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Database Management System for Cell Phone Ewaste

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Abstract **— Over the recent past, the requirement of electrical and electronic equipment (EEE) has grown exponentially, while the lifespan of these products has become shorter. The production of semiconductors, printed circuit boards, disk drives and monitors used in computer contains many hazardous chemicals. Printer inks and toners often contain toxic materials such as cadmium. Computer Central Processing Unit (CPU) contains heavy metals such as cadmium, lead and mercury, silver, chromium, zinc, lead, tin and copper. The reviewed papers covered the analysis of various countries in the world like, China, USA, and UK. Primarily this paper discusses the ewaste in cellphone, a study of different mobiles based on toxic material, and if not recycled properly its hazardous effect on our health. This paper helps to control the ewaste through database management system**

Keywords **— Ewaste, Database Management, Metals, Toxic Materials, Harzarouds Effect**

INTRODUCTION

E-waste is the term used to describe old, end-of-life or discarded appliances using electricity. With the exponential increase in cellphone usage, it is becoming one of the major sources of ewaste. The components of cellphones like semiconductors, battery, circuit boards uses some of the toxic materials and hence disposal of cell phone is one of the major problem globally. The incineration, land filling and recycling are the existing solutions for managing electronic waste. Most mobile ewaste is trashed and not recycled

I. PRESENT SITUATION IN CELLPHONE Research

Mobiles phones have a short life span and are discarded due to:

- Advancement in technology
- Changes in fashion, style, status or perception
- Nearing the end of their useful life

The data collected from healthystuff.org states that

- The circuit boards in cell phones contain myriad toxins such as arsenic, antimony, beryllium, cadmium, copper, lead, nickel, and zinc.
- Brominated flame retardants are found in the plastic housing, printed wiring board, and cables.
- The lithium-ion and nickel-metal hydride batteries contain heavy metals such as cobalt, zinc, and copper.

The data analysis illustrates the chemical composition in PPM- parts per million (Data analyzed in 2011)

Iphone 5	
Button	Bromine 179 ppm Chlorine 2681 ppm Lead 122 ppm Mercury 24 ppm
Circuit board	Bromine 116 ppm Chlorine 20498 ppm Lead Not detected Mercury 12 ppm
Processor	Bromine 1 ppm Chlorine 3444 ppm Lead Not detected Mercury 50 ppm
Case	Bromine 40 ppm Chlorine 2425 ppm Lead 159 ppm Mercury 10 ppm

Samsung Galaxy S3	
Button/screen	Bromine 2 ppm Chlorine 1139 ppm Lead 5 ppm Mercury 4 ppm
Circuit board	Bromine 605 ppm Chlorine 6727 ppm Lead Not detected Mercury 44 ppm
Processor	Bromine 50 ppm Chlorine not detected Lead Not detected Mercury 108 ppm
Case	Bromine 6 ppm Chlorine 4160 ppm Lead 63 ppm Mercury 141 ppm

II. EFFECT ON HEALTH OF CELLPHONE CHEMICALS

The study of hazardous effect on health was carried out for battery types, screen type, motherboard and case of cellphone if not recycled scientifically.

Most of the phones have lithium battery. Lithium-polymer battery is sleeker and thinner, lithium-ion batteries have a higher energy density and cost less to manufacture. Li-ions, has the chemical symbols $LiCoO_2$ and the abbreviation LCO.

The hazardous effects on health of cell phone components is mentioned below:

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Battery type	Chemical present	Hazardous effect on health
Lithium ion batteries	Lithium	Shortness of breath Sore throat Burning skin Redness in eyes Abdominal pain
	Nickel	Lung cancer Nose cancer Larynx cancer
	Manganese	Dullness Weak muscles headaches
	Cobalt	Vomiting and nausea Vision problem Heart problem Thyroid problem

Screen type	Chemical present	Hazardous effect on health
Capacitive touch screen	Silicon	Chronic respiratory effect
LCD screen	Indium Tin	Can damage heart, kidney and liver Eye and skin irritation Stomachaches Sickness ,dizziness

Mother board	Chemical present	Hazardous effect on health	
`	Silicon di oxide aluminum copper	Chronic respiratory effect Can irritate skin and eyes irritation of the nose, mouth and eyes headaches, stomachaches, dizziness, vomiting and diarrhea	

Case (entire cover is made of plastic). This plastic are difficult to dispose and hence create pollution.

Case	Chemical present	Hazardous effect on health
	Polypropylene Or Silicone Or Carbon fiber	Irritate the skin, mucous membranes, and tissues. Inflammation of hair follicles

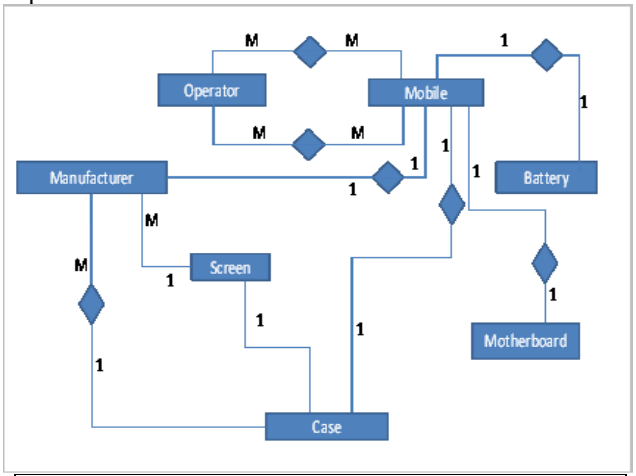
III. Database Approach to Reduce Ewaste

Data was collected for 100 mobile in the following format:

Sample data is listed below:-

Manufacturer Name	IMEI No.	Operator	Battery type	Screen	Processor
Samsung Galaxy	22121121	vodafone	2100 mAh Lithium Ion	Capacitive touch screen	QUALCOMM
Samsung Duos-S7572	12122121	Aircel	1500 mAh Lithium Ion	TFT touch screen	QUALCOMM

The Entity relationship model based on the above data is as per below



Operator
Operator Name

Mobile
IMEI no
Operator name
Mobile no

Manufacturer
Manufacturer Name
IMEI No
Screen Type

Battery
Battery type
Lithium
Nickel
Manganese
Cobalt
Bromine
Chlorine
Lead
Mercury

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Screen
Screen type
Silicon
Indium
Tin
Bromine
Chlorine
Lead
Mercury

Case
Case type
Polypropylene
Carbon
Bromine
Chlorine
Lead
Mercury

Motherboard
Motherboard type
Silicon
Aluminium
Copper
Bromine
Chlorine
Lead
Mercury

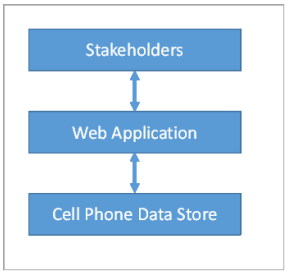
The advantage of this approach is

- This database will be easy for manufacturers and users to help predict the e waste in cell phones.
- It will be easy for users to maintain their cellphone for a longer time thus reducing wastage.
- It will help to sort recyclable materials. It will help the customers to reuse the cellphones more efficiently. The database can be uploaded on cloud computing technology.

IV. Database and Cloud Computing

This database hosted on the cloud will enable easy exchange of data between various stake holders.[2] The stake holders may include Manufacturers, Ewaste Recycling Companies, End Users etc. The data ownership can lie with a group of stakeholders

The following is the proposed architecture where first layer is storage and upper layer is application layer. Data can be encrypted for the security purpose. It is a less expensive platform.



V. Limitations

The cell phone have different types of batteries, motherboards, processors. The exact toxic data present in mobile needs further research. The data security on cloud is one of the challenges. Manufacturer should introduce recycling polices and processes to make effective use of above model

VI. Conclusion

The database management system will be useful for better recycling management. Manufacturers, Ewaste recycling companies and end users will play major role for successful implementation database management system.

References

[1] Xu, Zhiduan, and Xiaobin Xue. "Three-tiered E-waste recycling supply chains based on revenue sharing." Advanced Management of Information for Globalized Enterprises, 2008. AMIGE 2008. IEEE Symposium on. IEEE, 2008

[2] Lee, Sunguk. "Database Management System as a Cloud Service."Database 5, no. 2 (2012).

[3] Yuksel, Hilmi. "An analytical hierarchy process decision model for e-waste collection center location selection." In Computers& Industrial Engineering, 2009. CIE 2009. International Conference on,pp. 1684-1689. IEEE, 2009.

[4] Ansari, Noushin Laila, Md Mahfuz Ashraf, Bushra Tahseen Malik, and Helena Grunfeld. "Green IT awareness and practices: Results from a field study on mobile phone related e-waste in Bangladesh." In 2010 IEEE International Symposium on Technology and Society, pp. 375-383. IEEE, 2010.

[5] Nagurney, Anna, and Fuminori Toyasaki. "Reverse supply chain management and electronic waste recycling: a multitiered network equilibrium framework for e-cycling." Transportation Research Part E: Logistics and Transportation Review 41, no. 1 (2005): 1-28.

[6] Terazono, Atsushi, Shinsuke Murakami, Naoya Abe, Bulent Inanc, Yuichi Moriguchi, Shin-ichi Sakai, Michikazu Kojima et al. "Current status and research on E-waste issues in Asia." Journal of Material Cycles and Waste Management 8, no. 1 (2006): 1-12.

[7] L. Nageswara Rao, "Environmental Impact of Uncontrolled Disposal of E-Wastes", International Journal of ChemTech Research, Volume 6, pp 1343-1353,2014.

[8] Zhi, Guo-Jian, Xiong-bao Dong, and Rui-xia Zhang. "Application of genetic algorithms for the design of WEEE logistics network model." In Intelligent Computing and Integrated Systems (ICISS), IEEE, 2010

[9] Smith, D., et al. "Computer monitors recycling: a case study." Engineering Science & Education Journal 5.4 (1996): 159-164

[10] Li, Wei, et al. "Pricing decision for remanufactured and refurbished products about WEEE." Logistics Systems and Intelligent Management, 2010.

[11] Ashish. Chaturvedi," The Carbon Footprint of E-Waste Recycling - Indian Scenarios", Gesellschaft International Zusammenarbeit, Germany, page 1-6, 2004.

[12] Lozano, S., et al. "Clustering Spanish households E-waste disposal behavior using Self-Organizing Feature Maps." IEEE 2010

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