

A Study of E-Waste Disposal Management Awareness among Local Community based on KAP Model

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Abstract: E-waste is a trash generated by abandoned gadgets and components, as well as by chemicals utilised in the production or use of personal products. The reduction in the creation of e-waste contributes to the preservation of resources and reduction of the quantity of energy from the earth causing pollution and damaging long-lasting health without adequate management or management of trash. The awareness of society is the fundamental foundation for overcoming this problem. In this study, the degree of knowledge, attitude and practice in managing e-waste disposal is determined and the link between factors is examined. The research consisted of 160 respondents from the area of Tebrau, Johor Bahru. For this study, the quantitative approach was used as an instrument for obtaining input from respondents. Data examined using SPSS software system for interpretation of information through descriptive and correlation analyses. Knowledge, attitude and practices of e-waste disposal management are the factors considered in this study. The results of the study showed that the individual with better knowledge and an e-waste disposal attitude seems to have good practice as well. These findings might offer reference information on e-waste management in Malaysia and the development of effective e-waste management program by researchers and other stakeholders.

Keywords: E-Waste Disposal, E-Waste Awareness, Knowledge, Attitude, Practice.

1. Introduction

1.1 Background of Study

A clean environment affects good health and increases the quality of life for humans. Household waste disposal requires a high level of awareness and knowledge (Jatau, 2013). To improve environmental protection, effective e-waste disposal must be considered. This is due to a lack of understanding, attitude, and practice about proper e-waste disposal, which results in incorrect disposal. As a result, it has an immediate influence on human health. E-waste refers to all electrical and electronic equipment that is dumped by its owners since it is no longer usable until repurposed and recycled. Electronic waste, also referred to as WEEE, includes discarded electrical or electronic equipment, which is no longer useful to the consumer of electronic waste. Electrical and electronic equipment, such as mobile phones, laptop computers, light bulbs, and television sets, are also included in this waste stream (Awasthi & Li, 2017).

In recent years, research on sustainable e-waste management has grown in importance, as many studies have been done throughout the world to examine various elements of e-waste management (Andrade *et al.*, 2019). This is because most academics feel that if the key issues remain unresolved, the situation will grow more realistic and worse. As a result, about three thousand peer-reviewed articles linked to e-waste were discovered through recently published bibliometric research, with the trend of publications rapidly growing in recent years (Andrade *et al.*, 2019). Electronic gadgets have grown more affordable to the majority of Malaysians as the country's economy has progressed. Therefore, electrical and electronic items provide satisfaction and have become a must-have commodity in Malaysia. This fast expansion has both advantages and disadvantages for the environment in terms of disposal. From hazardous chemicals and heavy metals seeping into soils in landfills to contamination of air and water sources, e-waste is a major environmental concern (Abdullah, 2018). For example, burning to recover metal from wires and cables emits brominated and chlorinated dioxins, which pollute the air.

According to a 2015 research by the Japan International Cooperation Agency, Malaysian household would generate 24.5 million units of e-waste by 2025 (TheStar, 2021). Taking a lesson from this, the Department of Environment (DOE) hopes to collect 100 metric tonnes of e-waste from households this year through an E-Waste Collection Day, which will take place on the last Saturday of each month (TheStar, 2021). This suggested that the issue was highly severe and that more focus was needed to raise societal awareness about e-waste disposal and management. The awareness of e-waste must be investigated in Malaysia, as the evaluation of e-waste management is undoubtedly different in different nations (Ongondo *et al.*, 2011). Local researchers are limited in their investigation of this topic. Most prior studies include sustainable research, plus not based on theory to examine the behaviour of the respondent (Kumar *et al.*, 2017).

1.2 Problem Statements

Although Malaysians are becoming more aware of the need of solid trash recycling, many continue to discard electrical and electronic products (e-waste) indiscriminately, unaware of the detrimental impact on health and the environment (TheStar, 2021). In Malaysia, e-waste management, including the e-waste recycling system, is still in its early phases (Ahmad Faisal *et al.*, 2014). The primary issue with e-waste in Malaysia is Malaysians' negative attitude toward e-waste recycling (Ho *et al.*, 2015). Solid waste management, especially e-waste, is currently difficult in Malaysia and is frequently a national concern (Abdul Rahman, 2008). More sustainable sources should also be handled with e-waste management facilities (Suja *et al.*, 2014). Most of Malaysia's landfills are becoming more and more diminished. This is because of the volume of solid waste produced and the development of e-waste in

conjunction with a population growth. Indeed, Malaysia has increased e-waste buildup with the shorter lives of electrical and electronic items (Mahat *et al.*, 2019).

In order to provide information to sustainable e-waste management, despite the increased use of electrical and electronic equipment in line with population expansion there are still some shortcomings in management and disposal control systems for those equipment (Mahat *et al.*, 2019). However, there is significantly less awareness of e-waste disposal among Malaysian populations, according to a psychometric research (Mahat *et al.*, 2019). A number of foreign nations, including Jordan, Nigeria, India, China, Spain, Iraq, and the Philippines, have undertaken e-waste awareness studies, and their findings revealed that the public's degree of understanding about e-waste management varied in various sectors (Mahat *et al.*, 2019). As a result, utilising the Knowledge-Attitude-Practice (KAP) model as an indicator, this study focused more on aspects that contribute to societal awareness in terms of e-waste disposal. As stated by, the awareness components of knowledge, attitude, and practice of e-waste disposal management are critical in order to build a cost-effective and environmentally friendly management system (Othman *et al.*, 2015).

In order to improve information and also detect community barriers on the development of sustainable e-waste management awareness, the gathering of information on the actual public knowledge, attitude and practices in management of e-waste waste is a crucial element of the process. The rationale for the application of this study to the same knowledge and practice of attitude (KAP) is because Malaysia is a foreign setting. Previous research showed the Malaysian people have a good degree of understanding about e-waste, however the replies were unsatisfactory when further questioned on e-waste management. This may be observed in research conducted in Kuala Lumpur by Afroz *et al.* (2012), Afroz *et al.* (2013) and Akhtar *et al.* (2014). This study therefore employed the KAP model of Schwartz (1976) to investigate the human behaviour, which creates awareness, internally because it relates to environmental problems.

1.3 Research Questions

- (i) What is the level of awareness of e-waste disposal management among community in Tebrau, Johor Bahru?
- (ii) What is the relationship between individual knowledge and practice of e-waste disposal management?
- (iii) What is the relationship between individual attitude and practice of e-waste disposal management?

1.4 Research Objectives

- (i) To identify the level of awareness of e-waste disposal management among community in Tebrau, Johor Bahru.
- (ii) To investigate the relationship between individual knowledge and practice of e-waste management disposal in Tebrau, Johor Bahru.
- (iii) To investigate the relationship between individual attitude and practice of e-waste management disposal in Tebrau, Johor Bahru.

1.5 Significance of the Study

From theoretical part, this study tested the theory from the previous researcher about the e-waste disposal awareness on theory of personal knowledge that influence behavior change which is, the KAP model from Schwartz (1976). Moreover, exclusively for in this study, determined the theory and measuring method that has been suggested by previous researcher regarding to the government

intervention to ensure the application of e-waste disposal management reach up to desired level in future in the society. Furthermore, this study should boost up the knowledge and understanding on how to measure and assess the factors contribute an e-waste disposal awareness among society. The findings of the study also could provide referential information on e-waste management in Malaysia and for researchers and other interested parties working on developing effective e-waste management. This study also could provide guideline to government or non-government organization to improve their existing intervention in order to promote education and awareness on e-waste programme in achieving towards sustainable community life.

1.6 Scope of the Study

This study focused on the level of e-waste awareness among society in term of knowledge, attitude and practice of e-waste. This study also stressed on the relationship between these three variables. The respondents of this study involved the community who staying in Tebrau, Johor Bahru. The quantitative technique applied to this study and used online questionnaire as tools to collect responds from 160 respondents in selected area. The data and information obtained recorded in the SPSS software for analysis.

2. Literature Review

2.1 Definition of E-Waste

According to the Basel Convention, e-waste includes a wide and growing range of discarded electronic devices, including large household devices such as refrigerators and air conditioners, cell phones, personal stereos, consumer electronics, and computers (Suja *et al.*, 2014). The Organization for Economic Cooperation and Development (OECD) defines e-waste as any appliance that uses an electric power supply and has reached the end of its useful life (OECD, 2001). Awasthi & Li (2017) defined e-waste as discarded electrical or electronic equipment that is no longer useful to end-users. Electrical and electronic equipment, such as mobile phones, laptops, computers, light bulbs, and television sets, are also included in this waste stream. According to Ercan and Bllen (2014), e-waste is created from a variety of sources, including companies, institutions, and homes. The purpose of this study was to assess respondents' potential to recognize e-waste in their situations based on their e-waste knowledge.

2.2 E-waste Management

According to the Malaysia Department of Environment (2013), the data for e-waste disposal is increasing year after year. For example, e-waste management, particularly e-waste in Malaysia, is extremely difficult and frequently becomes a national issue. A facility for managing e-waste toward a sustainable source should be explored (Suja *et al.*, 2014). E-waste management is critical at this stage to avoid inappropriate e-waste disposal handling. Hazardous waste management programmes were established in Malaysia in 1989 as a result of the fast expansion of industrial operations, which created a variety of waste products and materials. To reduce the environmental and health hazards posed by such complex hazardous wastes, adequate policy and strategy execution is necessary.

In the Environmental Quality Regulation (2005), e-waste is designated as scheduled waste. These laws specify that no individual is permitted to dispose of any e-waste in landfills, e-waste must be recycled, collected, recycled, and disposed of in the approved premises and in an ecologically friendly manner. Licenses were given to 18 complete recovery facilities and 128 partial recovery facilities by Malaysia, through its Department of Environment (DOE), to convert different e-waste into source material. For the separation, dismantling, and treatment of e-waste, many viable technologies have been identified.

2.3 E-Waste Awareness

Henley (1984) described awareness into a subjective and simply equates consciousness with self-reports, which indicate that an observer "sees consciously" a stimuli. It is concluded that a more objective sensitivity measure is necessary for distinguishing the subjective states of 'seeing' and 'no seeing' of stimulation. According to Starke (1990), many people have failed to turn their awareness into commitment while many people still have an unacceptable attitude towards the environment. In terms of environmental awareness many people know the environment. During the last decade difficulties of e-waste sensitization have been growing drastically. Increased awareness, particularly in society, will contribute to improved knowledge and to greater engagement in overcoming this challenge. The e-waste management awareness of the community was characterised in three key ways within the context of this study: knowledge, attitudes and practices based on the KAP model.

2.4 Theory of Awareness KAP Model

Schwartz (1976) introduced the Knowledge, Attitudes, and Practices (KAP) model, which is a quantitative method that provides access to both quantitative and qualitative information. KAP surveys reveal misconceptions or misunderstandings that may represent obstacles to the activities we want to implement, as well as potential barriers to behaviour change. To put it another way, the KAP survey discloses what was stated, but there may be significant gaps between what was said and what was done, which is why this theory was used to this research.

Schwartz (1976) established the early knowledge, attitudes, and practices (KAP) paradigm, which emphasises the presence of consciousness based on three elements: knowledge, attitudes, and practices (Schwartz, 1976). KAP surveys were initially created in the 1950s and are now widely utilised in social science research in various nations. Because they are narrowly targeted and limited in scope, KAP investigations are more cost-effective and preserve resources than other social research methodologies (Eckman & Walker, 2008). KAP surveys are currently a common approach for investigating human behaviour when it is influenced by environmental issues. According to Sabouhi *et al.* (2011)'s research findings, there was a link between awareness toward knowledge, attitude, and practice, with knowledge becoming important components in the smart city of the future (Salerno, Nunziante, & Santoro, 2014).

(a) Knowledge

Individual knowledge of e-waste disposal management practice is studied in order to determine whether or not the individual understands and knows about these matters. Knowledge is described as a comprehension of other people's actions in the context of one's own (Dourish & Bellotti, 1992). In a recent research, Kamweru (2019) said that most respondents expressed good levels of awareness on e-waste disposal management, implying that they are aware of the consequences of failing to manage e-waste in their area. The findings of the study also reflected the assertion.

(b) Attitude

In the KAP Model, which was used in this study, attitude is one of the aspects to measure the awareness of e-waste disposal management. According to Othman *et al.* (2015), an individual's attitude is essential since it demonstrates how they respond to the knowledge they acquire and how they may put it into effect. Kamweru (2019) noted in a prior research that the community's unfavourable views included a lack of individual responsibility ability to volunteer to clean up e-waste that was already badly disposed in open areas.

(c) Practice

The practice of e-waste management can be described as the response to open-ended questions revealed that the majority of respondents claimed to have regular e-waste collection services, with the majority stating that the waste was collected once a week (Kanweru, 2019). The concept of practice refers to the application of routine e-waste disposal management in society in the targeted area of study. According to this study, the practice of e-waste disposal in society reflected the level of awareness.

2.5 Hypothesis Development

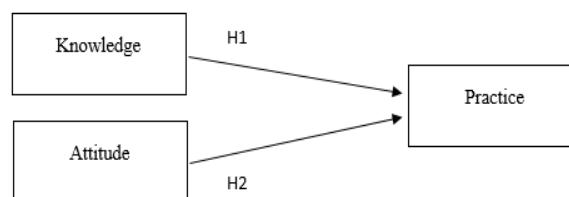
The awareness of e-waste disposal management was assessed in the context of this study using three variables: knowledge, attitude, and practice. According to Sabouhi *et al.* (2011), there is a link between knowledge, attitude, and practice toward e-waste management, such that it will be the primary contribution in the future of major cities (Salermo *et al.*, 2014). According to Schwartz's (1976) knowledge, attitude, and practice (KAP) model, this methodology detected awareness by testing on three factors. The KAP model has been utilised in foreign nations to conduct social science research, and the study is more cost-effective and fully utilises resources than other social research methods, owing to its tightly concentrated and narrowed scope (Eckman & Walker, 2008). The KAP model from Schwartz (1976) is currently extensively utilised in the methodology section of studies that deal with human behaviour that is influenced by environmental concerns. According to earlier research that used the knowledge, attitude, and practice (KAP) model in their study, the results revealed that the respondents for e-waste disposal knowledge and attitudes were at a high level (Mahat *et al.*, 2019). This research was carried out in Malaysia. Based on the above discussion, it can be hypothesized that:

H1 There is significant relationship between individual knowledge and disposal practice of e-waste disposal management.

H2 There is significant relationship between individual attitude and disposal practice of e-waste disposal management.

2.6 Framework of Study

The conceptual framework model proposed that all the independent variables (knowledge of e-waste disposal and attitude towards e-waste disposal) are tested to determine whether those factors have significant relationship to dependent variable (practice of e-waste management) which is shown in Figure 1.



3. Research Methodology

3.1 Research Design

In this study, the design used is quantitative research and using the questionnaire as the instrument. The reason why this type is using is because it is suitable based on the population sample that been targeted for this conducting this study, due to the time constraint and limitation (Battacherjee, 2012).

3.2 Population and Sampling

The participants in this research are residents of Tebrau, Johor Bahru. This region was chosen for this study because it is the most urbanized in Johor Bahru, as well as an industrial zone with manufacturing companies and residential areas. The population of the targeted region is estimated to be around 356 people (Department of Statistics Malaysia, 2019). The minimal sample size proposed by Krejcie and Morgan (1970) based on that population figure is 150 responders. The respondents were drowned and chosen at random using convenience sampling from the entire number of residents in the area.

3.3 Research Instrument

The research used questionnaire as an instrument to distribute through online survey. The questionnaire items were divided into three sections: Section A, B and C. Section A consist of respondent's demographics background, which is consist of gender, age, marital status, education level, type of employment, number of people living together, race, residential area and years of work experience. Section B consist of respondent's general knowledge in term of familiarity of e-waste, type of electronic item used by household, e-waste source of information, the main reason buying new electronic item, and the period of using electronic products. Section C was adopted and modified from Mahat el al. (2019) which is consisted with 8 items for each parts and variables which is divided into C(a) for knowledge, C(b) for attitude and C(c) for practice. This section used different five scale likert type to ask the perception form respondents. Part C(a) use scale with 5-extremely familiar, 4-very familiar, 3-moderately familiar, 2-slightly familiar, lastly 1-not all familiar. Part C(b) use scale with 5-strongly agree, 2-agree, 3-somewhat agree, 4-disagree, lastly 5-strongly disagree. Lastly, Part C(c) use scale with 5-very frequently, 4-always, 3-occasionally, 2-sometimes, lastly 1-never.

3.4 Data Collection

Data collection for this study was obtained from primary data and secondary data where the method used was detailed. The primary method is a survey form that will be distributed to the respondents of the study. Meanwhile, the secondary data uses the educational journals by accessing online journals on the web links of Google Scholar, Scopus, Science Direct, Emerald Insight, UTHM journal portals and etc. For further steps onwards, data collection will be gain from observation, statistics, and also respondents as well for latest info to add on this study.

3.5 Statistical Analysis

In this study, the descriptive analysis and also correlation analysis was used to interpret data on respondent knowledge, attitude, and practice on e-waste disposal awareness among society in selected area in Tebrau, Johor Bahru. All data was keyed-in and analyze by using SPSS software system. Therefore, the correlation analysis was conducted to identify is there is any relationship between these two variables.

4. Data Analysis and Results

4.1 Response Rate

During data collection process, snow ball technique was applied and the questionnaire was distributed by using online platform to selected area in Tebrau, Johor Bahru, since pandemic issue getting serious plus require social distancing among citizen. The online questionnaires have been distributed to investigate the relationship between respondent knowledge, attitude, and practice towards

e-waste disposal awareness among society. Surprisingly, there was 160 feedbacks was collected for this research, which is exceeded the targeted amount 150 respondent.

4.2 Reliability Test

The reliability test is method used for measure the scale's consistency. Cronbach's alpha coefficient is used as the indicator to check the degree of consistency (Cronbach, 1951). The value of Cronbach's alpha for all variables must be above 0.6 (Hair *et al.*, 1998).

Table 1: Reliability Test

Variables	Cronbach's Alpha	No. of items
Knowledge about e-waste	0.923	8
Attitude towards e-waste	0.906	8
Practice on proper e-waste disposal	0.894	8

Table 1 shows the Cronbach's Alpha for all the variables used in this study. The Cronbach's Alpha for knowledge about e-waste is 0.923 which is determine the reliability knowledge about e-waste is high. Secondly, the value of Cronbach's Alpha for attitude towards e-waste is 0.906 which is shows that independent variable has high reliability test. Next for practice on proper e-waste disposal also has high reliability test value which is 0.894 and it shows the dependent variable has high level of reliability. To conclude, all variables has high reliability value.

4.3 Level of E-Waste Awareness

Mean descriptive analysis was used to identify the level of awareness of e-waste disposal among community in term of their level of knowledge, attitude and practice of e-waste management in Tebrau, Johor Bahru. Table 2 shows the mean score levels used in this study. The results of the study found that the level of awareness of e-waste disposal for all three variables are at the highest level which the mean value ranged 3.68 to 5.00 (Piaw, 2006). This indicated that the community staying in Tebrau, Johor Bahru have a good level of knowledge, attitude and practice of e-waste disposal in their daily life. Overall, this study indicated that the level of awareness of e-waste management among community is considered high level.

Table 2: Level of E-Waste Awareness

Variables	Average Mean	Level
Knowledge	3.81	High
Attitude	4.02	High
Practice	3.71	High
Overall	3.85	High

4.4 Hypothesis Testing

Since the collected samples in this study determined as not normal distribution, the non-parametric technique is used to test those variables. Spearman correlation method used to test the correlation between the knowledge about e-waste, attitude towards e-waste, and practice on e-waste management.

Table 3: Correlation of Knowledge about E-waste and Practice on E-waste Management

		Knowledge about e-waste	Practice on e-waste management
Knowledge about e-waste	Correlation	1.000	.686**
	Coefficient		
	Sig. (2-tailed)	.	.000
	N	160	160
Practice on e-waste management	Correlation	.686**	1.000
	Coefficient		
	Sig. (2-tailed)	.000	.
	N	160	160

***. Correlation is significant at the 0.01 level (2-tailed)*

Based on Table 3, the correlation result between knowledge about e-waste disposal and practice on e-waste management shows that there is significant value of the elements in less than 0.01. There is significant and high relationship between knowledge about e-waste and practice on e-waste management, plus with positive correlation ($r=0.686$, $p<0.01$). Therefore, the individual with higher knowledge about e-waste have greater practice on e-waste management as well. Thus, H1 is accepted.

Table 4 presents the correlation result between attitude towards e-waste disposal and practice on e-waste management. It can be seen that there is significant value of the elements in less than 0.01. There is significant and high relationship between attitude towards e-waste and practice on e-waste management, plus with positive correlation ($r=0.609$, $p<0.01$). Therefore, the individual with higher attitude towards e-waste have greater practice on e-waste management as well. Hence, H2 is accepted.

Table 4: Correlation of Attitude towards E-waste and Practice on E-waste Management

		Attitude towards e-waste	Practice on e-waste management
Attitude towards e-waste	Correlation	1.000	.609**
	Coefficient		
	Sig. (2-tailed)	.	.000
	N	160	160
Practice on e-waste management	Correlation	.609**	1.000
	Coefficient		
	Sig. (2-tailed)	.000	.
	N	160	160

***. Correlation is significant at the 0.01 level (2-tailed)*

5. Discussion and Conclusion

5.1 Discussion

This research has revealed that the community of Tebrau, Johor Bahru, is well aware of the amount of disposal of e-waste. The community revealed that they had good understanding, decent attitude and a good standard of e-waste management practices in their homes. The same results have been achieved with the few e-waste investigations carried out in Malaysia. Hamzah *et al.* (2020) observed, for example, found that Port Dickson respondents had high understanding, behaviour and practice with regard to recycling of e-waste, which was also largely affected by their education. The Kalana's study (2010) showed that Shah Alam respondents had strong e-waste awareness, and that Kuala Lumpur

respondents had comparable findings (Afroz *et al.*, 2012; Akhtar *et al.*, 2014). In all investigations, however, the researchers found that e-waste waste management methods were yet to be enhanced. Another research by Mahat *et al.* (2019) in Selangor revealed that respondents had a good level of knowledge, a positive attitude and a good degree of practical practice with regard to e-waste disposal.

Furthermore, the findings of this study reveal that there is a strong and positive link between individual knowledge and attitude toward e-waste disposal and management among the Tebrau population in Johor Bahru. This conclusion is consistent with the findings of other studies on e-waste. Ohajinwa *et al.* (2017), for example, discovered a favourable association between employees' knowledge and attitudes and practices related with occupational health risk awareness of e-waste workers in Nigeria. This discovery is quite similar to that of Kalana (2010). Attitude plays a significant role in e-waste management practice, which leads to an increase in awareness. According to Mahat *et al.* (2019), the results suggest that there is a link between the KAP model and societal awareness. Knowledge of e-waste has a significant influence on society's practice of e-waste management among citizens (Miner *et al.*, 2020). A better synchronisation of knowledge and attitude will result in an effective e-waste management approach (Hamzah *et al.*, 2020). This revealed that higher knowledge gains by individuals result in a more positive attitude toward e-waste and more practice with e-waste management.

Therefore, individual understanding of e-waste management should be constantly expanded by mass media, social media, and a variety of other sources. The government, non-governmental organisations (NGOs), and any other accountable entities are responsible for informing the public about e-waste and its appropriate handling. As a result of this well-understood information, individuals will develop a favourable attitude toward e-waste, resulting in increased e-waste management practices in their lives.

5.2 Conclusion

In a conclusion, this research which was conducted among the local community in Tebrau has reported that level of awareness of e-waste disposal management is high level in term of levels of knowledge, attitude, and practices of the local community regarding e-waste. This research also found the significant and positive relationship between knowledge, attitude and practice on e-waste management. These findings might offer reference information on e-waste management in Malaysia and the development of effective e-waste management program by researchers and other stakeholders.

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