighting the damages about e-wastes to individuals	36.4
Highlighting the dangers posed by e-wastes to the environment	43.6
Encouraging recycling of e-wastes	38.2
Form/join e-waste awareness clubs	18.2

As is evident from Table 1, majority of the respondents believe that the two most important individual contributions to e-waste control should be spreading the news about e-wastes thus creating awareness as well as highlighting the dangers posed by e-wastes (43.6% each). Next to those two efforts is that individuals should encourage recycling of e-wastes (38.2%), closely followed by the need for individuals to highlight the damages caused by e-wastes to individuals (36.4%). It is important to note, however, that majority of the respondents are not convinced that forming or joining E-Wastes Awareness Club is necessary. Only 18.2% of the respondents feel that forming or joining an E-Wastes awareness Club is important.

Aside the responses above, in the unstructured part of the questionnaire, respondents added that individuals should begin to properly dispose their e-wastes, embark on aggressive campaigns against improper e-wastes management as well as work towards the total eradication of e-wastes.

Corporate Bodies Contribution To E-Wastes Control

In answer to another question bothering on the contribution of corporate bodies to e-waste management, the responses are presented in Table 2 below:

Table 2. Corporate contributions to e-waste management

Questions	Percentage
Organize public awareness campaigns	60
Encourage staff to properly dispose their wastes	38.2
Organize competitions among departments in e-waste management	23.6
Give prizes for best e-waste management departments and individual staff	30.9

As can be seen in Table 2, 60% of the respondents believe that the most effective way, corporate bodies can assist in curbing e-waste is by organizing public awareness campaigns to enlighten the public on the dangers posed by e-wastes to the environment. 38.2% of the respondents think that the encouraging staff to properly dispose their e-waste is a good idea. Similarly, 30.9% of the respondents feel that giving out prizes to departments and individuals would rather be the best option. However, another 23.6% of the respondents are rather more comfortable with organizing competitions among departments on e-waste management. A particular respondent felt strongly that corporate sanctions for improper waste disposal will provide better result than the above

Government's Contribution to E-Waste Control & Management

The next potion of the questionnaire investigates the role of the central government in the effort to control and manage e-wastes. The responses are presented in Table 3

Table 3. Individual contribution to e-wastes control

Questions	Percentage
Organize public awareness campaigns	50.9
Encourage citizens to properly dispose their wastes	36.4
Organize competitions among states and local governments in e-waste management	21.8
Give prizes for best e-waste management individuals, corporate bodies and arms of governments	20
Make budgetary provisions for e-waste management	32.7

Statistics from Table 3 indicate that many people advocate the organization of aggressive enlightenment campaign as being vital to solving the problem of e-wastes (50.9%). Next to this is the need to encourage citizens to properly dispose their wastes (36.4%), make budgetary provisions for e-waste management (32.7%), organize competitions among states and local governments in e-waste management (21.8%) and finally giving out prizes for best e-waste management individuals, corporate bodies and arms of governments (20%).

Conclusion

This study examined the awareness, control and management of e-wastes in third world countries. Using Malaysia in the Asian continent and Nigeria in Africa as case studies, the study discovers the low awareness of different class of persons in the subject of e-wastes. It is disheartening to note that several persons in the enlightened circles of the society, (represented by students and staff of two prominent universities in these countries) know very little about e-wastes. Rather more disturbing is the fact that some Lecturers as well as Masters' degree and PhD students still are largely ignorant of the dangers posed by e-wastes.

This study having investigated the contributions of individuals, corporate bodies and governments in the effort to control e-wastes opines that three relevant bodies need to work cooperatively in the effort to control and manage e-wastes. The management and control of e-wastes to be successful in the third world, individuals, corporate bodies and the various arms of government should work together to avert this looming human catastrophe: e-waste. This they can achieve through effective grass root awareness, effective wastes disposal strategies, proper education of the dangers posed by e-wastes, formation of e-waste management clubs and proper reward systems for those who properly dispose of their e-wastes.

It must also be emphasized that while the governments in third world countries should encourage proper recycling and disposal of e-wastes through proper budgetary provisions and regulations, penalties and fines should be imposed on erring individuals and companies in order to prevent the alarming pollution of underground water systems, systemic destruction of our aquatic life as well as environmental pollution resulting from improper e-wastes disposal.

In view of the implosive dangers posed by e-wastes if not properly managed this study concludes that governments of third world countries should in addition to creating a special government agency dedicated solely to aggressive awareness, control and management of e-wastes, e-wastes awareness, control and management should incorporated into tertiary school curriculum

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