The Study on Perception on E-Waste Among the People

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Abstract

E-waste is piling up at an alarming rate, which results in our environment's pollution, while only a few are being disposed of correctly. This research aims to discover people's awareness of e-waste and how to handle it. An online survey was done among 75 respondents, who were asked about their general knowledge of e-waste. Most respondents are aware of the effects of e-waste but lack knowledge on how to tackle them, including questions concerning e-waste management and its causes. In conclusion, the general public must be educated on e-waste to reduce and dispose of e-waste efficiently and effectively.

Keywords: E-waste, Technology, Online Survey, Environment

1. Introduction

The 20th century was rich with pivotal technological advancement, from the birth of the television to the creation of personal computers. Technological advancement kickstarted the tech industries towards more innovations that are rapidly improving, which led to inventions such as the iPhone that paved the way for modern-day smartphones. Technology these days has become mainstream. Statistics show an uphill trend regarding the adoption of technologies in a household. For example, colour TV use increased exponentially, recording a 10 per cent adoption in 1966 to 96 per cent in 1990 and a fairly stable adoption rate moving towards the 21st century, staying around 90 per cent. The adoption of computers has also shared the same prosperity**,** skyrocketing from 20.70 per cent in 1992 to 89.30 per cent in 2016. The biggest winner of all this is the smartphone. Since its introduction around the 21st century, its adoption has rapidly increased, from 35 per cent in 2011 to 73 per cent in 2016. Its predecessor, the cellular phone, is the only factor stopping the adoption of smartphones from growing further since it also has an increase of adoption from 10 per cent in 1994 to 93 per cent in 2016 [1].

There are a multitude of factors feeding the growth of the usage of technology. The role of the government and human nature to favour efficiency are the pivot of this swift growth of technology usage. The government have been emphasizing Vision 2020 lately, which includes an objective to establish a scientific and progressive society that is not only a consumer of technology but also a contributor [2]. Another thing to note is the term Industry 4.0, which aims to create a smart factory environment. Alternatively, technology is known to ease day-to-day tasks. Due to this, technology has infused into our lives and become an ongoing trend. To make it clear, if the five big tech companies are combined, they would have a higher revenue (up to 802 billion) compared to Saudi Arabia, which has the 19th highest GDP at 684 billion [3].

Unfortunately, there is always a catch. The ever-increasing demand for technology causes tech companies to manufacture more and people to upgrade their technologies. All of this causes a domino effect, which leads to e-waste. Electronic waste or e-waste could be defined as any electrical and electronic equipment disposed of without considering it being repurposed. The term covers any objects with screens, temperature-related equipment like refrigerators, lamps, large or small electronic appliances such as a vacuum or dishwashers, and portable electronics ranging from Global Positioning System (GPS) to calculators [4]. As with any production, the manufacturing of technologies is not proportionate to its recycling work. As of 2016, 44.7 million metric tons of e-waste were produced,

comparable to 6.1 kilograms per inhabitant (kg/inh), which increased compared to the 5.8 kg/inh amount in 2014 [5]. In other words, the perception of people regarding e-waste remains uncertain. Therefore, this study aims to investigate the general public's perception of e-waste in Klang Valley.

2. Background

2.1. Overview

Electronic waste and electronic waste identify mechanical and digital products that have been discarded. These wastes are also regarded as appliances deemed refurbishable, recyclable, disposable and saleable. The processes involved when managing e-waste are burdensome, as they cause pollution and negatively impact human conditions, especially in developing countries.

2.2. Definition

E-waste or digital waste is generated after completing its useful life when an electronic item is discarded. The rapid expansion of innovation and the economy powered by usage contributes to producing a large amount of e-waste every minute. The European WEEE Directive classifies electronic and electrical equipment for waste management purposes into ten categories namely large household appliances (e.g., refrigerators, washing machines), small household appliances (e.g., toasters, coffee makers), IT and telecommunications equipment (e.g., computers, phones), consumer equipment (e.g., TVs, radios), lighting equipment (e.g., lamps, fluorescent tubes), electrical and electronic tools (e.g., drills, saws), toys, leisure, and sports equipment (e.g., video game consoles), medical devices (e.g., X-ray machines, pacemakers), monitoring and control instruments (e.g., thermostats, smoke detectors), and automatic dispensers (e.g. vending machines).

2.3. Current Situation of E-Waste

Electronic waste keeps growing. Today, people are buying more electronic devices, which are being quieted faster. For example, cell phones generally have a short lifespan of one to two years. People use most of their incomes to buy electronics yearly. According to a study, more than 20 million tons of e-waste are produced annually.

The environmental impact of e-waste is a growing concern in today’s society. With the widespread use of electronic devices and rapidly advancing technology, people constantly upgrade to more efficient electronics, contributing to the ever-increasing e-waste problem.
The old electronic devices are thrown away without considering the toxic materials from the electronic devices released into the environment. The groundwater, soil and air affect land and sea animals, causing harmful substances to seep into groundwater. When e-waste is released, toxic chemicals are released into the air, damaging the atmosphere.

Numerous electronic devices contain hazardous materials like lead and barium. In particular, the release of lead into the environment can result in adverse health effects, including damage to the human blood, kidneys, and peripheral nervous system.

2.4. Amount of Electronic Waste Worldwide

Increasing technological changes, media developments (tapes, computers, MP3), affordable market prices and the deliberate design of short life span technologies have culminated in a rapid buildup of accumulation of e-waste internationally. An achievable countermeasure has been developed, but in most situations, it is necessary to implement it to work legally in the real world, which is time-consuming even in the most advanced nations, especially due to the bureaucracy.
Different models and versions of TVs, processors, storage units, and audio modules have varying lifespans. Among these, screen systems and processors are commonly affected by electronic waste. Screen systems are often discarded without attempts at repair, whereas processors see a continuous influx of new and improved versions to meet the demands of ever-advancing video gaming graphics.

2.5. Environmental Impact

The methods used to manage e-waste in developing countries are often questionable. It has caused many issues that have an unfortunate effect on Mother Nature. These range from airborne or liquid-borne material leakage into the atmosphere, soils, water and foods, affecting animals, humans and plants.

2.6. Electronic Waste Substances

Many electronic parts can be recycled in manufacturing new computer devices, while others are reduced to materials that can be reused for industries as diverse as building, flatware, and jewelry. Large-scale materials include fiberglass, PVC, fabrics, gold, iron, copper, quartz, beryllium and oil. Almost all electronics contain lead-tin (as solder) and copper.

2.7. Effects

It is known that 13 percent of e-waste is processed in developing countries. Yearly, e-waste is generated at a large sum (around 40 million metric tons) worldwide. According to the United Nations Environment Program (UNEP), the European Union contributed up to 22.5 percent of the e-waste. Meanwhile, in China, the Philippines, Pakistan, India and Vietnam, unconventional ways of the procession of e-waste are largely practiced, with 50-80 percent of the e-waste procession. The processes involve dismantling, burning and shredding the items in backyards. These actions cause bi-products that have been proven impactful (in a bad manner) to mother nature and humans alike. Their action, however, is also due to the large amount of e-waste flowing in since they are handling e-waste domestically and internationally.

2.8. Methods Used to Reduce E-Waste

The production of devices and the use of the materials that go into their manufacturing represent a major way of embodied energy. Reducing the e-waste helps protect the resources and minimizes the required total energy taken from the earth.

- Recycling
  Recycling the highly valuable materials of old electronics rather than making or mining new materials for new devices.
- Stem the Spread
  Before buying a new electronic device, think twice. We can use the old electronic as an MP3 player or GPS device. Please do not throw it away.
- Sell and donate old electronics.
  The best and easiest way to minimize the electronic waste footprint is to sell or give it away to the people who need it. Giving out an electronic device to poor people is a good example of reducing e-waste; not only that, but it also makes us feel good.

- Educate and organize
  We may also educate our neighbors and local businesses on recycling. Returning these electronics to the recycling flow will lower the pressure on the mining, refining, manufacturing, and transportation industries and reduce pollution. Make a much more affordable trip to the local recycling centre to organize a group project to clean up old electronics. For example, Green Citizen.com organizes pickups for those in the San Francisco Bay area and provides mail-in services to those who cannot make it.

- Recycle and dispose of e-waste properly.
  Inappropriate throwing of e-waste is a more hostile problem as we speak, as its volume is increasing every year. For this reason, major business brands provide their customers with a platform to recycle their old electronics.

- Maintain the electronics.
  Effectively taking care of electric gadgets and appliances is a way of killing two birds with one stone since it could halt the production of e-waste and, at the same time, save money since it could function longer.

- Store data online
  Cloud services are effective in minimizing environmental effects. By keeping data online, we can access the data from any place all over the globe. There is no need to take other storage devices.

3. Methodology

This study is based on an online survey. The questionnaire was prepared with multiple-choice questions that comprised general information about the respondents (age and gender) and knowledge in regards to the topic, such as the proper e-waste disposal technique, country produces the most e-waste, e-waste hackable after being thrown away, country hosts the biggest digital dumping ground, the main causes of e-waste, its effect on children within the proximity of the dumping ground, environmental pollution and the main victim of e-waste. The data obtained from the survey was computed in Microsoft Excel for analysis. The statistics of each question were presented in the form of tables, pie charts and bar charts, as shown in the next section.

4. Result and discussion

In total, 75 respondents took this survey. 69.3 percent of the respondents were male, and 30.7 percent were female. Therefore, most of the respondents are males. The survey was taken by people ranging from the age of 19 and below or 20 to 49. None of the respondents over 50 years old participated in this survey. About 74.7 percent of people aged 19 and below took this survey, while 25.3 percent of respondents aged 20 to 49 took this survey. Seventy-six per cent of respondents choose to give to a reliable e-waste company. Moreover, 18.7 percent of respondents choose to throw e-waste in the

rubbish bin, while 4 percent throw e-waste by throwing it in the streets, and 0.3 percent of respondents choose to burn e-waste. The right answer is to give it to an e-waste company, as shown in Fig. 1. Based on a study, Switzerland and Germany tackled the e-waste problem efficiently. All these countries have a specialized company that handles it, such as the Public Waste Management Authorities (PuWaMa) of Germany or the Producer Responsibility Organization (PROs) of Switzerland [6].

Fig. 1: Respondents way of disposing E-waste

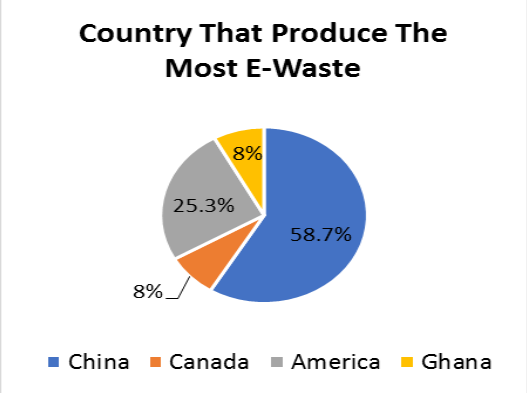

Fig. 2: The Country that produces the most E-Waste

Based on Fig. 2, respondents think China produces the most E-waste, with 58.7 percent of respondents, USA at 25.3 percent, and Canada and Ghana, gaining 8 percent of respondent choices. Unsurprisingly, China produces the most e-waste, amounting to 7.2 tons per annum. However, it is also worth noting that Norway tops it all in kg per capita, at 28.3 [7].

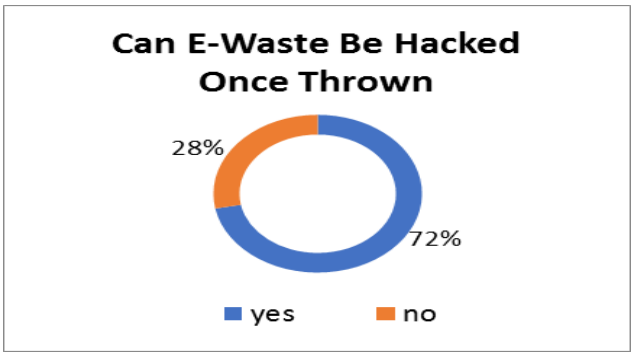

Fig. 3: Result of respondent regarding the prospect of E-Waste being hackable

Fig. 3 represents respondents' view on whether they think e-waste are possibly hackable once thrown away. As we can see, 72 percent of respondents said yes while 28 percent of respondents said no. Fig. 4 illustrates the percentage of people's predictions on which country would have the largest digital dumping ground. Brazil was the most chosen, at 41.3 percent, followed by Ghana, which had 25.3 percent of the respondents' choices. Mexico came in third, sharing 18.7 percent, while Kenya received 14.7 percent. Most respondents chose Brazil as the world's biggest digital dumping ground.

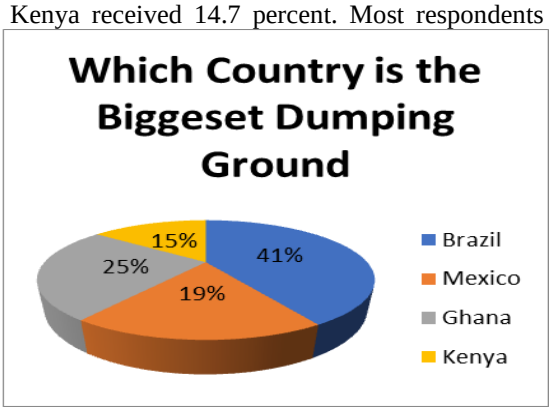

Fig. 4: People's view on who shares the biggest E-Waste dumping ground

Fig. 4 illustrates the percentage of people's predictions on which country would have the largest digital dumping ground. Brazil was the most chosen, at 41.3 percent, followed by Ghana, which had 25.3 percent of the respondents' choices. Mexico came in third, sharing 18.7 percent, while Kenya received 14.7 percent. Most respondents chose Brazil as the world's biggest digital dumping ground. However, statistics showed Ghana is the worlds' largest digital dumping ground [8].

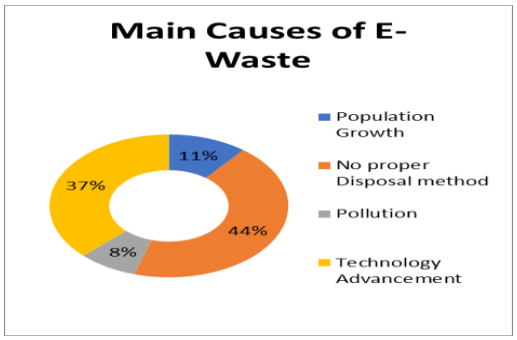

Fig. 5: Main causes of E-Waste

Based on the above Fig. 5, our respondents regarded improper disposal as the main cause of e-waste, gaining 44 percent of the responses. On the other hand, 11 percent of respondents chose population growth, 8 percent chose pollution, and 37 percent assumed due to technological advancement. In truth, the main contributor to e-waste is the failure to dispose of it effectively. Countries usually lack appropriate infrastructure, legislation, quantification measures and funding, resulting in a mass accumulation of e-waste [9].

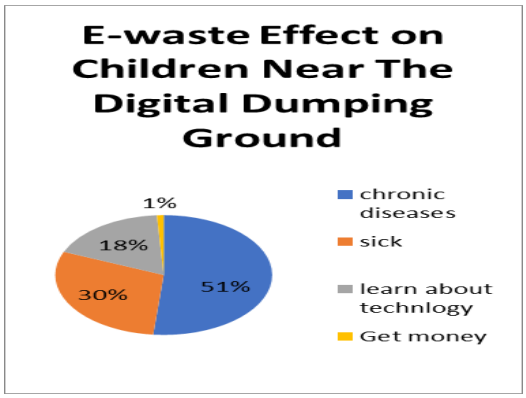

Fig. 6: Effect of E-Waste on children near the digital dumping ground

The pie chart in Fig. 6 shows respondents' views on the effect of e-waste on children near digital dumping grounds. 29.7 percent of the respondents chose the answer of the possibility of the children getting sick. 51.4 percent chose the answer of children getting chronic diseases, 17.6 percent of children would get a chance to learn technology, and 1 per cent would get money. Children exposed to e-waste are highly likely to get a chronic illness or disease. It could harm the nervous, immune, reproductive and digestive systems. Due to this, they would have permanent, irreversible damage to their body (World Health Organization [10]. The pie chart in Fig. 7 below shows the possible types of pollution e-waste can do to the environment. 50.7 percent of respondents chose soil pollution,17.3 per cent chose water pollution, and 32 per cent chose air pollution, concluding that soil pollution is the main pollution mostly caused by waste. E-waste produces all types of pollution. It affects the air from the open burning and dust emitting into the air, while water is polluted when chemicals used are improperly treated and let out into the normal world. However, soil pollution is the most harmful form of pollution caused by e-waste [11], [12]. Toxic chemicals would be absorbed into the soil, which later would be used for farming. This would then grow harmful foods that humans would consume. In other words, it slowly and silently kills people who ate the food produced.

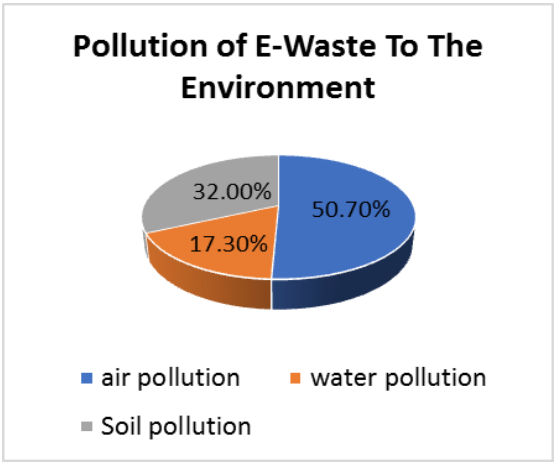

Fig. 7: Respondents' view on the possible pollution due to E-Waste

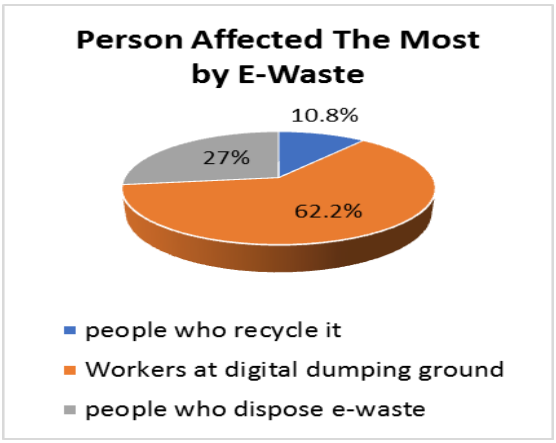

Fig. 8: People affected by E-Waste

The types of people affected by e-waste are shown in Fig. 8. 62.2 percent of respondents chose that workers working at digital dumping grounds are affected most

27 percent of respondents chose people who dispose of their e-waste, and 10.8 percent of respondents chose people who recycle e-waste. In conclusion, workers working at digital dumping grounds are affected the most by e-waste. The people that are most affected are those who work near the dumping ground. As stated before, e-waste causes air, water and soil pollution. Therefore, anything they do has a chance of being contaminated, thus harming them, especially in the long term.

5. Conclusion

E-waste is one of the rapidly growing environmental problems around the world. This is because of the lack of awareness and appropriate information on disposing of these wastes. Another reason for the rapid growth of E-waste is technological advancement. As technology advances, the old technologies will be left out because they are outdated. Furthermore, because of the ever-growing rate of technological advancement, we are creating more waste than ever every day. Most of these wastes are hazardous to the environment, and due to the growing amount of waste, we are damaging the ecosystem more and more every day [13]. Moreover, very few authorities are making any necessary moves yet. We hope the government can create more campaigns and talk about e-waste, its destructive properties and what we can do to stop this environmental crisis. The school authorities must also create awareness in kids and young adults so they would not even destroy the future. We hope the government and school authorities take immediate action to reduce this environmental crisis.

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Authors Introduction

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