e-ISSN:2682-9193

e-JOMS
MALAYSIAN JOURNAL OF MEDIA & SOCIETY

LEVEL OF AWARENESS TOWARDS E-WASTE MANAGEMENT

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ABSTRACT

Public consciousness around e-waste has always been at an all-time low even with countless efforts by the experts and activists constantly reminding them that mindless e-waste dumping would have their own consequences. Now that the issue has been constantly debated and the effects have started to show itself through the people it touched and the environment it slipped through, this research was made to identify if the people have started to learn more about e-waste and possess the awareness on how to manage it ethically. The research was made using a quantitative survey method through the distribution of Google Form on 300 volunteering respondents. The end of the research resulted in the respondents having shown quite a sufficient level of knowledge on the importance of e-waste management (M=3.33) and high level awareness towards the importance of e-waste management (M=3.51).

Keywords : e-waste, knowledge, awareness

INTRODUCTION

As the world moves forward to a better future, the demands on new inventions and ever-changing technologies have become more apparent. Consumers are constantly looking for something new for their hand-held equipment such as smartphones, smart watches, laptops, tablets, etc (Jang and Kim, 2010). This is all because most of these products have short lifecycles and need to be constantly updated or thrown away when they are no longer

e-ISSN:2682-9193

functioning accordingly. Another factor would be the competitiveness of tech companies in delivering the best product that has caused heavy dumping of technologies to the public.

As much as we were made aware, the issue on careless management of electronic waste or e-waste has been a topic of discussion for years now and seemingly wouldn't come to an end in the near future. The constant production of electronic tools and the indifference people have when handling discarded electronic have shown to give negative impact to the world as we can see in Indonesia where it was projected that 9500-plus tonnes of electronic waste mainly from smartphones alone have been produced and now steadily increased (Panambunan-Ferse and Breiter, 2013). The United States is leading the world in producing electronic waste by dumping 3 million tons each year while China which has been estimated to already produce about 2.3 million tons by 2010, second only to the United States remains a major electronic waste dumping ground for developed countries (United Nations, 2010).

Seeing the alarming increase of e-waste dumping all over the world, nations have started to work with each other or related organizations to find a way to curb the electronic waste that mushroomed all over our planet. 196 nations have vowed to do their best to find the solution and implement related policies to climate change issues, with resolving the e-waste matter as one of their goals, in the Paris Agreement made at the United Nations Climate Change Conference in France (UN, 2015). A policy called Extended Producer Responsibility (EPR) was made to hold companies accountable for what they have made for the public and make it durable to withstand more than a few years of use (Tojo, 2004). On the communal level, society has started to take reuse and recycling seriously and manage the peculiar waste accordingly without letting it destroy the environment (Debnath et al., 2016).

The total generated e-waste in Malaysia in 2012 was approximately 10–15% of the total scheduled waste, and its value is expected to increase as each household starts to produce their own e-waste collection (Awang, 2012). Environmental Quality (Scheduled Wastes) Regulations (2005) have also put e-waste under their belt. These regulations stated that no person is allowed to throw away of any e-waste into landfills, must be recycled and recovered at prescribed or licensed premises, and disposal need to take place at prescribed premises and must be carried out in an environmentally sound environment

e-ISSN:2682-9193

The relationship that e-waste has with the Malaysian public is interesting as they are mostly knowledgeable about e-waste but don't have many clues on how to manage it (Afroz et al., 2012). Supian, Lalit Shah, and Mohd Yusof (2015) also supported the statement where even though local authorities like those in Selangor, had implemented the separation of solid waste, starting on 1st September 2015, obeying rules established by the Solid Waste and Public Cleansing Management Act 2007 (Act 672) (Department of National Solid Waste Management, 2015), Malaysians still have trouble to decide what is the ethical way of disposing their e-waste. According to these reports, research made to identify the knowledge and awareness the public in this country have for proper e-waste management and disposal are very much needed.

PROBLEM STATEMENT

Industry and waste management officials are confronting a new dilemma, and policymakers are paying close attention to e-Waste, also known as waste electrical and electronic equipment (WEEE). According to Faisal and Kalana (2014), in Malaysia, e-waste management, including the e-waste recycling system, is still in its infancy. The biggest issue with e-waste in Malaysia is Malaysians' negative attitude toward e-waste recycling. Furthermore, despite the rise in the use of electrical and electronic gadgets in tandem with population expansion, there are still numerous inadequacies in the management and disposal control systems for these appliances.

According to Tolaymat (2014), the issue of lacking e-waste supply is brought up at all full recyclers visited. This appears to be the primary difficulty faced by all large plants, as it relates to plant productivity and consequently revenue. Due to a lack of e-waste in Malaysia, many complete recyclers are unable to operate at full capacity. Furthermore, bidding for garbage has become very competitive. Many complete recyclers devote an excessive amount of time and resources to bid preparation.

According to the Malaysia Department of Environment (2013), solid waste management, including e-waste, is now highly difficult in Malaysia and frequently emerges as a national concern. Moreover, Fatihah Suja (2014), said that a facility for managing e-waste in the

e-ISSN:2682-9193

direction of a sustainable source should be considered. This is due to the fact that most landfills in Malaysia are nearing the end of their useful life. This is owing to the fact that the amount of solid garbage produced, including e-waste, is increasing in tandem with population expansion.

RESEARCH QUESTIONS

- What is the level of knowledge towards e-waste?
- What is the level of awareness towards the importance of e-waste?

RESEARCH OBJECTIVES

- To measure the level of knowledge towards e-waste.
- To identify the level of awareness towards e-waste.

DEFINITION OF E-WASTE

According Tan Yen Ling (2020), E-waste is a word that refers to all electrical and electronic equipment (EEE) and parts that have been dumped as rubbish by their owners with no intention of being reused. Electric devices are still being developed by technology innovators to make our lives easier and more convenient in every manner possible. Nonetheless, we seem to be all too quick to pitch the equipment we already have. It makes no difference how pleased we have been with them up to this point.

The Partnership on Measuring ICT for Development classifies e-waste into six categories which is temperature exchange equipment (such as air conditioners, freezers), screens, monitors (TVs, laptops), lamps (for example, LED lamps), large equipment (washing machines, electric stoves), small equipment (microwaves, electric shavers), and small IT and telecommunication equipment (such as mobile phones, printers). The majority of e-waste is made up of a mix of metals such as Cu, Al, and Fe. They can be attached to, covered in, or blended with a variety of polymers and ceramics. Because e-waste has such a negative impact on the environment, it is critical to dispose of it at an R2 certified recycling site. Hazardous compounds, as well as precious and scarce materials, are found in electrical waste. Electronics industry companies give these products such short lifespans because they know that the consumer will want a new product and will buy it if they make it.

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RESEARCH FRAMEWORK

RESEARCH METHODOLOGY

Research Design

This study is carried out in the form of a quantitative survey. An online survey was carried out and distributed via Whatsapp, Facebook, Instagram and Telegram. By using these social media platforms, we have a wider reach to obtain more accurate information on how acceptance towards vaccines is influenced by others.

Sampling Technique

As for the sampling, this study is using a non-probability sampling technique which involves the convenience sample. According to Derek, and Kerryn (2020), non-probability sampling involving convenience samples means distributing the survey to people that we have access to such as friends, family and colleagues.

Research Measurement

This questionnaire consists of 30 questions with 3 sections breakdown. The first section consists of 10 nominal scale questions on demographic background and general information on e-waste. The second section consists of 8 ordinal questions on the level of knowledge towards the importance of e-waste, while the third section consists of 12 questions on the level of awareness towards the importance of e-waste. The questions are using multiple choice questions (MCQ), rating scale to four, and matrix questions. The questions are made easy for the respondents to understand and answer. The data were keyed-in on an Excel Spreadsheet.

Data Analysis

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The methods used for data analysis are through Statistical Package of Social Science (SPSS) software version 23. The data analysis procedure includes creating a survey stage, Pilot test and data transferring. The survey or questionnaire is made up of questions that are connected to the study's research objectives. The questionnaire is distributed to the first 50 respondents in order to identify the reliability of the research. The survey is continued to complete the data of 300 responses and the data collected transferred to SPSS software for analysis and finding purposes (Ridzuan, Ridzuan and Ridzuan, 2018). Researchers used descriptive statistics to see frequency, percentage and mean

FINDINGS: RESULTS AND DISCUSSION

In the first section, there were 10 questions asked. These questions were asked to identify respondents' demographic background and also general questions on e-waste. Table 1 represent the 6 questions related to demographic backgrounds. Apart from the demographic questions, there are also additional questions on general information related e-waste management. There are 4 questions asked in this section. These questions were distributed to see the respondent's knowledge about e-waste.

Table 1: Distribution of the respondents by demographic (n=300)

DEMOGRAPHIC	FREQUENCY	PERCENTAGE
Sex / Jantina		
Male / Lelaki	93	31
Female / Perempuan	207	69
Age / Umur		
18 – 25	202	67.3
26 – 35	69	23
36 – 45	16	5.3
46 – 55	5	1.7
56 and above	8	2.7
Occupation / Pekerjaan		
Student / Pelajar	186	62
Government Sector / Sektor kerajaan	16	5.3
Private Sector / Sektor swasta	66	22
Self-employed / Bekerja sendiri	8	2.7
Unemployed / Tidak bekerja	6	2.0
Retiree / Pesara	7	2.3

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Housewife / Surirumah	9	3.0
Others / Lain-lain	2	0.7
Household Income / Pendapatan Isi Rumah		80.7
B40 (RM 0 – RM 4,850)	242	15
M40 (RM 4,851 – RM 10,970)	45	4.3
T20 (RM 10,971 and above)	13	
Current residing state / Negeri menetap semasa		
East Coast (Pahang, Kelantan & Terengganu)	39	13
Northern Region (Perak, Penang, Perlis & Kedah)	15	5.0
Central Region (Kuala Lumpur, Selangor & Putrajaya)	130	43.3
Southern Region (Negeri Sembilan, Melaka & Johor)	106	35.3
East Malaysia (Sabah & Sarawak)	10	3.3
Current residing area / Kawasan tempat tinggal semasa		
Urban area / Kawasan bandar	271	90.3
Rural area / Kawasan pedalaman	29	9.7
7. On average, how frequent do you buy a new electronic device/electrical appliances? / Secara purata, seberapa kerapkah anda membeli peralatan elektrik baru?		
• Once in <12 months / Sekali dalam kurang daripada 12 bulan	65	21.7
• Once a year / Sekali dalam setahun	78	26
• Once in 2-3 years / Sekali dalam 2-3 tahun	87	29
Once in more than 3 years / Sekali dalam lebih 3 tahun	70	23.3
What was your reason for purchasing new electronic device/electrical appliances? / Apakah yang menyebabkan anda membeli peranti elektronik/peralatan elektrik yang baru?		
• Loss of Function / Kehilangan fungsi	161	53.7
• Need for Greater Functionality / Memerlukan kegunaan yang lebih tinggi	49	16.3
• Physical Damage / Kerosakan fizikal	55	18.3
• Desire for latest technology / Keinginan memiliki teknologi yang terbaru	34	11.3
• Others/ Lain-lain	1	0.3
What do you do with unused electronics that are STILL functioning? / Apa yang anda lakukan		

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pada peralatan elektrik tidak digunakan yang MASIH berfungsi?	194	64.7
• Kept in Home / Disimpan di dalam rumah	47	15.7
• Given or sold to Informal System (Family, friends, acquaintances on social media etc.) / Dijual kepada sistem informal (Keluarga, rakan-rakan, kenalan di sosial media dsb.)	32	10.7
• Sold to Formal System (Shopee, Electrical shops, Cash converters, etc..)	24	8.0
• Trash/Tong sampah	3	0.9
• Others/Lain-lain		
What do you do with unused electronics that are NOT functioning? / Apa yang anda lakukan pada peralatan elektrik tidak digunakan yang TIDAK berfungsi?		
• Keep in a storeroom / Simpan di dalam stor	89	29.7
• Sell to second hand shops / Jual di kedai barangan terpakai	72	24
• Throw away together with daily trash / Buang bersama-sama sampah harian	72	24
• Dispose it at recycling center / Buang di pusat kitar semula	60	20
• Burn it at open area / Bakar di kawasan terbuka		
• Others/ Lain-lain	5 2	1.7 0.6

Table 1 above shows the demographic of 300 respondents. Based from the findings, most of the respondents who answered the questionnaires are female (69%) and male (31%) aged between 18-25 (67.3%) and most of them are students (62%). Majority of the respondents also comes from B40 (RM0-RM4850) group of household income (80.7%). Most of the respondents are from the Central Region (Kuala Lumpur, Selangor dan Putrajaya) with (43.3%) and predominantly from urban areas (90.3%).

According to Bahruddin Yusof (2015), the public's understanding of proper disposal of technology trash, particularly used electrical and electronic products, is still lacking. The majority of individual customers are aware of the capabilities of the most recent technology, but they do not know how or where to properly dispose of their used equipment. Malaysians like to store unwanted commodities due to their respect of the value of those products. As a result, over time, due to a lack of room, they would most likely dispose of the waste with other household rubbish. Due to the growing number of electrical and electronic devices in

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Malaysian households' storage, Malaysian dumping sites will suffer a "Ewaste Tsunami" if Malaysians opt to empty their storage. This would be the start of an environmental calamity similar to that which industrialised countries such as the United States have faced as a result of toxic leachate from incorrect ewaste disposal contaminating long-term water resources.

For the second section, a total number of 8 questions were asked to determine the level of knowledge towards the importance of e-waste management.

Table 2 : Level of Knowledge Towards Importance of E-Waste Management

Level of Knowledge Towards Importance of E-Waste	Mean
I believe valuable materials from recycled e-waste could be used to make new products. / Saya percaya bahan berharga daripada e-waste kitar semula boleh digunakan untuk membuat produk yang baru.	3.57
I believe e-waste releases toxic chemicals, causing air pollution / Saya percaya e-waste membebaskan kimia toksik yang menyebabkan pencemaran udara	3.53
I am sure e-waste requires special treatment before disposal / Saya pasti e-waste memerlukan perawatan khas sebelum dilupus	3.51
I think e-waste impose health and enviromental hazard / Saya merasakan e-waste mendatangkan bahaya terhadap kesihatan dan persekitaran	3.47
I have heard the term "e-waste" / Saya pernah mendengar terma "e-waste"	3.31
I know what "e-waste" means / Saya tahu maksud perkataan "e-waste"	3.27
I am aware of the sources of e-waste / Saya tahu punca-punca e-waste	3.06
I have read about "e-waste" recently / Saya pernah membaca tentang "e-waste" kebelakangan ini	2.91
OVERALL	3.33

Table 2 above shows the respondents' knowledge towards E-Waste management in overall. Based on the findings, most of the respondents believe that valuable materials from recycled e-waste could be used to make new products as the mean is the highest (M=3.57). Some materials like hard disk, toners and cartridges, glass, plastic and batteries are among the components of e-waste that can be recycled. For example, toners and cartridges can be recycled to retrieve raw materials for a new product, aluminum ingots that are useful for automobiles can be recovered from recycled hard disks, and glass can be recycled and process to produce newer screens (Rinkesh, 2019). Not just that, according to United States Environmental Protection Agency (EPA), for every 1 million mobile phones recycled, approximately 30 thousand pounds of copper, 700 pounds of silver, 70 pounds of gold and 30 pounds of

e-ISSN:2682-9193

palladium are often recovered. Besides, most of the respondents are also aware that E-Waste materials releases toxic chemicals, causing air pollution (M=3.53). In addition, Green E-Waste Recycling Centre mentioned that when e-waste is disposed in landfills, it will usually be burned on-site using incinerators. This leads to hydrocarbon release to the atmosphere which contribute to the greenhouse gas effect, one of the factors for global warming.

For the third section, there were twelve questions asked. These questions were distributed to the public to see the level of correspondent's awareness towards the importance of e-waste management.

Table 3: Level of Awareness Towards Importance of E-Waste Management

LEVEL OF AWARENESS TOWARDS IMPORTANCE OF E-WASTE MANAGEMENT	MEAN
I think intervention by the government is necessary to curb the e-waste issues / Saya percaya pihak kerajaan perlu melakukan langkah pencegahan untuk membendung isu e-waste.	3.73
I believe e-waste recycling imposed positive environmental impacts / Saya percaya pengitaran semula e-waste memberi impak positif kepada alam sekitar	3.69
I believe the correct recycling e-waste measures help improve our health / Saya percaya langkah-langkah pengitaran semula e-waste yang betul dapat membantu kesihatan kita	3.67
I think intervention by industrial companies is necessary to curb the e-waste issues / Saya percaya syarikat-syarikat perindustrian perlu melakukan langkah pencegahan untuk membendung isu e-waste.	3.66
I believe sufficient amount of awareness on e-waste help improve waste management / Saya merasakan bahawa kesedaran mengenai e-waste yang mencukupi membantu menambah baik pengurusan sisa.	3.62
I am responsible for the e-waste in my own home / Saya bertanggungjawab terhadap e-waste yang terdapat di dalam rumah saya.	3.58
I will dispose the e-waste correctly / Saya akan melakukan pelupusan e-waste dengan cara yang betul.	3.52
I will separate e-waste from other garbage / Saya akan mengasingkan e-waste daripada sampah yang lain	3.52

e-ISSN:2682-9193

I believe current e-waste management are using modern technology invention. / Saya percaya pengurusan e-waste menggunakan ciptaan teknologi terkini.	3.48
I have sufficient awareness on e-waste issues / Saya mempunyai kesedaran yang mencukupi tentang isu e-waste.	3.35
I am aware about the existing state law concerning the issue of e-waste recycling / Saya tahu dan sedar tentang undang-undang negara sedia ada yang berkaitan dengan e-waste.	3.21
I believe it is convenient to find an e-waste recycling center / Saya percaya pusat kitar semula e-waste mudah dijumpai.	3.04
OVERALL MEAN	**3.51**

Table 3 above shows the respondent's awareness towards the importance of e-waste management. Based on the findings, most of the respondents who answered the questionnaires stated that they are aware that a good e-waste management would lead to a better environment (M=3.69). This has been supported by Al-Taai (2021) where it was stated that hazardous materials that have not been taken care of carefully would penetrate the soil, causing the soil to experience loss of fertility and its natural vegetation cover. By handling the waste efficiently, no parts of nature would be affected by it. Most of the respondents also agree that the correct recycling e-waste measures help improve our health (M=3.67). Careless and continuously direct exposure to e-waste without proper safety measures (PPE) could have resulted in the victim with respiratory problems, skin disorders, acute brain damage, stroke, asthma, coughing, bronchitis, reduced lung development, and high blood pressure (Grant, Goldizen, Sly, et al., 2013). This is entirely avoidable if you started to take care of your e-waste more efficiently and ethically. Other than that, respondents also believed that intervention by the government is necessary to curb the e-waste issues (M=3.73). This can be seen through the National Television and Computer Recycling scheme that was built by the Australian government as an incentive to encourage their people to recycle their electronic waste and ultimately plan their e-waste management day to day (Australian Agriculture, Water and the Environment Department). Looking through this incentive prepared by the Australian government, we can say that any involvements from the government are welcomed as it shows their concern on this

e-ISSN:2682-9193

alarming issue. Although the responses are mostly on the positive side, respondents also think that it is quite a hassle to find an e-waste recycling center near them as the response given were quite low than the others (M=3.04). To conclude, the overall mean of respondent's awareness towards the importance of e-waste management is (M=3.51).

CONCLUSION

Based on the findings, we can conclude that the public in Malaysia is highly aware about the E-waste management. Our research questions' findings can be arranged as per following:

Level of Knowledge	3.33
Level of Awareness	3.51

This shows that the level of knowledge and awareness on E-waste management in Malaysia is positively high. However, this awareness still has room to be improvised and raised. This is because, according to Department of Environment (DoE), the percentage of e-waste recycling rate in Malaysia has not exceed 25%, which means that there are still a huge number of e-waste disposed in landfills yearly, reaching up to hundreds and thousands of tonnes. In Malaysia, everyone has to take part in raising awareness in this global-impact issue. As an individual, every person has to be responsible towards their own e-waste. It is important to know how to recycle or dispose the e-waste properly in order to reduce pollution. It is also important for everyone to take part in battling this e-waste problem as it is also for our own life comfort. Every little effort counts and it starts within small scale of being responsible ourselves.

In addition, at the community level, many campaigns can be held in order to encourage and educate the public on e-waste. Environment-related NGOs can curate interesting campaigns such as designing posters, organizing community events related to e-waste, distributing booklets on e-waste and many more. As for corporate levels, companies that produce electrical devices could also run a campaign that could raise public's awareness and knowledge on e-waste as well as benefit them. For example, a "Recycle your E-waste and get discount for new items" kind of campaign could actually attract the public. Companies that run

e-ISSN:2682-9193

recycling centers and environmentalist NGOs can also work together to make e-waste recycling boxes available within residential vicinities.

Not just that, it is also the Government's duty to create an interesting campaign that could engage with and encourage the public to practice recycling e-waste as a part of their life. Making the e-waste collection center easily accessible should be one of the priority and aim for the Government, especially the Department of Environment. This could develop the public's positive attitude towards recycling their e-waste as it could help them get rid of their unused electronic devices as well as getting paid for it. Furthermore, mass media should also play their role in spreading the awareness to the public. Public Service Announcement videos on e-waste and its impact could be produced and shared massively on many media platforms especially social media.

In conclusion, every individual in Malaysia has to take part in ensuring a good e-waste management. It is our own responsibility to be knowledgeable and aware on this issues as it involves the future well-being of our environment. We sure would want a better and healthier environment for us and for our future generations.

e-ISSN:2682-9193

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