A Performance on Awareness of e-waste Management among University Students

Muhammad Hafiz bin Mohd Tukimin, Rina Md Anwar, Aliza Abdul Latif

Abstract: Electronic waste management is the practice in managing waste generated from electronic appliances, which may involve the recycle, reuse and reduce of the devices. Although there have been initiatives introduced by countries such as Basel convention or Stockholm convention, the issue of e-waste management is increasing globally. Most of the e-waste was contributed by the high usage of mobile phone or tablet, and the demand keep increasing especially among young generation. This necessitates a study on the awareness among young generation, specifically on university students in gauging their awareness level of the impact of e-waste on human and environmental health. A survey has been carried out among students in a private institution in Malaysia to assess their awareness on e-waste management. As a result, students were aware on the concepts but still are unclear on the e-waste management practices in Malaysia. Based on the survey outcome, the university and the students should play a bigger role in understanding and being directly involved in e-waste management.

Keywords: Electronics, E-waste management, Health concerns

I. INTRODUCTION

Over decades, ICT have provided society with a vast array of new competencies that have improved many facets of their life and lifestyle. Alongside the various benefits, challenges lie in how best to curb ails that IT has brought with it [1], [2], [3]. Amongst are the waste that ICT devices have accumulated at the end of their lifecycle; through their manufacturing processes, maintenance and use, ICTs currently contribute an estimated 2% of global greenhouse gas (GHG) emissions. Hall [4] claimed that the production of one computer requires an estimated 240 kilograms of fossil fuels, 22 kg of synthetic chemical compounds and 1,500 litres of greywater. The recycling of E-waste products could allow the diminishing use of virgin resources in manufacturing and, consequently, it could contribute in reducing the environmental pollution.

Malaysia has regulated its e-waste management since 2005 [5]. However, its success is confined to e-waste generated by industry.

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It has yet to tackle the "households" e-waste management. According to The Global E-waste Monitor 2017 report, Malaysia generated a total of 280 kilotons of e-waste or 8.8 kg per inhabitant in 2016 [6]. The amount of e-waste is expected to increase when the collection of household e-waste is fully implemented. As such, if the e-waste is not managed properly, the implication will be severe to the country. According to STEP, although there is ample information about the negative environmental and health impacts of primitive e-waste recycling methods, the lack of comprehensive data has made it hard to grasp the full magnitude of the problem and how severe it has become [7].

In response to the e-waste problem, Malaysia under the direction of the Department of Environment has intensify its effort to manage the impact of e-waste: diligence in keeping track of Information on production, import, export and domestic consumption of electric and electronic appliances in Malaysia; the 138 recovery facilities (16 are full recovery facilities); and initiating various programs geared at addressing the waste problem. However, for Malaysia to improve its overall situation of e-waste, a lot is yet to be done, especially in addressing the household e-waste.

II. LITERATURE REVIEW

The classification of e-waste in Malaysia is based on the guideline published by Department of Environment in 2008 (Department of Environment Second Edition, 2010) which is the "Guidelines for the Classification of Used Electronic and Electrical Equipment". In order to have a better perspective on where Malaysia stand on the e-waste issue, it is crucial to look it in a worldwide perspective and how they rate the situation and quantify the problem. Malaysia have implemented the Environmental Quality (Scheduled Wastes) Regulations 2005 (Department of Standards Malaysia, 2007). In this classification, any treatment of e-waste is regulated and must be carried out at a licensed on-site treatment facility, and the disposal of e-waste must be performed at the only prescribed premise which is Kualiti Alam Sdn. Bhd. As one of the parties to the Basel Convention, the export or import of e-waste is strictly prohibited.

E-waste in Malaysia must be handled by licensed recovery facilities. In order to convert e-waste into a source material, Malaysia facilities have encounter several issues and obstacles. One of it is the lack of e-waste supply. E-waste supply is important as it relates to production of the plants, thus become the income to the plants. Due to the lack of supply, many facilities were not able to operate at full capacity. Recycling licenses have been issued without

considering the amount of e-waste available leading to too many full recyclers. In some cases, e-waste also has been illegally processed by illegal operators without proper facilities and safety measures.

License can only be issued by Department of Environment in Malaysia. Only facilities with license are allowed to collect and treat e-waste. In total there are 138 e-waste recovery facilities in Malaysia, whereby only 16 are categorized under full recovery facility and 122 as partial recovery facility. These facilities are to perform the recovery process of precious (gold, silver, and platinum) and valuable (copper, aluminium, and nickel) metals [8].

The International Organization for Standardization (ISO) have issued certain standard that needed to be followed for e-waste industry [9]. Most e-waste recovery facilities have applied for certification through an accreditation process, whereby the certification includes requirements for quality, the environment and the occupational health and safety management system.

Most of the company that manage and recycle e-waste are manage by private companies. The company pay the e-waste supplier or generator and process the e-waste into their basic form, and sold back to the manufacturer. E-waste also can be collected from residential area but the quantity is smaller compared to the industries. The National Solid Waste Management Department (NSWMD) is one of the entity that conduct discussion on how to collect e-waste efficiently. In Malaysia, public are encourage to send their e-waste such as mobile phones, batteries and their accessories, mobile accessories, and television to the e-waste collection centres. But due to the limitation on the type of product and the lack of exposure the progress for such effort are running slow.

Earlier studies on e-waste awareness among students has been carried out by [10], [11], and [12]. The study showed that most of the students did aware of the term e-waste and the hazardous effect of e-waste. However, the students lack of awareness in handling the e-waste in proper way. Their e-waste had been thrown away in the ordinary dustbin or to scrap collector whereas they should dispose the e-waste to licensed e-waste facilities.

III. METHODS

The initial questions used for the survey are adapted from a survey done by Anthony Okoye and Chijioke Odoh in 2013 entitled "Assessment of the Level of Awareness of E-Waste Management and Concern for the Environment amongst the Populace in Onitsha, South Eastern Nigeria" [13]. The original questions then were tested in order to determine their suitability with the research being done, the compatibility with the research question and its suitability with the current research environment and scope.

The type of sampling used in this study was based on convenience sampling. Subjects selected were among UNITEN students, as the scope of the study was to assess the awareness level of young generation towards e-waste management. This sampling was also chosen due to the convenient accessibility and proximity to the researcher. The initial questions were altered to cater for the university student in UNITEN. The initial question used in the earlier study were developed for house holders and were not

suitable for university environment. The questionnaire was distributed to 370 students from College of Engineering, College of Computing, Informatics, College of Foundation, and Diploma Studies in UNITEN.

The questionnaire studied the various level of awareness of e-waste among the university student. The questionnaire comprised of four different sections. The first section investigated the respondent profile, such as gender, age, status, and ethnicity. The aim was to determine the overall population and sample of the research. The second section studied on the level of awareness or involvement in electrical and electronic waste generation, which include the study on the effectiveness of government regulation and the students' awareness status. The third section focused on the electronics appliances and gadget ownership management and understanding of disposal of e-waste model that the respondent adopted. The last section investigated the respondent awareness of e-waste impact on the environment and health. The survey was distributed by hand in creating more interaction with the respondents.

Data was analysed using Microsoft Excel. Pie-charts and bar graphs were drawn in the full report. In this paper, data has been represented in tabular form.

IV. RESULTS AND DISCUSSION

From the survey that has been conducted, the demographic data of the respondent have been gathered and analysed in order to determine the accepted hypothesis. Table I shows the demographic information of the respondent participates in the survey.

Table. 1 Demographic Profile

SECTION 1: Profile	Frequency	Percentage
1. Gender		
Male	251	68%
Female	119	32%
Total	370	100%
2. Age		
18-20	74	20%
21-23	197	53%
24-26	87	24%
>26	12	3%
Total	370	100%
3. Status		
Single	238	64%
In-relationship	125	34%
Married	7	2%
Total	370	100%
4. Ethnicity		
Malay	228	62%
Chinese	32	9%
Indian	22	6%
Sabah	38	10%
Sarawak	27	7%
Others	23	6%
Total	370	100%
5. College		
CSIT	246	66%
COE	86	23%
CFGS	38	10%
Total	370	100%
6. Program		
Bachelor of Information Technology (Information Systems) (Hons)	148	40%
Bachelor of Information Technology (Graphics & Multimedia) (Hons)	24	6%
Bachelor of Computer Science (Systems & Networking) (Hons)	29	8%
Bachelor of Computer Science (Software Engineering) (Hons)	50	14%
Bachelor of Civil Engineering (Hons)	38	10%
Bachelor of Electrical and Electronics Engineering (Hons)	11	3%
Bachelor of Electrical Power Engineering (Hons)	9	2%
Bachelor of Mechanical Engineering (Hons)	23	6%
Bachelor of Computer and Communication Engineering (Hons)	0	0%
Diploma in Mechanical Engineering	5	1%
Diploma in Electrical Engineering	3	1%
Diploma in Computer Science	7	2%
Foundation in Electrical and Electronic Engineering	0	0%
Foundation in Electrical Power Engineering	0	0%
Foundation in Mechanical Engineering	7	2%
Foundation in Civil Engineering	5	1%
Foundation in Computer Science	3	1%
Foundation in Information Technology	3	1%
Total	370	100%

A. Student's awareness of the term e-waste

The first question in the survey explored the respondent understanding and familiarity of the term e-waste. Fig. 1 shows that almost 69% of students did not have any idea or understood the concept of e-waste management. It was very alarming as majority of university students did not know how to manage e-waste, which has been a critical issue in recycling. Looking at Fig. 2, 70% of students did aware that they are generating e-waste.
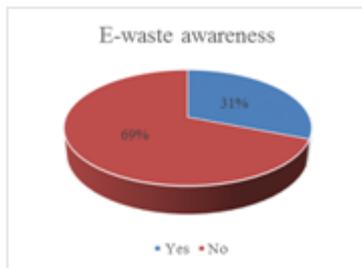

Fig. 1 Awareness of the term e-waste
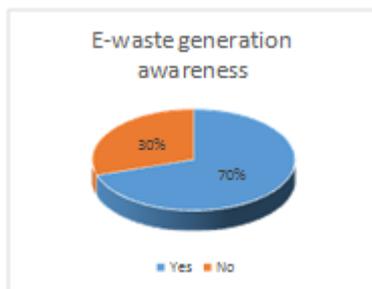
Fig. 2 Awareness of the e-waste generation

B. Electronics appliances and gadget ownership management

The survey did focus on the electronics appliances and gadget ownership management among students in UNITEN. By identifying the devices and appliances being used by the students, the study should be able to understand how these devices are being managed including the model of e–waste that the students adopted. Fig. 3 shows the result of the top three electronic gadget used by university student. The most used electronic devices among university students were mobile phone/tablet, followed by computer/laptop and the third one was monitor.
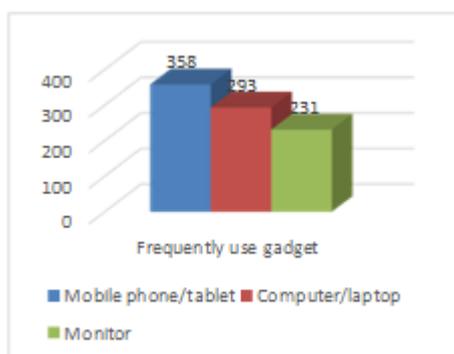

Fig. 3 Most frequent used electronic devices in UNITEN

There are numbers of factor that contributed to this result. The main reason is because university student assignments are typed and not handwritten, which make a computer or laptop as a necessary tool in a university environment. It is required by a university student to finish their assignment. Secondly, due to the nature of today social networking, mobile phone or tablet allow the student to communicate with other and also to obtain information faster.
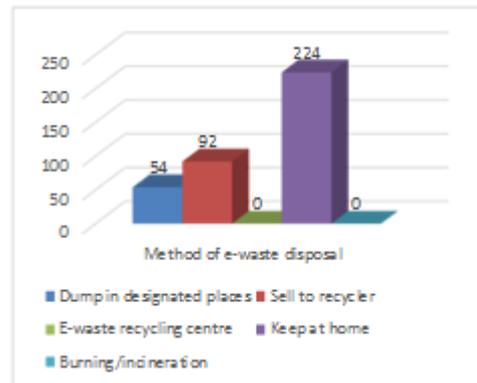

Fig. 4 Method of e-waste disposal

Fig. 4 shows the method of disposal of e-waste. 54 respondents dump the e-waste in designated places, such as recycle bins at places being prepared by the government. 92 students sell to recycle companies, 224 students keep the damaged or unused electronic at home and none of the students sends it to e-waste recycling centre or burning/incineration centre for e-waste.

The result shows that most of the respondent prefer to keep their e-waste at home. For some students, the electronic appliances may not be totally damaged or faulty and may still be repaired. It can even be used in case of emergency. Other stated there are no suitable designated places to dump these appliances. This is because some of them are aware of the value of this appliances, where they keep the electronic devices until they found the right opportunity to sell later at a good price.

This result shows that university students did not think much on the e-waste that they generated in a university-setting, and only 15% are having some efforts in handling and managing the e-waste by throwing them in designated places or sell to recycler. Majority of students, 61%, although they might know the consequences of e-waste, they did not feel any necessity in managing their e-waste and dumping their electronic waste properly. This has resulted in the increase of amount of not recycled e-waste getting higher every year, which is very alarming. If the percentage of e-waste recycling do not increase, the country will face severe consequences regarding environmental and health issues and situation might get out of control

C. Impact of e-waste on the environment and health concerns

The last section of the survey investigated the respondent awareness of e-waste impact on the environment and health. Fig. 5 shows the result collected from the responded

regarding their understanding and knowledge on e-waste and their effect on human and environment. It investigated the respondents' concern about the environment and awareness of the harmful nature of the e- waste if they are not being managed properly.
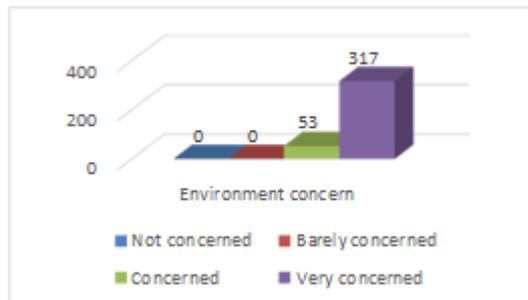
Fig. 5 Environment concern of the students

Most of the electronic appliances come with warning that stated the warning, effect of exposure and special disposal method needed for the appliances. However, most of the dangerous chemical are sealed within the appliances so that it is safer to use or handle them. This have led to a predictable result of 287 students aware of the health issues e-waste have and the rest 83 student were "not sure" about the impact of e-waste to health as shown in Fig. 6.
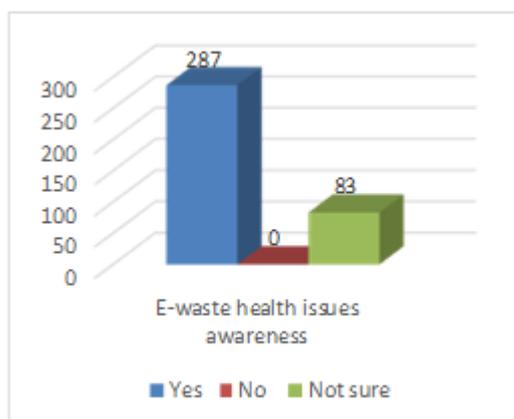

Fig. 6 Awareness of e-waste health issue

V. RECOMMENDATIONS

A. Management level

University management is the authority that are responsible in resource management and involves in decision-making in the university level. Besides, university management also responsible in determining the mission, vision and the direction of the university. Hence, the university management is responsible in developing the framework and policy related with e-waste management program. Since university management having the resources to obtain information whether from the people knowledgeable in this area or sources related with this area, it will not be a major problem for the university management to outline what is e-waste management program is all about.

The university management need to gather information on the type of e-waste being produced in the university, the amount produced, or cost in disposing this e-waste conventionally. By obtaining the critical information, needed,

proper type of e-waste management program can be established. After that, the university management must decide goals that must be achieved within a specific duration. The goals can be used to evaluate the successfulness of e-waste management program. If the goals are not achieved within the time frame, certain adjustment on the measure taken must be carried out. By having a proper evaluation, the e-waste framework can be improved based on the aspect that had been laid out. Then, the policy can be adapted by university management. This policy also will reflect the university's stand on e-waste management program and the action that will follow. After that, based on the framework outlined and the policy that had being developed, regulations may be carried out to ensure that e-waste management program is being executed. University management must provide proper regulations since they have the power to give penalties and punishment to the students that fail to abide the regulations that had been outlined. The regulations will be enforced by the security offices, part of the university management to the students and the penalties and punishment are in the form of fined since it is the type of penalties and punishment which is suitable for students. University management also can provide the guidelines for the students related to e-waste management program. The effectiveness of the guidelines created can be supported by organizing a campaign related with the e-waste management program. As a result, it will increase students' awareness of the e-waste management program, hence ensuring that the students will follow the guideline.

B. Students' organization level

Students' organization is one of the entity beside university management that should be involved in e-waste management program. Students' organization role is to link the university management to the students. Besides that, there are independent students' organizations which not related with university management but still cater the right and needs of the students. In addition, there are clubs and sport-related clubs. Although the students' organizations have different scope and direction, they are still important part in implementing e-waste management program. As students' organizations are linked to university management, they are the one that involve directly with program organized by the university management related with e-waste management program. They help in shaping the direction of the program organized by the university management. Since they are closer to the students, their roles are to spread the awareness regarding the e-waste management program. However, since regulations need enforcement, students' organization does not have power in developing the regulations related with e-waste management program. Moreover, students' organization also does not have the authority to give penalties and punishment to the students. Nevertheless, students' organization can assist in creating the guidelines, alongside the management which may help the students to understand on execution of e-waste management program.

C. Student's level

Students also play a part in e-waste management system. Comparing with university management and student's organization, students have the lowest authority, power and resources in e-waste management program. Nonetheless, they are the main entity that determine the success of the e-waste management program in the university. Students have responsibilities to obtain information besides participate in the activities related with the e-waste management program. Students also should follow the guidelines related e-waste management program and adhere with the regulations imposed by the university management. Hence, for student, they are responsible to involve actively with the e-waste management program to ensure that e-waste management program can be implemented successfully in the university.

VI. CONCLUSIONS

The result of the study showed that more than half of the students did not aware of e-waste and its impact but they did know that they are generating e-waste. Only 15% or 92 students sent the e-waste to the proper disposal site while majority of them just kept it at home. This is quite worrying since e-waste contains hazardous components and it requires proper management and control on the disposal of it. A proper e-waste management program can be established for students by involving university management, students' organization and also students itself. This will increase the university students' awareness of the e-waste and the importance of the proper e-waste disposal.

ACKNOWLEDGMENT

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