Assessing the Level of Awareness of Electronic Waste Among the Business Economics Majors of the University of Santo Tomas College of Commerce and Business Administration

Review of Integrative Business & Economics Research

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ABSTRACT

Utilizing the model developed by Roy (2016), this research measures the awareness levels of four hundred and two Business Economics majors of the University of Santo Tomas College of Commerce and Business Administration on e-waste and its disposal. Primary data via an online survey with the following statement indicators reflecting the following assessment criteria were utilized and evaluated using a Likert scale: awareness level, cognition, risk perceptions, attitudes towards e-waste recycling, and recycling behavior. Initial results revealed that twenty-six percent of the respondents learned about electronic waste in high school than those who encountered it in college. Hardly anyone reported learning about e-waste in their elementary and pre-school lessons. Seventy-eight percent of the respondents had a high e-waste awareness complemented with a high awareness level for the need to properly dispose e-waste. Respondents had the lowest relative mean of 1.87 in their attitude towards participative e-waste recycling. However, this e-waste awareness was not complemented by the provision of waste disposal facilities that address the specific requirements for proper waste disposal. This paper recommends that the dangers of e-waste and its proper management be integrated in the elementary level curricula and be followed through in both the secondary and tertiary levels with regards to e-waste awareness be inculcated in nurturing concern for the environment. This calls for the Local Action for Sustainable Development accord to come in: local governments' responsibility for coming up with specific actions and projects related in assuring the incorporation of sustainability in public programs and projects.

Keywords: Electronic waste, Ewaste.

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1. INTRODUCTION

Ooman (2014) defined e-waste as "*any white goods, consumer and business electronics, and information technology hardware that is in the end of its useful life*". These electronic devices often referred to IT and telecommunications equipment (personal computers, CRT and LCD monitors, laptops, mobile phones, printers, scanners, modems, etc.); large household appliances (refrigerators, air conditioning units, washing machines, electric stoves, etc.); lighting equipment (light bulbs, fluorescent tubes, rechargeable lamps, etc.); small household appliances (irons, kettles, microwaves, hair dryers, fans, vacuum cleaners, etc.); batteries (car batteries, accumulators, one-way batteries, etc.) and other consumer equipment (television sets, stereos, radios, DVD/VCR/MP3 players, cameras, game consoles, etc.), that when discarded by their users, became e-wastes.

In a global scale, 41.8 million metric tonnes (Mt) of e-waste were generated in 2014, and this was forecasted to increase to 50 million tons in 2018 (Debnath et.al. 2016; Awasthi et.al., 2016; Balde, 2015). E-waste had grown at a rate of 3% to 5% annually, which makes it one of the fastest growing waste streams in the world, and was expected to increase in the next generations (Cucchiella et.al., 2015). According to the UNEP, in developed countries, the life span of computers have shortened from six years in 1997 to just two years in 2005, and this increased the volume of e-waste that must be managed worldwide. Television sets, refrigerators and washing machines, on the other hand, were found to be used in a household more than twice for the past ten years (Rhee, 2016). The most widely used electronic product in the world was the mobile phone (Li, et.al., 2012), and with their relatively short lifecycles and their planned obsolescence, it has become one of the major contributors to the emerging e-waste problem in the world (Ongondo & Williams, 2011).

Electrical and electronic equipment (EEE) depreciate over time, and these generate electronic wastes which are sometimes coined as Waste Electrical and Electronic Equipment (WEEE), or EOL (End of Life) electronics (Bhat & Patil, 2014), and informally known as e-scrap or e-waste (Senophiyah & Meenambal, 2016; Awasthi et.al., 2016). The rapid advancement of technology and developments of Information and Telecommunication sectors have led to many changes in people's personal and professional lives. The increasing number of firms penetrating the market, and the built-in obsolescence policies of firms, who designed products that have artificially limited functional life, resulted to the inevitable growth of electronic waste or e-waste (Roy, 2016; Sivathanu, 2016; Senophiyah & Meenambal, 2016; Jaiswal, et.al., 2015; Jager, 2015; Ooman, 2014; Tiwari & Dhawan, 2014; Shah et.al., 2014; Wei & Liu, 2012; Peralta & Fontanos, 2006).

Debnath et.al. (2016) presented the lifecycle of electronic equipment, which was lifted from the work of Wath et.al. (2010). Wath, et.al. (2010) divided the lifecycle of EEE in three

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levels. The first phase is the process of manufacturing an EEE and its entrance to the value chain (either domestically produced or imported). This was followed by the generation of UEEE (Used Electronic and Electrical Equipment) which were created due to a technology change making the EEE obsolete, thereby discarding them. There was said to be a huge amount of UEEEs that were transported to developing countries (from developed countries) in the form of donations, thus making them free of all type of associated duties. The most crucial phase of any EEE lifecycle follows; which Debnath et.al. (2016) called as "*Decision for fate*", referring to the time when the EEE was decided whether it can be repaired and used by a Second hand market, or will it be included in the growing volume of E-waste.

Improper dismantling, treatment & management of WEEEs pose environmental and health hazards (Senophiyah & Meenambal, 2016; Jaiswal et.al., 2015; Jager, 2015; Ooman, 2014; Shah et.al., 2014; Grant, et.al., 2013; Sothun, 2012)According to the World Health Organization, e-waste are hazardous since these contain substances of concern (SOC) and highly toxic elements such as barium, cadmium, arsenic, selenium, chrome, copper, lead, liquid crystals, PCBs (polychlorinated biphenyls), selenium, silver, zinc, cobalt, nickel, lead, mercury, lithium and other harmful plastics (Tiwari and Dhawan, 2014).

Even with the dearth of solid research, the adverse effects of chemical exposure to e-waste on people's health have been a growing concern. Some of the hazardous effects have been enumerated in existing studies namely, prematurity, risk of cancer, blindness, nerve damage, reproductive problems, kidney and lung damage and a range of skin reactions, low birth weight, congenital malformations, respiratory and gastro intestinal tract problems, abnormal thyroid function and thyroid development, neuro behavioural disturbances, and geno toxicity (Senophiyah & Meenambal, 2016; Jaiswal et.al., 2015; Shah, et.al., 2014; Grant, et.al.' 2013; Johri et al., 2010).

Various countries around the world use different management approaches and regulatory policies to curb the problem of WEEEs. Appropriate collection and gathering of WEEEs, sorting and segregation techniques and recycling systems are important in proper e-waste handling (Jaiwal, et.al., 2015). A recycling process, according to Chanceler & Rotter (2009), as cited in the study of Jaiwal et.al. (2015), is described as *a sequence of 'process units' aiming at recovering recyclable components and reusable materials.* For instance, in Korea, a system was developed to ensure that the process of waste collection, recovery facilities and recycling activities minimize e-waste in the country (Rhee, 2016). In Korea, as mentioned in the study of Rhee (2016), policies are put not only to curb the usage of hazardous components in WEEEs, but also to encourage a systematic management for life cycle analysis from cradle to grave. An efficient recycling systemcan keep SOC components of WEEEs out of the environment. (Senophiyah & Meenambal, 2016; Johri et al., 2010).

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In some developing countries however, facilities for recycling activities and recovery are not always present. The common practice in most of these countries is informal recycling wherein e-waste products are repaired or reused to produce a second life (Ongondo, Williams & Cherrett, 2011). Some of these e-waste products are stockpiled and disposed with the municipal waste, or crudely recycled (Osibanjo & Nnorom, 2007), and these e-waste workers often are not aware of the health risks that rudimentary techniques of recycling bring (Tiwari & Dhawan, 2014). Even with methods deployed, with insufficient infrastructure, crudely recycled e-waste in some countries disperse materials and pollutants that result to contamination of air, soil in landfills, and even groundwater (Ongondo et.al., 2011).

In developing nations, such as China, the informal recycling sectors play a significant role in WEEE recycling (Wei & Liu, 2012). The informal sector in developing countries usually use informal recycling (Ongondo and Williams, 2011) and inappropriate methods of recovery, such as open burning that pose a threat on the environment (through contamination of the air, groundwater and landfills which result to ozone layer depletion and other environmental problems), and health (Senophiyah & Meenambal, 2016). E-waste recovery in most developing countries is mainly concentrated on few metals of value with primitive process (Awasthi et.al., 2016). Informal e-waste recycling markets in China, India, Pakistan, Vietnam, and the Philippines process from 50% to 80% of the amount managed by the developing countries. These management methods often include but not limited to shredding, burning, and dismantling of waste electronics in informal "backyard operations." (Kumar and Jain, 2014).

Exposure to e-waste toxins for human beings and the physical environment can be described in a variety of risk levels: (1) e-waste toxicants are released as a mixture more often than not through the means of an uncon trolled recycling processes making persistent organic pollutants (POPs) and heavy metals present in the recycling workshops and immediate neighbourhood (2) exposure to e-waste toxicants comes from varying factors: what type of E-Waste, how long has the recycling been going on, how much is being recycled and the specialization in recycling processes, where is the location of the workshops, is there parental involvement in the recycling act, and are children involved in the daily recycling activities, and (3) e-waste toxicant exposure lasts a long time.

There are many studies that focused on the issue of e-waste; however, there is very little research that focused on this environmental issue in the Philippine setting.

In the Philippines, Alam (2016) claimed that a huge amount of e-waste were still kept in households and have yet to be in the e-waste disposal or recycle chain due to storage practices of Filipino households. The awareness of the public regarding the disposal of electronic commodities plays a critical role in solving the e-waste problem (Debnath, et.al.,

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2016; Jaiwal, et.al., 2015; Bhat & Patil, 2014; Shah, et.al., 2014; Sothun, 2012 ; Chibunna, et.al., 2012; Anwesha, 2012; Skinner, et.al., 2010). Some studies show that the level of awareness on the impact of electronics disposal to health and the environment is poor (Ooman, 2014). Mahesh (2014), as cited in the study of Shah et.al. (2014), asserted that almost 99 percent of the consumers in their community did not have any knowledge about the harmful effects of e-waste on health and the environment, worse, do not understand what it is. A similar study done by Bhat & Patil (2014) show that consumer awareness of e-waste is present in their community, however, disposal practices of residents were poor. Sivathanu (2016) presented five important factors that influence consumers' e-waste disposal, and these are awareness of 1) health hazards; 2) environmental hazards; 3) proper e-waste disposal; 4) stakeholders' e-waste management; and 5) convenience of recycling.

General prevention from e-waste exposure means are the following: (1) In order to develop preventive measures with regards to exposure to e -waste, exposure assessments and health effects researches conducted by engineers, environmental scientists, and other professionals. (2)Regulating or maybe even restricting the use of toxic chemicals in the manufacturing of electronic devices to reinforce the backward prevention efforts, regardless if improvements are also critical in the present recycling practices, (3) Standardized recycling technologies must become the global/national norm of e-waste recycling complemented with the honest phasing out of the informal and crude recycling practices, and (4) Both the household and the community should be cautious of children being exposed to e-waste.

In developing countries where crude recycling processes are the norm, human health, particularly children's health, is a significant impetus for the regulation and management of recycling activities. Restricting the use of toxic chemicals in manufacturing electronic devices contribute to the reduction of exposure to hazardous substances.

Due to the lack of specific data on the effects of e-waste on children's health, the following plans of actions were initiated: (1) communicating the adverse impacts associated with e-waste in an effort to raise public awareness; (2) developing training methods and programs for health professionals; (3) encouraging specific research about e-waste, and (4) gathering interested stakeholders to move this issue forward. (Brune et al; 2013)

UNESCO encourages nations to develop a curriculum that will form values that motivate and mold the present generation to be agents of change and enable them to cooperate with others to contribute in the building of a sustainable future (Jager, 2015). It is critical to educate students about the dangerous impact of e-wastes to human lives. Some studies suggest that a comprehensive education is needed to equip students with the values, attitudes, knowledge and skills necessary to address environmental issues that can be damaging for themselves and the environment (Jager, 2015). It is important that the present generation

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develops an attitude that perceives electronic products not just as luxury commodities but also a hazard that harms not only the environment, but also the health of the populace (Bhat & Patil, 2014). However, there are very little studies that focus on e-waste awareness in the Filipino youth. Awareness surveys provide relevant information for the development of a sustainable management system (Roy, 2016; Li, et.al., 2012). For these reasons, the researchers would like to find out the level of youth awareness on e-waste, and the possibility of this issue to be a compulsory subject embedded in the curriculum.

This research focused on the level of awareness of the Filipino youth, as represented by the chosen population, regarding what comprises e-waste and how these should be properly disposed of. The source/s of their knowledge regarding these were also revealed in order to conclude the research by providing strong policy recommendations.

Since the term e-waste includes a wide range of appliances, gadgets and other physical home and office utilities, this research limited the term's scope to fit what the respondents' are normally able to decide on in terms of disposal e.g., desktop computer units and accessories, laptops, mobile phones, tablets, MP3 players, gaming consoles and power banks to name a few.

2. METHOD

This research utilized primary data collected from the currently enrolled BSBA Major in Business Economics students of the University of Santo Tomas College of Commerce and Business Administration. The authors were granted permission by Assistant Professor Shaunak Roy (Faculty of Management, Department of Commerce and Business Administration) of Saint Xavier's College to adapt portions of the survey instrument he used in his research, "Anatomizing the Dynamics of Societal Behavior towards E-waste Management and Recycling Initiatives: A Case Study of Kolkata, India." The survey instrument developed for *this* research comprised of basic demographic questions, what specific electronic devices did they currently possess (multiple answers are of course allowed), how do they normally dispose of older units once the newer and upgraded version is available and, utilizing a Likert scale (On a scale of 1-5, where 1 = Highly aware, 2 = Somewhat aware, 3 = Neutral, 4 = Somehow Unaware, 5= Completely Unaware), their level of awareness regarding e-waste hazards and proper disposal management.

Statement indicators reflecting the following assessment criteria were contained in the survey instrument and these were evaluated by each respondent according to the: Respondents' Awareness Level of E-Waste (indicators1-4), Respondents' Cognition of E-Waste (indicators 5-9), Respondents' Risk Perceptions of E-Waste (indicators 10-12), Attitudes towards Recycling of E-Waste (indicators 13-18), and lastly, E-Waste Recycling

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Behavior of Respondents (indicators 19-22).

The survey instrument was uploaded to Google docs and all students of the said academic program were instructed to answer online. Of the 433 total student population of the UST CCBA Business Economics Department for the AY 2016-2017, 402 questionnaires were completely accomplished and valid. This sample represented 92.8% of the population.

3. RESULTS

Profile of Respondents

The following tables present the respondents' profile as well as the population's profile as users of electronic devices as well their disposal and/or storing behavior:

Table 1

	# of users	% of Sample*
Laptops	366	91.0%
Desktop Computer	236	58.7%
Printers	270	67.2%
LCD Monitors	180	44.8%
CRT Monitors	21	5.2%
Scanners	183	45.5%
External Hard Drive	248	61.7%

Table 2

		% of Respondents
Mobile Phone	401	99.8%
Phone (E.g. Landline)	268	66.7%
Tablet/iPad	273	67.9%
Pocket WiFi	202	50.2%
Power Bank	272	67.7%
MP3/MP4 Player	128	31.8%
PSP/Gaming Console	200	49.8%

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Table 3

	#	% of Sample
Resell to Junk shops as scrap	55	13.7%
Resell as a second hand commodity (example: Greenhills Tiangge)	123	30.6%
Store at home	304	75.6%
Donate to others	156	38.8%
Throw in trash	50	12.4%
Handover to garbage collector	29	7.2%
Handover to e-waste collecting facilities	7	1.7%
pass it on to family members	1	0.2%
Hand me down	1	0.2%
Sell at online marketplace / through online classified advertisement	1	0.2%

Table 4

		% of Sample
Store at home	306	76.1%
Resell to Junk shops as scrap	25	6.2%
Resell as a second hand commodity (Example: Greenhills Tiangge)	143	35.6%
Donate to others	178	44.3%
Throw in trash	45	11.2%
Handover to garbage collector	16	4.0%
Handover to e-waste collecting facilities	11	2.7%
recycle	1	0.2%
Lost	1	0.2%
pass it on to family members	1	0.2%
Sell at online marketplace / through online classified advertisement	1	0.2%

There were 221 female and 181 male respondents (Figure 1) with a mean age is 18.69 years.

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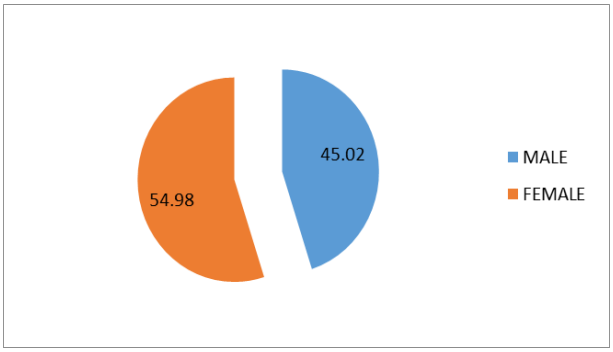
Figure 1



Three hundred sixty six or 91% of the respondents owned a laptop device and 236 or 58.7% own a desktop computer (Table 1). This information implies that it is relatively normal for students to simultaneously own a laptop and a desktop computer and this adds to the future e-waste volume when the time to upgrade comes around. Two hundred seventy or 67% of the respondents currently own a printer. In relation to these desktop computers and laptops, 304 or 75.6% of the respondents store the electronic equipment they no longer use instead of properly disposing of these. Table 3 shows that156 or 38.8% donate the units to others and a far third (30.6%) resell the units as a second hand commodity (for example at the Greenhills tiangge).

All 402 respondents currently own a mobile phone (Table 2) and 306 or 76.1% of the respondents replied that the mobile phone units that they no longer use are stored at home instead of disposing of these. Forty four percent done their old units to others and a third is reselling the units as a second hand commodity (Table 4).

These answers are consistent with the findings of Alam (2016) which claimed that majority of e-waste in the Philippines are still being kept at home. It has been a widely accepted practice in Philippine households to simply stash away the things that they own but no longer use.

Respondents' Awareness of the Concept of E-waste and from where they learned these

Table 5

		% of Sample
WEEE: Waste Electrical and Electronic Equipment	28	7.0%
E-Waste: Electronic Waste	165	41.0%

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I don't know any of these terms	220	54.7%
EOL Electronics: End of Life Electronics	19	4.7%
E-Scrap	30	7.5%

Table 6

		% of aware
Advertisments	72	39.6%
College	97	53.3%
Friends	59	32.4%
Grade School/ Elementary	18	9.9%
Highschool	106	58.2%
Home	54	29.7%
Other Institutions	47	25.8%
Preschool	3	1.6%

The respondents were asked if they were in any way aware of the following terms: Waste Electrical and Electronic Equipment (WEEE), Electronic Waste (E-waste), End of Life Electronics (EOL Electronics) and E-Scrap. Table 5 shows that 220 of the 402 respondents answered that they did not any of these terms at all. 165 (41.00%) of the respondents are aware of the term Electronic Waste or E-waste. There were very few respondents who were aware of the other terms. This specific question, as simple as it may be, was capable to reflect the overall awareness of the respondents regarding electronic waste. It was a disquieting revelation that more than half of the respondents were not even aware of the term e-waste and what more the other details related to this environmental issue. Debnath (2016) and a long list of other researchers emphasized the critical consequence the awareness of the public regarding the disposal of electronic commodities had in addressing the e-waste problem.

When asked where the respondents learn about electronic waste and its related issues, Table 6 shows that 106 learned from their high school education, 97 from college, 59 said they learned about it from friends while others learned it from home and from other institutions.

With regards to relating electronic waste to the rest of the community (as an externality), of those who were relatively aware of e-waste, Figure 2 shows that 78% were aware that e-waste required special treatment in order to be properly disposed. However, Figure 3 and Figure 4 show that 69% answered that the waste collectors that come to their home do not

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collect any electronic waste at all. In relation, Figure 5 shows that 88% of the respondents reported that their community did not maintain an electronic waste collection system and facility.

Figure 2

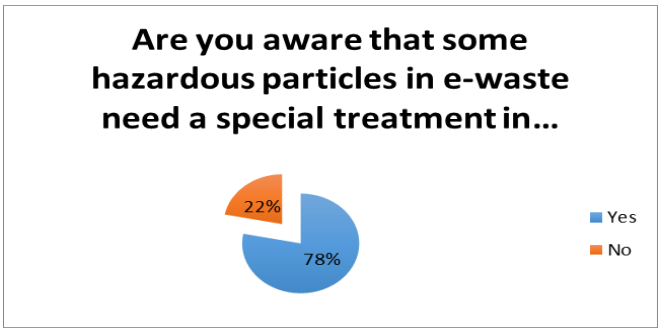

Figure 3

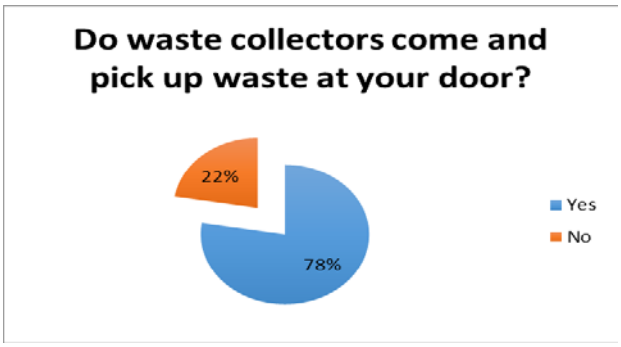

Figure 4

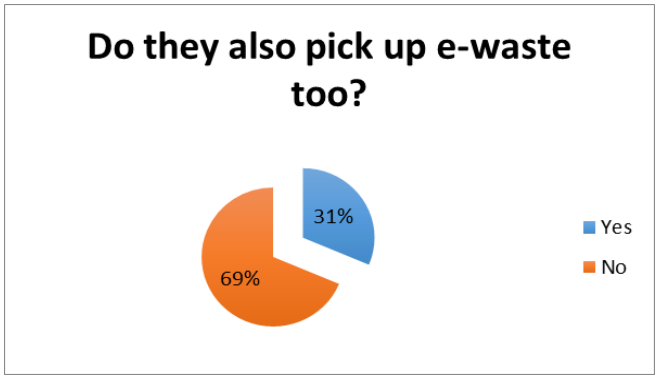

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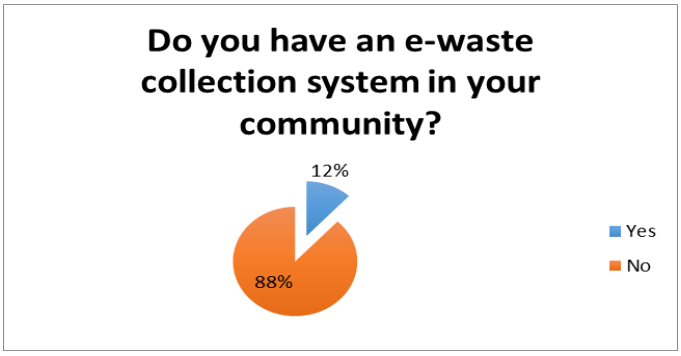
Figure 5



These reports on e-waste collection and facilities were able to illustrate that Filipino communities are generally ill-equipped with proper e-waste disposal processes and facilities. Just as Osibanjo and Nnorom (2007) observed, local e-waste products are disposed with the municipal waste or possibly crudely recycled. It was also revealed that the respondents' year level and gender were insignificant with regards to his or her level of e-waste awareness.

The Respondents' Level of Awareness Using the Likert Scale and Assessment Criteria

Table 7 is the frequency table that summarizes the assessment of the respondents' awareness level using the predetermined assessment criteria:

Table 7

Indicator of Respondents' Awareness	Highly Aware	Somewhat Aware	Completely Unaware	Somehow Unaware	Neutral
E-waste might even cause cancer among other health problems.	106	147	37	40	72
Recycling of e-waste helps in reducing potential greenhouse gas effects.	126	163	19	29	65
E-waste has potential	121	174	14	33	60

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impacts on climate change					
E-waste results in a more polluted environment.	134	175	15	26	52
I am willing to sort household e-waste to protect the environment.	164	171	3	15	49
I am willing to procure eco-friendly products to help reduce the impact of e-waste on the environment.	187	156	2	7	50
I am willing to recycle electronic products.	182	157	9	5	49
I am wiling to resell/buy reused packages (eco-friendly).	174	149	10	6	63
I always check for strategies before disposing electronic items.	107	141	14	33	107
I am practicing recycling of	60	155	27	49	111

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e-waste all the time.					
I am ready to recycle e-waste in order to protect the environment.	142	174	9	10	67
It is my responsibility to encourage my neighbors to recycle e-waste.	128	169	4	16	85
I am willing to implement recycling behavior for my family.	167	168	3	4	60

Table 8 summarizes the testing of means which is the result of the Likert scale:

Table 8

Respondents' Awareness Level towards E-Waste	2.163557214
Respondents' Cognition of E-Waste	2.2460199
Respondents' Risk Perception of E-Waste	2.077114428
Attitude Towards Recycling of E-Waste	1.875621891
E-Waste Recycling Behavious Respondents	2.070273632

With regards to the respondents' level of e-waste awareness the following results were revealed by the Liker scale: (1) Respondents were between being Neutral to being Somewhat Aware that E-Waste was a social and environmental perennial problem and were the same with regards to their awareness of the presence of e-waste in their surrounding and its impact on the environment and on health; (2) Respondents were only Somewhat Aware that e-waste had a negative impact on public health, resulted to more pollution, and contributed to escalating

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climate change; (3) Respondents were between being Somewhat and Highly Aware of different methods to properly manage and reduce their e-waste in order to somehow protect the environment; (4)Respondents were somewhat aware that proper recycling mitigate the environmental effects of e-waste. These findings reflect a relative high e-waste awareness among the respondents and a high awareness level of the need for proper and effective e-waste disposal in order to circumvent environmental and health consequences.

4. DISCUSSION

This research intended to assess the e-waste awareness level of the currently enrolled BSBA Business Economics majors of the UST College of Commerce and Business Administration using the criteria respondents' awareness level towards e-waste, cognition of e-waste, risk perception of e-waste attitude towards e-waste recycling and e-waste recycling behaviors. Given that the concept of electronic waste covers a wide range of devices and appliances, this research only limited the e-waste concept to the devices and gadgets that students normally use and have a significant degree of influence with regards to the unit's eventual disposal. All 402 respondents owned either a laptop or a personal desktop computer *or both*. Majority of the respondents maintained their own printers. All 402 respondents were current owners of mobile phones. 76% of the respondents self-reported that whatever gadgets and devices they no longer use were stored in their home which was consistent with the findings of Alam (2016) with regards to Filipino behavior in storing their devices no longer being used.

Only 41% of the respondents were in any way aware of the diverse terms bracketed with the most common term which is electronic waste/e-waste. There were slightly more respondents who learned about the e-waste problem in high school than those who learned about it in college. Hardly anyone reported learning about electronic waste in elementary and in pre-school which further reinforced the endorsement of the researchers that lessons on e-waste as an escalating environmental problem be formally integrated in natural science courses as early as in the elementary level and then followed through in the higher levels.

The respondents had a relative high e-waste awareness complemented with a high awareness level for the need to properly and effectively dispose of e-waste in order to avoid dire environmental and health consequences. Respondents had the lowest relative mean in their attitude towards e-waste recycling which reveals their lack of initiative when it comes to contributing and doing their part in addressing the issue.

5. CONCLUSION

It was established that the relatively high level of e-waste awareness of the respondents

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was not complemented by institutional infrastructure/facilities that address the specific requirements for proper waste disposal. This is where the significance of the Local Action for Sustainable Development accord comes in: local governments were given the responsibility to come up with specific actions and projects related in assuring the incorporation of sustainability in public programs and projects.

The Local Action for Sustainable Development in the Philippines addresses a variety of action agendas but with regards to e-waste, and given the apparent concentration of recycling establishments in metropolitan areas, the action agenda for urban ecosystems is significantly related to it. Institutional interventions such as enhancing control of international and national traffic of chemical and toxic substances are above the mandate of local governments however there are strategies regarding e-waste that can be directly addressed by local governments such as strengthening the management of hazardous wastes,by coming up with short-term treatment, storage and disposal options for hazardous wastes presently used by the industrial sectors (which should have been addressed and in full implementation by the year 2005 by the way) and the identification, remediation and rehabilitation of contaminated sites (the target for this in by year 2025).

Since e-waste toxicants can evidently contaminate bodies of water, local action with regards to water pollution are also significant: LGU's must be geared to intensify urban water protection efforts by monitoring water pollution control enforcement and processes and reducing the pollution of urban waters (target year is 2025).

6. RECOMMENDATION

As per the Philippine Agenda 21 for Sustainable Development there is an action agenda that contains the integration of solid waste management in the school curricula and the point institutions for this specific point institutions are the Department of Environment and Natural Resources and the Department of Education. Springboarding from this action agenda, it is the recommendation of this research that awareness about the dangers of e-waste and the importance of its proper waste management be specifically integrated in the curricula of AS EARLY AS in the elementary years as hardly any one of the respondents learned anything about e-waste in their elementary years but this must also be followed through in both the secondary and tertiary curricula. Just as Jager (2015) recommended curriculum enhancement is another recommendation that can most probably ensure that e-waste awareness be inculcated in the genuine concern for the environment. Ensuring the environment's future entails educating the future generations today and, hopefully, effectively sustainable practices with regards to proper e-waste management and disposal becomes second nature to them.

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APPENDIX

Survey Questionnaire:

Age: _____ Gender: _____

Which among the following electronic equipment do you own? (Check all that apply)

- Desktop Computer
- CRT Monitors
- LCD Monitors
- Laptops
- Printers
- Scanners
- External Hard Drive

How do you usually dispose the above-mentioned electronic equipment?

- Resell as a second hand commodity (example: Greenhills Tiange)
- Resell to Junk shops as scrap
- Store at home
- Handover to garbage collector
- Handover to e-waste collecting facilities
- Throw in trash
- Donate to others
- Others _____

Which among the following electronic devices do you own? (Check all that applies)

- Mobile Phone
- Phone (Example: Landline)
- Tablet/iPad
- Pocket WiFi
- Power Bank
- MP3/4 Player
- PSP/Gaming Console

How do you usually dispose the above-mentioned electronic device?

- Resell as a second hand commodity (example: Greenhills Tiange)
- Resell to Junk shops as scrap
- Store at home

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Handover to garbage collector
Handover to e-waste collecting facilities
Throw in trash
Donate to others
Others _____

Which of the following terms are you aware of
WEEE: Waste Electrical and Electronic Equipment
e-waste: Electronic Waste
EOL Electronics: End of Life Electronics
e-scrap
I don't know any of these terms

If you are aware of any of the foregoing, where did you learn about it?
Home
Preschool
Grade School/Elementary
High School
College
Friends
Advertisements
Other Institutions

Are you aware that some hazardous particles in e-waste need a special treatment in order to be safely disposed of
Yes
No

Do waste collectors come and pick up waste at your door?
Yes
No

Do they also pick up e-waste too?
Yes
No

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Do you have an e-waste collection system in your community?

Yes No

If Yes, are you willing to give out your e-waste for free if you can be certain that its disposal will be useful and not harm the environment?

Yes

No

Do you know any facility/establishment that collects e-waste such as old electronic products, batteries, chargers, and adaptors?

Yes (such as? _____)

No

On a scale of 1-5, where 1 = Highly aware, 2 = Somewhat aware, 3 = Neutral, 4 = somehow Unaware, 5= Completely Unaware, please mark your preference towards the following questions:

1. I am aware of the hazardous nature of e-waste
2. I am aware of the fact that e-waste is a massive problem for the environment
3. I am aware that e-waste is dumped indiscriminately across the city
4. I am aware of the fact that e-waste affects human health
5. I know that e-waste is rapidly increasing across the city of Manila
6. E-waste has disastrous impacts on the environment
7. I am cognizant of the toxic composition of e-waste
8. E-waste might even cause cancer among other health problems
9. Recycling of e-waste helps in reducing potential greenhouse gas effects
10. E-waste is detrimental to public health
11. E-waste has potential impacts on climate change
12. E-waste results in a more polluted environment
13. I am willing to sort household waste into separate containers
14. I will sort my household e-waste to protect the environment
15. I am willing to procure eco-friendly products to help reduce the impact of e-waste on the environment
16. I am willing to recycle electronic products
17. I am willing to resell/buy reused packages (eco-friendly)
18. I always check for strategies before disposing electronics items

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19. I am practicing recycling of e-waste all the time
20. I am ready to recycle e-waste in order to protect the environment
21. It is my responsibility to encourage my neighbors to recycle e-waste
22. I am willing to implement recycling behavior for my family

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