ISSN: 2141 – 3290

E-WASTE AWARENESS AND DISPOSAL PRACTICES: AN EMPIRICAL INVESTIGATION

EGWALI, A. O[1]. AND *EKONG, V. E[2].
[1]*Department of Computer Science,*
University of Benin, Benin City, Edo State, Nigeria.
e-mail: egwali.annie@yahoo.com Phone: +234 7033247730
[2]*Department of Computer Science, University of Uyo. Uyo, Nigeria.*
e-mail: victor_eshiet_ekong@yahoo.co.uk Phone: +234 8056043359
*Corresponding Author

ABSTRACT: In Nigeria, electronic wastes from electronic items is a cause for concern because many businesses, institutions and individuals dealing with electronic systems engage in practices like landfilling, burning, reselling and storing e-waste items in unsanitary conditions. Mostly these hazardous practices are carried out because of financial benefits, believes and some challenges, which includes lack of awareness and the dearth of knowledge of any requirements for segregation of e-wastes in the environment. Many electronics items like the computer system contain toxic materials that are hazardous to the environment and human health. This study seeks to determine current business, institution and individual e-waste awareness levels and disposal practices by means of a survey which targets businesses, institutions and individual computer repairers. 530 individuals participated in the survey which was conducted from February 2011 to May 2011. Findings show that there is a general awareness of the effect of e-waste and its impact on the human health and environment, but yet many still employ unconventional and hazardous means of disposing e-wastes. Therefore awareness campaign on e-waste regulations and environmental policies are needed to address the menace of accumulated and unregulated piles of e-wastes.

INTRODUCTION

The electronics and information technology industry is the world's largest and fastest growing manufacturing industry. In Nigeria, not only is there a natural hunger among the populace to stay abreast with technological developments in order to compete and communicate in an increasingly globalize world, some of the newer technologies such as the internet and telecommunication technology have allowed citizens to leap for a grip of more newer technological gadgets and computer systems. For example, between 2000 and 2004, the number of internet users increased from about 107,000 to almost 1.8 million, while the number of mobile phones increased from 35,000 to about 9.2 million (Puckett *et al.* 2005). As a consequence of these remarkable quests, in recent years, millions of electronic waste (e-waste) from obsolete computers and other electronic sets are being imported out of which only about 25-75 percent of imported computer equipment are cost effective, while so many are stored or burnt (BAN and SVTC, 2002; Puckett *et al*, 2005; Nnorom and Osibanjo, 2008).

Due to lack of financial resources available to most people in developing countries, much of the growth in the Information Technology (IT) sector has been fuelled by the importation of hand-me-down, used equipment from rich, developed nations whose consumers are all too happy to find buyers for it. Furthermore, the cheap labor in developing countries on making repairs and facilitating the reusability of old equipments feasible, giving it a longer life and allegedly forestalling the need for more products to be manufactured (BAN & SVTC, 2002) has resulted in the springing up of many brokers and businesses in order to channel used equipment from developed to developing countries, from rich to poor. Not knowing that developing nations are merely shoving off its growing e-waste mountain that threatens groundwater in landfills, which

have proved to be a serious burden for local municipalities and at the same time benefit those who are too poor to afford brand-new equipment.

These importations are enabled because of lack of environmental standards in developing nations, cheaper labor and the legalization of e-waste importation into developed countries. Developing countries are increasingly victimized by a disproportionate burden of the world's toxic cyber waste for **e**lectronic equipment especially computers contain toxic and heavy metals (Huisman, 2003). In Nigeria there is the open burning of plastic waste, exposure to toxic solders, river dumping of acids and widespread general dumping of e-waste mixed with other types of waste in poorly designed municipal landfills and it is an increasing concern (Alhumoud, & Al-Mumin, 2006), for many e-waste from high-tech equipment such as brominated flame retardants in plastics and circuit boards, lead tin based solders, lead and barium laden Cathode Ray Tubes, beryllium alloys in connectors and mercury lamps are hazardous wastes and when dumped in landfills contains toxic materials that are hazardous to the environment and human health.

This study seeks to determine current e-waste awareness levels and disposal practices by means of a survey which targets businesses, institutions and individuals engaged in computer repairs. The study concentrates on computers and computers accessories. The source of data is the Computer Village at Ikeja Lagos and Benin City.

METHODOLOGY

A questionnaire was developed and distributed to businesses, institutions and individuals engaged in computer and computer accessories repairs. This helped to increase the availability of the survey and increased the response rate, rather than distributing the survey online or by mail. Males and females were randomly selected from different education levels and age groups. The survey covered questions relating to respondents awareness level; hindrances to proper e-waste disposal based on the following nine parameters: enforced policies, time, cost, security, transportation, knowledge, complexity, motivation and accessibility. Responses to employed disposal methods of unworkable computer systems and components was also retrieved based on the following six factors: landfilling, burning, selling, garbage, warehouse and unavailability. Responses were received from businesses, institutions and individuals located in two states in Nigeria: Lagos and Edo. Although Nigeria is a large country with over 57 million population and made up of 36 states (FMJ, 2008; Wiki, 2012), Ikeja town in Lagos states accommodates the largest IT market known as the Computer Village in Nigeria and in West Africa.

530 questionnaires were administered to respondents and retrieved from February 2011 to May 2011 out of which 497 questionnaires were utilized in the analysis. Respondents were asked a total of 21 questions, which focused on the following topics: demographic information, awareness level of the hazardous nature of e-waste, computer components viewed as hazardous and computer systems disposal method.

RESULTS AND DISCUSSION

The participant level was 93.8%, 47 respondents attended higher institutions while 65 respondents had no qualification. 166 respondents which forms the majority class where Diploma and N.C.E holders. The statistics of the surveyed population is shown Fig. 1.

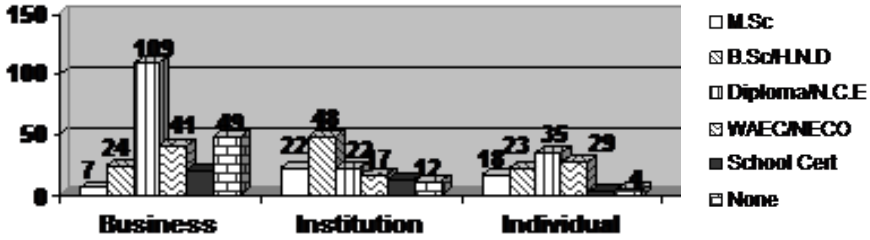

Figure 1**:** Representation of the Surveyed Population

Male participant where 203, out of which 7(3%) were in the agricultural discipline, 24(13%) read business administration while 2(1%) read mathematics. The majority of respondents where in the computer discipline 31(16%). The statistics of the discipline of the population is shown Fig. 2.

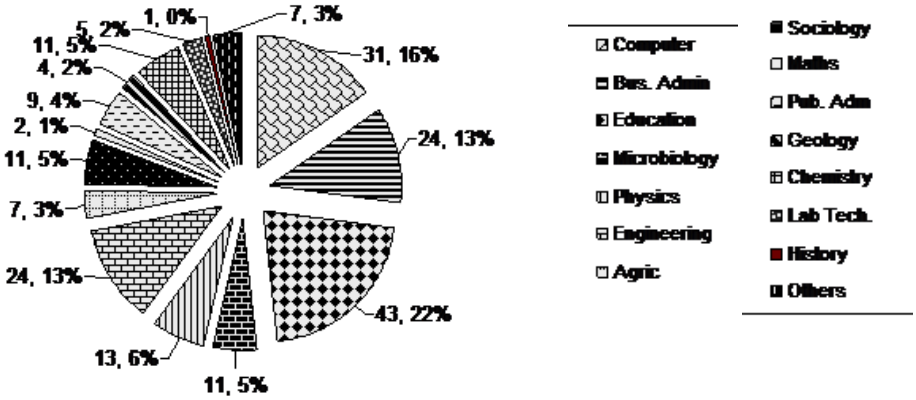

Figure 2: Statistics of Male Participant Discipline

Female participant where 96, out of which, 2(2%) read laboratory technology, geology 1(%) and computer science 6(6%). The majority of respondents, 21(20%) read sociology as a discipline. The statistics of the surveyed discipline of the population is shown in Fig. 3.

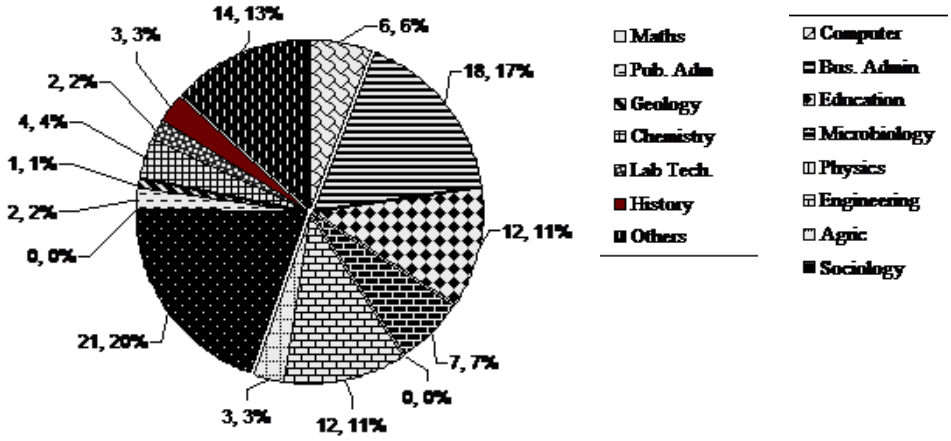

Figure 3: Statistics of Female Participant Discipline

The respondents were also required to specify a major component of the computer system they consider very hazardous when the component life span has been exceeded. 101(20%) considers the monitor to be the most hazardous component, 27(5%) specified the hard disk, and 63(13%) specified the motherboard. Statistics on respondents' choices of the other computer components are shown in Fig.4.

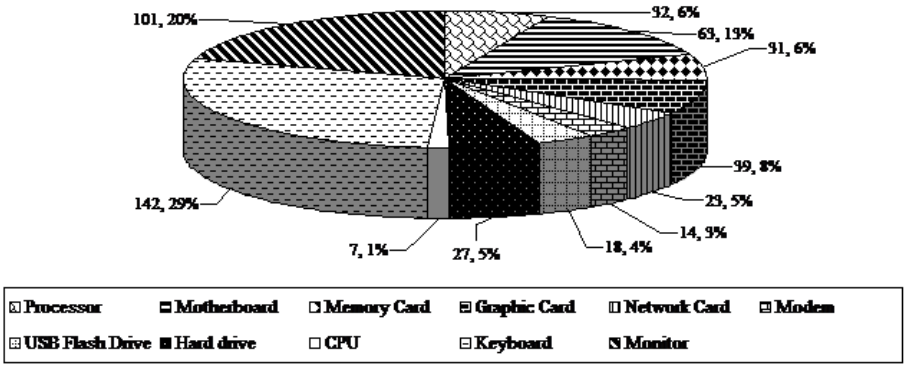

Figure 4: Computer components specified as hazardous

The awareness level results are shown in Fig. 5. It reveals that most respondents are aware of the requirements for segregation, reduction and proper disposal of e-wastes. Most of the respondents from business organizations are very familiar with e-wastes issues and the least class of respondents familiar with e-waste issues are from the individual firms. Also very few respondents from the business firms have no idea of e-waste and more respondents from individual firms have no knowledge.

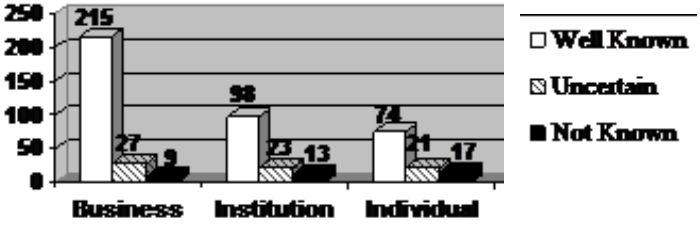

Figure 5: Awareness Level of Respondents

Respondents were also required to specify the current disposal method adopted for discarding unused computer systems and components, for the front panel of cathode ray tubes of monitors contains elements like barium, zinc and hexavalent chromium which causes general health disorders like muscle weakness, damage to the heart, liver and spleen; monitor casings contains triphenyl phosphate which causes endocrine disruptor, dermatitis and affects major enzyme in the blood (Canadian Council of Ministers of the Environment, 2001); and motherboards contains silicon controlled rectifiers and elements like Beryllium which causes carcinogenic (lung cancer), chronic beryllium disease or beryllicosis and skin diseases such as warts. Respondents' responses are shown in Fig. 6.

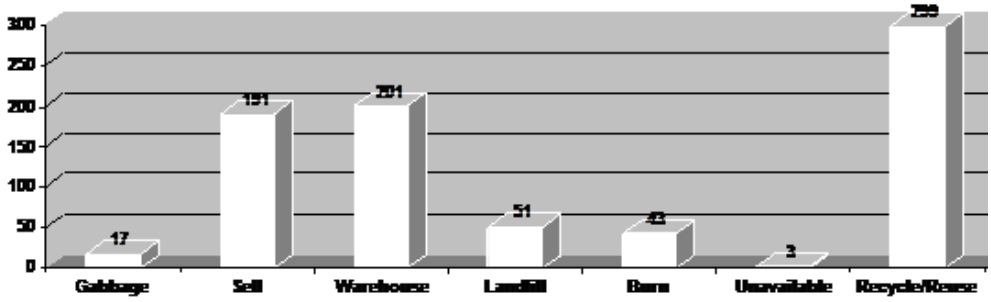

Figure 6: Responses to Computer Systems Disposal Method

191 respondents sell their unused computer systems and components if possible, while 51 of the respondents specified that scrap computer parts that are not bought after component separations end up in landfills. 299 recycle their computer system parts, while most

respondents carry out all six operations at a time, selling, storing in warehouses, burning, landfilling and disposing into garbage dump. Even monitors and some other computer parts in the warehouses are kept for sometime before they are sold if need be or dismantled and recycled to derive components which are sold.

From the list of hindrances to proper e-waste disposal, respondents selected their answers based on the following nine factors: enforces policies, complexity, motivation, knowledge, accessibility, security, cost, transportation, and time. As shown in Fig. 7, the least significant hindrance for proper e-waste disposal selected by respondents is motivation, which is selected by only 19(4%) respondents. Whereas the most significant hindrance selected by 97(20%) respondents is security. It is possible that a lot of respondents are concerned about the poor infrastructural structures in place for recycling e-wastes. Major efforts employed to collect and recycle e-waste materials are insufficient, unhealthy, and unscientific. The variance in most developing countries is accompanied with fewer requirements to protect workers and the environment. Thus, as these e-wastes undergo disassembling, treatment, burning and disposal in very loose environmental frameworks with underdeveloped facilities, it has negatively impacted on the industrial safety of individuals in their specific operations and increased environment health hazard.

The second most significant hindrance to appropriate disposal of e-waste disposal was cost which was selected by 95(19%) respondents. Definitely if the cost of proper disposal is not worth the effort, then for citizens who are trying to make ends meet, it will not be worth the effort. Knowledge is another hindering factor that should be considered, for 58(12%) respondents claim not to have a knowledge of the fact that e-waste need to be properly disposed of and yet they are at the core of operations that contains lots of these e-waste materials. Time is another issue. Apparently many respondents are so concerned with doing business and making money that they hardly have the time to properly dispose their e-waste. In fact from the study, it was discovered that many would just dump these e-waste materials at the sides of their stores or warehouses in a hip and sometime wait until individual scrap pickers who are not registered but are very efficient at going in search of e-waste scraps at garbage dumps along the streets come along to pick them at agreed prices. Some respondents from bigger firms wait for registered agencies to collect their e-wastes also at an agreed price.

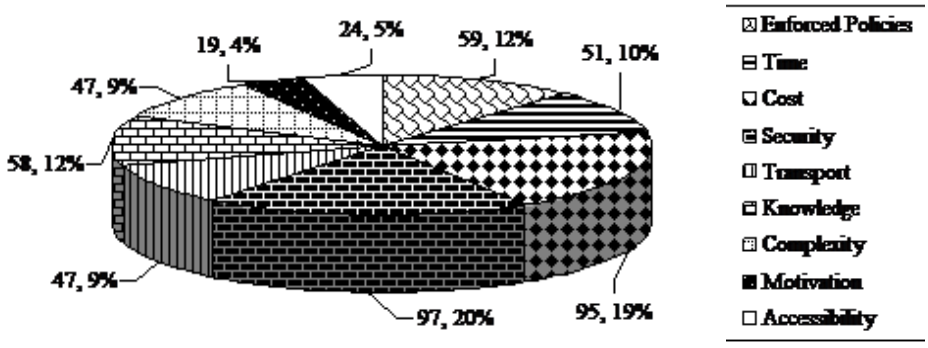

Figure 7: Hindrances to Appropriate E-waste Disposal

CONCLUSION

The study revealed that while most respondents know of the hazardous nature of e-waste, most are actually concerned with the monetary benefits when it comes to disposing of unusable parts of the computer system. The only extensive measure that can address the issue of appropriate e-waste disposal is the adoption and deployment of e-waste policies. These policies should focus on addressing importation of already used computer parts, disposal methods and recycling techniques, including the selection or appointment of appropriate bodies that will effectively monitor the different phases of processing e-waste elements. The policies should

also include educating citizens in order to increase the awareness level of e-waste hazardous nature. The government should create a "green" culture that will encourage all to be committed to enhancing the environment. Also proper regulations should be included that will ensure proper collection and treatment of e-waste from residential and commercial sites. And finally a monitoring system should be implemented to make certain that the e-waste collection and recycling process is properly enacted**.**

REFERENCES

Alhumoud, J.M. and Al-Mumin, A. (2006). A Comprehensive evaluation of solid waste management in Kuwait. *World Review of Science, Technology and Sustainable Development*. 3:2.

BAN and SVTC. (2002). Exporting harm: the high-tech trashing of Asia. The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC). Available at: http://www.svtc.org/cleancc/pubs/technotrash.pdf.

Canadian Council of Ministers of the Environment. (2001). Canada-Wide Standard for Mercury-Contaminating Lamps. Endorsed by CCME Council of Ministers. Winnipeg. Available at: http://www.ccme.ca/assets/pdf/merc_lamp_standard_e.pdf

FMJ (2008). The Federal Ministry Of Justice, Abuja. Nigeria's 3rd Periodic Country Report: - 2005-2008 On The Implementation Of The African Charter On Human And Peoples' Rights In Nigeria. Available at: http://www.achpr.org/english/state_reports/ Nigeria/3_ Periodic %20Rpt.pdf

Huisman, J. (2003). The QWERTY/EE concept—quantifying recycability and eco-efficiency for end-of-life treatment of consumer electronic products. Thesis Delft University of Technology, Delft, The Netherlands.

Nnorom, C. and Osibanjo, O. (2008). Review Electronic waste (e-waste): Material flows and management practices in Nigeria, *Innocent Waste Management*, 28: 1472–1479.

Puckett, J, Westervelt, S, Gutierrez, R and Takamiya, Y. (2005). *The digital dump: exporting re-use and abuse to Africa*, Basel Action Network, viewed. P 6. Available at: <http://www.ban.org/BANreports/10-24-05/documents/TheDigitalDump.pdf>.

Wiki (2012). Nigeria. Available at: en.wikipedia.org/wiki/Nigeria