*Research Article*

# Waste Management Perspective in Malaysia: A Conceptual Framework

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***Abstract:*** *Waste management is an effort to systematically managing the disposal of household or individual waste. In 2020 scheduled waste in Malaysia increases by 7.5% to a total of 4.0 million tons. Intriguingly, recent statistics also indicated that Malaysia imported 872,531 tons of plastic waste. Besides, the pandemic of Novel Coronavirus 2019 increases the needs for the proper management of waste, especially among the local districts. On the other hand, there is also a scarcity of research on the relationship between website quality characteristic and their impacts on waste management efficiency. As we know, a website is an important medium of communication between the citizens and their local districts. Therefore, the purpose of this study is twofold; first, to identify the current state of waste management among districts in Kelantan, and second, to investigate the impacts of website quality characteristics on the efficiency of waste management among the local district in Kelantan. A quantitative research methodology will be adopted; the instrument will be developed by adopting previous instruments, expert test, pre-tested, pilot tested, before actual data collection. Findings will be analyzed based on a descriptive and inferential relationship using Statistical Package for Social Sciences (SPSS) version 26 and Partial Least Square Structural Equation Modeling (PLS-SEM) using SmartPLS 3.3.3. The findings should contribute as follows (1) indicating the current level of waste management in Kelantan, (2) identifying the current perception of a user towards the waste management services provided by their local authority, (3) identifying the needed waste management services among citizens, and (4) identifying the roles of website quality characteristic on the waste management efficiency.*

*Keywords: waste management; efficiency; website design characteristic*

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## 1. INTRODUCTION

Waste management is the systematic management of household or industrial waste from its creation (inception) until disposal. According to the Department of Statistic Malaysia (2020), scheduled waste in Malaysia has increased by 7.5% to a total of 4.0 million tons. More intriguingly, recent statistics also indicated that Malaysia had imported 872,531 tons of plastic waste from overseas (Singh, 2021). Besides, the pandemic of Novel Coronavirus 2019 (COVID-19) demand for more proper management and treatment of health waste generated by healthcare facilities, medical laboratories, and biomedical research facilities (Das, Islam, Billah, M., & Sarker, 2021; Vanapalli, Sharma, Ranjan, Samal, Bhattacharya, Dubey, & Goel, 2021; Fletcher, Clair, & Sharmina, 2021). Subsequently, the Malaysian government has taken a proactive effort to minimize waste and promoting sustainability waste through five cycles of steps; reuse, reduce, recycling, treatment, and disposal. Besides, Malaysia also is one of the countries currently working towards embracing green technology in an attempt to safeguard the environment (Isa, Sivapathy & Kamarruddin, 2021). One of the efforts in ensuring a green environment is the proper and effective management of waste, especially among the local authorities.

Disposal of waste is one of the problems faced by the local authority over the past few years and until today, it is one of the crucial problems that must be solved (Chancellor, 1988; Yang & Chang, 2021; Gonzales & Vargas, 2021). Lack of communication and promotional activities leads an individual to focus only on the disposal of waste to local garbage bins provided by the local authority. Moreover, most of the research on waste management is focusing on the impact and factors influencing waste disposal and there is a scarcity of research focusing on the quality of information and interaction between individual and waste management effectiveness (Safar, Bux, Faria, & Pervez, 2021). Besides, Priyadarshini, Sreejesh and Anusree (2017) indicated that the perceived information quality of a website influences the behavioural intention and attitude to perform a task. Mahmod, Angie, Jalil, & Abd Ghani (2021) argue that knowledge on waste management provided through electronic means can help to (1) educate individuals on the importance of recycling, (2) ease the work of waste collectors, and (3) save the environments from hazardous waste. However, encouraging an individual to properly managed their waste is a challenging process (Mohamed & Rasnan, 2021). Besides, more knowledge is needed to determine the current state of waste management practices in Malaysia, as most of the study is not focusing on this matter. On the other hand, one of the most important mediums of communication between the local authority and citizens is the use of websites that provides information as follows: (1) garbage collection schedule, (2) recycling campaign, (3) waste management services, and (4) waste management information. However, a thorough literature review shows that study on the relationship between website quality characteristic and waste management efficiency is limited especially in the domain of Information System (IS). Therefore, investigating this relationship might provide an interesting finding.

## 2. RESEARCH QUESTIONS AND OBJECTIVE

The research will address the following research question:

1. RQ1 – What is the current state of waste management practices among district in Kelantan?

2. RQ2 – What is the perception of users towards the waste management practices provided by the local authority?

3. RQ3 – Do web quality characteristics (e-service quality, system quality, information quality, perceived security, and perceived trust) jointly predicted waste management efficiency?

The research will address the following hypothesis:

1. H1: E-Service quality has a positive and significant relationship on waste management efficiency.

2. H2: System quality has a positive and significant relationship on waste management efficiency.

3. H3: Information quality has a positive and significant relationship on waste management efficiency.

4. H4: Perceived security has a positive and significant relationship on waste management efficiency.

5. H5: Perceived trust has a positive and significant relationship on waste management efficiency.

The research will address the following objectives:

1. To identify the current state of waste management practices among districts in Kelantan

2. To identify user perception towards waste management services provided by the local authority.

3. To identify whether E-Service quality, system quality, information quality, perceived security, and perceived trust jointly predict waste management efficiency.

## 3. LITERATURE REVIEW

### *3.1 Website Quality Characteristic*

The interest in assessing and evaluating web system development is on the rise as researcher aware of the aspect of citizens in the evaluation. There was little reference to the factor of a citizen who uses the system and task completed through these systems. The work by Demchak, Friis and La Porte (2000) and Eschenfelder, Beachboard, Wyman and McClure (1997) focus on the evaluation of websites from the context of government. It focuses on the characteristic of websites descriptively and does not count the characteristic of citizen and factor associated with their acts of accessing web-based services.

The study into literature shows that many researchers have recognized the importance of website evaluation and assessment (Cox, 2001; Nakwaski et al., 2010; Kiantruangkrai et al., 2010; Boiko, 2002; Thamaraiselvi, 2005; Souer & Joor, 2011). Coxes (2001) discuss the role of usability and accessibilities contributed to an effective website. This supported by Wan Abdul Rahim Wan Mohd Isa et al. (2011). They argue that the usability and accessibility factor affect the effectiveness of service delivery and satisfaction. Mohd Hairul Nizam Md Nasir, Hazrina Hassan and Nazean Jomhari (2008) stated that there are growing research on accessibility for older people and visually impaired person. Kane and Hegarty (2007) also stressed the importance of accessibility and usability by focusing on visual impact. Most of the research in websites management are focusing on the technical part of the websites, particularly in developing a CMS and evaluation of websites based on the technical part (Kane et al., 2006; Cox, 2001; McKeever, 2003; White, 2004).

Souer et al. (2011), Wan Abdul Rahim Wan Mohd Isa et al. (2011), Tsohou et al. (2013) and Robbins et al. (Robbins, Engel & Bierman, 2006) proposed that a citizen-centric evaluation of government websites should be carried out because most of the research is focusing on the characteristics of the web itself. Furthermore, the performance of service or content delivery is the least mention in any literature particularly among the available research work on government web sites evaluation.

A study into literature found out that there is not much research have been done toward assessing the quality of websites particularly towards government websites. Most of the studies focusing on electronic government, user satisfaction toward government websites and the development of content management system. Cox (2001) describe that websites management is similar to document management and information management. His theory is supported by Junco et al. (2005) and Katuu (2012). Junco et al. (2005) reckon that the origins of content management are from digital asset management, document management, web content management and enterprise content management. Cox (2001) conduct a study on website design and content management. Several important variables were identified that contribute to an effective website. Those variables are design, accessibility, and usability. The result of this study shows that those three variables contribute to an effective WCMS approach following the lifecycle of content management, from creation, approval, updating and weeding. The lifecycle control potentially complex problem or workflow. Furthermore, it is also balancing webmaster control and enables everyone to contribute to the web sites structure without knowing HTML. Cox (2001) also mention that the management of web content as a process needs some scale of policy, and it also presents the same content differently to the user based on their needs. Information professional must be involved in the development process especially during the selection of WCMS. This argument is also supported by Yuhfen and Mengxiong (2001) who discuss the impact of content management in delivering information through appropriate labelling and tracking of information that is placed on a website. Standard, bandwidth, security, and privacy, legal, lifestyle and language were identified as factors that contribute to the effectiveness of the content management system.

Wan Abdul Rahim Wan Mohd Isa et al. (2011) evaluate government websites based on Web Content Accessibility Guidelines 1.0 (WCAG 1.0) and Nelson usability guideline based on quantitative measure and automatic evaluation tools. WCAG 1.0 guidelines consist of 14 traits and divided into three (3) priorities, namely Priority 1, Priority 2 and Priority 3. The finding reveals that websites under state government may need to increase the accessibility level of the sites compared to federal government website due to the high number of accessibility error reported in this study.

*3.2 Waste Management*

Waste management has long become a crucial problem in society especially among household individual (Yang & Chang, 2021). The disposal of various kind of waste such as household and industrial waste has also become a major concern among the local authorities and must be solved (Chancellor, 1988; Yang & Chang, 2021; Gonzales & Vargas, 2021). Literature searches show that most research on waste management is focusing on the technical and processing aspect of waste management, and little concern on the roles of information systems (i.e., website) on the efficiency of the waste management system (Safar, Bux, Faria, & Pervez, 2021).

A work by Priyadarshini, Sreejesh and Anusree (2017) suggest that the perceived information quality of a website influences the behavioural intention and attitude to perform a specific task. Thus, engaging individual to the right resources might influence their waste management behavioural, and subsequently, encourage them to influence others (O'Brien & Toms, 2010; Diana, Masrom & Masrek, 2016; Masrek & Gaskin, 2016; Masrek & Shahibi, 2016; Masrek & Samadi, 2017; Masrek, Razali, Ramli & Andromeda, 2018; Rosman, Ismail & Masrek, 2019;2020).

Moreover, Mahmod, Angie, Jalil, & Abd Ghani (2021) argue that knowledge on waste management provided through electronic means can help to (1) educate individuals on the importance of recycling, (2) ease the work of waste collectors, and (3) save the environments from hazardous waste. However, encouraging an individual to properly managed their waste is a challenging process (Mohamed & Rasnan, 2021).

*3.3 Conceptual Model*

The following figure 1 shows the research model of the study. The independent variables are e-service quality, information quality, system quality, perceived security, and perceived trust. A higher second-order variable is conceptualized for the dependent variable; namely waste management efficiency that consists of local government approach, waste management services, policy and law, awareness, and subjective norms. Table 1 shows the mapping of variables, operational definition, and hypothesis:

Table 1: Mapping of variables, operational definition, and hypothesis

| Higher-order construct | First-Order Construct | Operational Definition | Number of Items | Hypothesis |
|---|---|---|---|---|
| **Website Quality Characteristics** | *e-service quality* | The degree of users' perception of waste management information provided through the website to support the information needs and individual user's specific tasks | 4 | H1: E-Service quality has a positive and significant relationship with waste management efficiency. |
| | *System quality* | The extent of users' perception of the website's performance in retrieving and delivering information | 4 | H2: System quality has a positive and significant relationship with waste management efficiency. |
| | *Information quality* | Information quality is the degree of the value of the output produced by the website as perceived by the user | 5 | H3: Information quality has a positive and significant relationship with waste management efficiency |
| | *Perceived security* | The extent of the user's perception of the website in securing the information provided through the website. | 4 | H4: Perceived security has a positive and significant relationship with waste management efficiency. |
| | *Perceived trust* | The extent of users' perception on the user trust towards the usage of the website | 4 | H5: Perceived trust has a positive and significant relationship with waste management efficiency. |
| **Waste Management Efficiency** | *Local government approach* | Users' perception of the performance by local authorities in Kelantan on the waste management. | 3 | Not Applicable |
| | *Waste management services* | Users' perception of the adequacy, suitability, and richness of waste management | 4 | Not Applicable |

| | | | | |
|---|---|---|---|---|
| | | services provided by local authorities in Kelantan | | |
| | *Policy and Law* | Policy and Law concerning waste management practices. | 6 | Not Applicable |
| | *Awareness* | The extent of individual awareness on the importance of a good waste management process to the environment, society, and quality of life | 3 | Not Applicable |
| | *Subjective norms* | The perceived social pressure from important others to perform or not perform the behaviour. | 4 | Not Applicable |

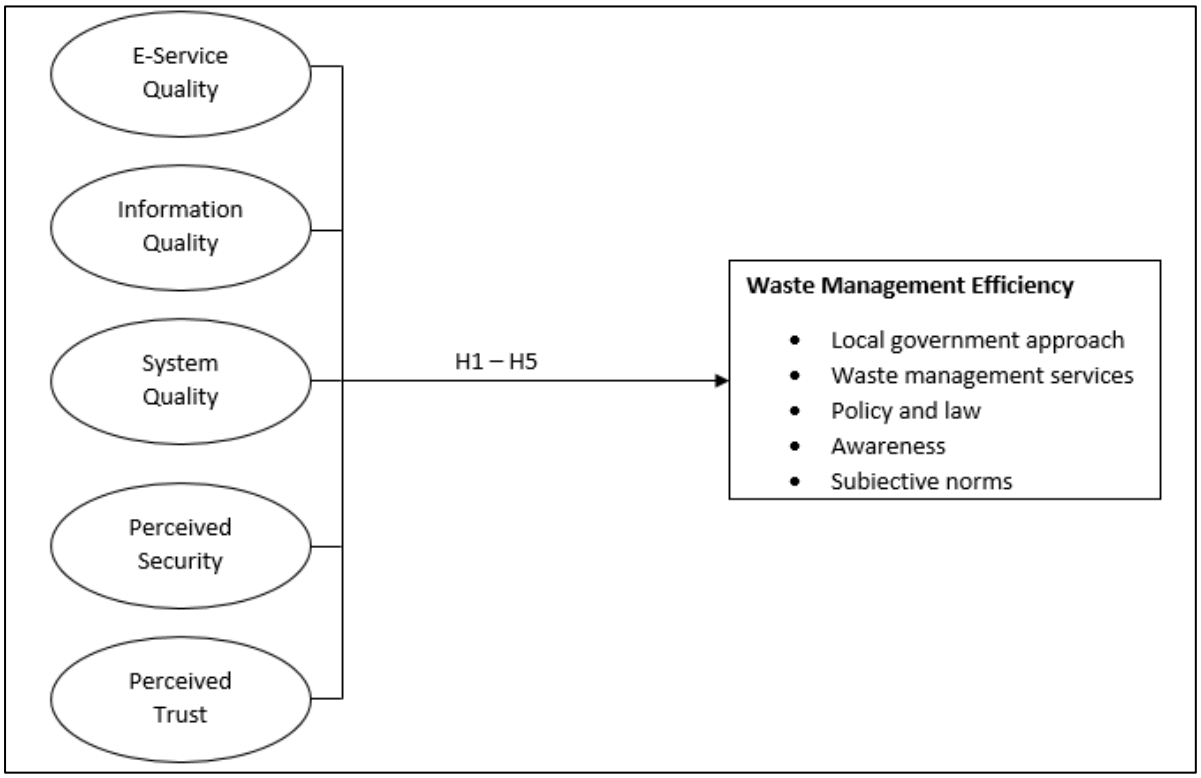


Figure 1: Research model

Ahn, Ryu, and Han (2004) found that service quality has a significant impact on user attitude and user technology acceptance of Internet shopping malls. In their seminal article of 1992, DeLone and McLean (2003) argue that information quality, systems quality, and service quality has the potential to directly affect both behavioural attention and information system success. Venkatesh, Morris, Davis, and Davis (2003) also found a positive relationship between service quality and the use of information system. In the context of website quality characteristics, service quality is very important because the use of a website involves a lack of face-to-face communication (Balog, 2011). To enhance the usage of a website, it must be able to access, have a reliable platform, responsive, and fully integrated with necessary tools (Masrek & Gaskin, 2016).

The importance of information quality has been confirmed by many researchers (DeLone & McLean, 1992; Masrek & Gaskin, 2016; Rahman et al., 2011). Users will not engage with the website in the absence of accurate, timely, and relevant information (Masrek & Gaskin, 2016). For the website to be meaningful, it must be able to attract users to use it first; then only by that, a state of engagement can be established through constant interaction with its resources. Moreover, failure to update the

contents will cause the underutilization of the website (Masrek & Gaskin, 2016). Besides, the existence of timely information, precision, and sufficiency of information also important in shaping user preferences towards the use of the website (Saha, Nath, & Salehi-Sangari, 2012).

Systems quality is also a good predictor of system engagement (Baroudi et al., 1986). People will look for an interactive and user-friendly design of a website. A complex structure of design will only lead to dissatisfaction and waste of time. Factors such as site navigability and easiness of access are very important in the context of system quality (Saha et al., 2012). Moreover, the information system should be able to be accessed remotely, accessible from a remote location, unlimited access to site content, dependable, and free from technical error or glitch (Masrek & Gaskin, 2016).

Perceived security refers to the user perception that using the website provided them with a sense of security. Security plays an important role in the acceptance and usage of information system (Salisbury, Pearson, Pearson & Miller, 2001). Lack of security will raise a concern about the usage of the websites and discourage the development of the information system (Salisbury, Pearson, Pearson & Miller, 2001; Flavián & Guinalíu, 2006). Yenisey, Ozok & Salvendy (2005) found out that two important perceived security is perceived operational factor and perceived policy-related factor. On the other hand, Marianus & Ali (2021) identify confidentiality, availability, non-repudiation, and privacy as the determinant of perceived security in determining website quality.

Perceived trust meanwhile is operationalized as the extent of users' perception of the user trust towards the usage of the website. Perceived trust encourages the usage of a website and e-services (Nayanajith, Dissanayake, Weerasiri, & Damunupola, 2021). The quality of a website subsequently will enhance the trust of a user's towards the usage and the quality of the website (Bhat & Darzi, 2021). Menzel and Teubner (2021) suggest that future work should investigate the factors of trust in the website itself.

The following Table 2 shows the mapping of the research objective, research question, data collection and data analysis.

Table 2: Mapping of research objectives, research questions, data collection, and data analysis

| **Research Objective** | **Research Question** | **Data Collection** | **Data Analysis** |
|---|---|---|---|
| To identify the current state of waste management practices among districts in Kelantan | What is the current state of waste management practices among district in Kelantan? | Questionnaire | Descriptive Statistics – Mean, Std Deviation, Variance, Std Error<br>Overall mean scoring to answer RQ1 using SPSS version 26 |
| To identify user perception towards waste management services provided by the local authority. | What is the perception of users towards the waste management practices provided by the local authority? | Questionnaire | Descriptive Statistics – Mean, Std Deviation, Variance, Std Error<br>Overall mean scoring to answer RQ2 using SPSS version 26 |
| To identify whether E-Service quality, system quality, information quality, perceived security, and perceived trust jointly predict waste management efficiency. | Do web quality characteristics (e-service quality, system quality, information quality, perceived security, and perceived trust) jointly predicted waste management efficiency? | Questionnaire | Inferential Statistics – Structural Equation Modelling (SEM) – Measurement Model and Structural Model<br>Path Coefficient to answer RQ3 and test H1 to H5. |

## 4. METHODOLOGY

A quantitative research methodology will be adopted for the study. A thorough literature review will be conducted on the issues of waste management efficiency and website quality characteristic. Then, a research framework will be developed based on the literature review. A higher-order construct was proposed for the waste management efficiency; consists of local government approach, waste management services, policy and law, awareness, and subjective norms.

Data collection started with instrument development. The items will be adopted from a similar previous study within the domain of information system, library and information science, e-commerce, and psychology. The instrument will be pre-tested, before being sent for an expert's review. Items will be modified based on the expert's recommendation before a pilot study was conducted. Then, the actual data collection will be conducted for a month.

The respondents will be selected based on convenience sampling, then stratified into the number of districts. A total of 360 respondents will be selected through convenience sampling and stratified into 10 districts. The number of respondents is calculated using Soper (2021) calculation based on the number of observed and unobserved variables. Based on the value, a total of 36 respondents were expected for each district.

Then, the data will be cleaned and coded, before being interpret based on descriptive and inferential analysis. Frequency, ANOVA and Independent Sample T-Test will be conducted to answer the first and second research questions (using SPSS), while SmartPLS version 3.3.3 will be used for answering the third research question.

## 5. CONCLUSION

The study main intention is to investigate the waste management efficiency among the local districts municipal, focussing on the state of Kelantan. A model was proposed, and proper methodology was also highlighted to further validating the research model via full data collection procedure. Subsequently, he next stage of this research is to conduct a quantitative data collection and develop an application to efficiently managing waste management among the local districts. This study, however, is not without limitation. First, we only focus on the element of website characteristics; future study may look beyond the website characteristic by including consumer engagement element such as focus attention, cognitive absorption, novelty, felt involvement, etc. Second, we only perceived the problem from local district in Kelantan. Including other geographical context especially from high rise building from urban environment may provide more interesting result.

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