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Barriers and Best Practices in E-Waste Management: Lessons from Selected Malaysian Public Universities

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Abstract

Electronic waste (e-waste) has emerged as one of the fastest-growing waste streams globally due to rapid technological advancements and the rising of electronic device consumption. In Malaysia, public universities generate substantial amounts of e-waste due to their reliance on electronic equipment for academic and administrative purposes. However, challenges such as a lack of awareness, the absence of a centralized e-waste management policy, and bureaucratic hurdles have hindered the effective handling of e-waste in these institutions. This study aims to analyze the barriers and best practices in e-waste management within six selected Malaysian public universities. A qualitative study approach was employed, utilizing semi-structured interviews with key personnel responsible for e-waste management in these institutions. Thematic analysis was used to identify patterns and extract meaningful insights from the collected data. The findings reveal that while universities face common challenges, such as inconsistent disposal practices, inadequate storage facilities, and lengthy administrative procedures, some institutions have successfully implemented structured policies, decentralized collection systems, and partnerships with certified recyclers. The study emphasizes the necessity of a standardized national e-waste management framework, mandatory awareness programs, and streamlined administrative processes to enhance e-waste management in universities. This research advances the formulation of more sustainable e-waste management strategies that can be adapted by other higher education institutions, ultimately supporting Malaysia's broader environmental and sustainability goals.

Keywords: Barriers, Best Practices, E-Waste, Public University, Sustainability

Introduction

Electronic waste (e-waste) is one of the waste streams with the fastest rate of growth in the world due to the rapid technological advancements and increasing consumption of electrical and electronic equipment (EEE). The improper disposal of e-waste poses severe environmental and health risks due to the presence of hazardous materials such as lead,

mercury, and cadmium (Yusof et al., 2023). In Malaysia, e-waste generation is escalating, with projections indicating that the country will produce approximately 24.5 million units of e-waste by 2025, equivalent to the weight of 82 Petronas Twin Towers (Bernama, 2024). The Environmental Quality (Scheduled Wastes) Regulations 2005 classifies e-waste as scheduled waste (SW110), requiring specific handling, recycling, and disposal procedures (Department of Environment of Malaysia (2020).

Despite having regulatory frameworks in place, Malaysia continues to face challenges in enforcing proper e-waste management. Informal e-waste recycling remains prevalent, leading to unsafe disposal methods that harm the environment and public health (Malay Mail, 2025). A lack of awareness and the absence of efficient collection mechanisms further complicate the situation, especially in institutions like public universities, where large quantities of outdated electronic equipment accumulate over time. Addressing these challenges is crucial to ensuring sustainable e-waste management and environmental conservation in Malaysia.

Importance of E-Waste Management at Public Universities

Public universities in Malaysia are significant contributors to e-waste generation due to their extensive use of electronic devices for academic, administrative, and research purposes. Institutions regularly procure computers, laboratory equipment, printers, and networking devices, many of which have a limited lifespan and require disposal after a few years (Janmaimool & Khajohnmanee, 2019). However, the absence of dedicated e-waste management policies in universities often results in improper disposal, with outdated electronics either being stored indefinitely or discarded alongside general waste.

The effective management of e-waste in universities is vital for several reasons. First, universities serve as educational and research centers that can promote awareness and best practices in sustainable waste management. Second, proper e-waste handling prevents hazardous substances from contaminating the environment and reduces the demand for raw materials by promoting recycling. Third, universities can set an example by implementing structured e-waste management programs that align with Malaysia's sustainability goals and national policies (Hashim et al., 2024).

Several universities worldwide have successfully implemented e-waste recycling initiatives, partnering with private e-waste recyclers and governmental agencies. However, Malaysian public universities face significant barriers, including financial constraints, limited awareness, and the absence of comprehensive e-waste collection and disposal guidelines (Baba-Nalikant et al., 2023). Understanding these barriers and identifying successful strategies will help develop effective e-waste management frameworks that can be replicated across the higher education sector.

Therefore, this study aims to analyze the barriers and best practices in e-waste management within selected Malaysian public universities. The research seeks to provide insights into the challenges universities face in handling e-waste and identify effective strategies that can be implemented to improve sustainability efforts. The following are the specific objectives of this research:

- To identify key challenges that hinder effective e-waste management in Malaysian public universities.
- To examine successful e-waste management strategies implemented by selected universities.
- To provide actionable recommendations for improving e-waste management practices in Malaysian public universities.

The scope of this study encompasses a qualitative analysis of e-waste management practices at six selected public universities in Malaysia. Data was collected through interviews with key personnel responsible for e-waste management in these institutions. By understanding the barriers and successful initiatives, the research being conducted intends to aid in developing more efficient and sustainable e-waste management frameworks for public universities in Malaysia.

Literature Review

Electronic waste, often known as e-waste, is the term for discarded electrical and electronic devices, including computers, televisions, mobile phones, and other consumer electronics. The rapid speed of technological innovation, along with rising consumer demand, has resulted in a huge increase in global e-waste output. Effective e-waste management involves a series of processes, including collection, transportation, recycling, and disposal, aimed at minimizing environmental impact and promoting resource recovery (Ghulam & Abushammala, 2023). Central to these processes is the principle of the waste hierarchy, with waste prevention coming first, followed by reuse, recycling, recovery, and, as the final option, disposal. Implementing sustainable e-waste management practices is critical for mitigating the negative effects of potentially harmful materials found in electronic products and conserving valuable materials through recycling and reuse (Ahmad et al., 2023).

Existing Policies and Regulations in Malaysia

In Malaysia, under the Environmental Quality Act 1974, the management of e-waste is governed by the Environmental Quality (Scheduled Wastes) Regulations 2005. These regulations classify e-waste as scheduled waste (code SW110), mandating specific handling, storage, transportation, and disposal procedures to ensure environmental safety. The Department of Environment (DOE) Malaysia oversees the enforcement of these regulations, providing guidelines and licensing for facilities involved in e-waste management. Despite the regulatory framework, challenges persist in effective implementation, particularly concerning public awareness and the informal recycling sector (Garg et al., 2023). Efforts are ongoing to enhance policy measures, including developing comprehensive e-waste management plans and promoting public-private partnerships to improve collection and recycling infrastructure.

Barriers and Challenges in E-Waste Management: Global and Local Perspectives

Globally, e-waste management faces several challenges, including inadequate regulatory frameworks, lack of public awareness, and insufficient recycling infrastructure. In developing countries, these issues are often worsened by the prevalence of informal recycling sectors, which operate without proper environmental and health safeguards (Andeobu, Wibowo & Grandhi, 2021). In Malaysia, specific barriers include limited awareness and knowledge about proper e-waste handling among the public and institutions, the absence of clear and sustainable policies at organizational levels, and inadequate facilities to support proper e-waste disposal practices (Islam, Dias & Huda, 2021). A study focusing on Malaysian public

universities highlighted these challenges, emphasizing the need for comprehensive policies, enhanced awareness programs, and improved infrastructure to facilitate effective e-waste management (Hashim et al., 2024).

Best Practices in E-Waste Management from Universities Worldwide

Universities worldwide have adopted various techniques for efficient e-waste management, serving as models for sustainable waste management practices. One of the key approaches is policy development, where institutions establish clear policies outlining procedures for e-waste disposal, recycling, and responsible procurement (Ismail & Hanafiah, 2021). These policies provide a structured framework to ensure that electronic waste is handled in a way that is favorable to the environment.

Another essential strategy is awareness and education, which involves conducting regular campaigns and integrating e-waste management topics into the university curriculum (Nanath & Ajit Kumar, 2021). By educating students and staff on the importance of proper e-waste handling, universities foster a culture of sustainability and encourage responsible disposal practices. Additionally, many universities engage in collaboration with certified recyclers, partnering with authorized e-waste recycling companies to ensure the secure and sustainable disposal of electronic waste (Adeel et al., 2023). These partnerships help institutions comply with legal requirements and promote sustainable recycling efforts.

Furthermore, some universities implement incentive programs, such as take-back initiatives or reward schemes, to encourage students and staff to return obsolete electronics for proper recycling (Dayaday & Galleto, 2022). These programs enhance participation in e-waste management efforts and contribute to the overall sustainability goals of academic institutions. Besides, some universities have adopted zero-waste frameworks, engaging the campus community in sustainable waste management practices and striving to minimize waste generation through comprehensive recycling and reuse programs (Phrophayak et al., 2024). These best practices not only address e-waste challenges but also foster a culture of environmental responsibility within academic institutions.

Methodology

A qualitative research design is employed in this study to investigate the barriers and best practices in e-waste management within selected Malaysian public universities. Qualitative methods are particularly effective in capturing the complexities and contextual nuances of e-waste management practices, allowing for an in-depth understanding of institutional behaviors and challenges (Cohen et al., 2018). By focusing on the experiences and perspectives of individuals directly involved in e-waste management, this approach assists in the identification of underlying issues and the development of tailored strategies for improvement.

The Method of Data Collection

Data were acquired by conducting semi-structured interviews with key personnel responsible for e-waste management at six public universities in Malaysia. Semi-structured interviews provide flexibility in exploring established topics while allowing participants to bring new perspectives based on their experiences (Creswell & Creswell, 2017). The interviews were designed to gather comprehensive information on current e-waste

management practices, perceived challenges, and successful strategies implemented within their respective institutions.

Sampling

This study employed a purposive sampling strategy, selecting one key respondent from each of the six participating universities. These individuals were chosen because of their expertise in e-waste management, allowing them to provide valuable insights. The interviews continued until common themes started repeating, meaning additional interviews were unlikely to add new information. Although the sample size is small, it fits well with qualitative research, which focuses on gaining a deep understanding rather than collecting large amounts of data.

Selection of Universities and Justification

The selection of the six public universities for this study was strategically made to ensure a comprehensive representation of different geographical regions in Malaysia, covering Northern, Central, and Southern areas. This approach allows for a more holistic understanding of e-waste management practices across varying institutional contexts, considering differences in infrastructure, policies, and local environmental factors.

Two of the selected universities, University A and B, represent Northern Malaysia. This region is known for its mix of urban and semi-urban landscapes, where e-waste management infrastructure may differ from that of more industrialized and densely populated regions. Three universities, Universities C, D, and E represent Central Malaysia, particularly the Klang Valley region, which is the economic and administrative hub of the country. Universities in this area operate within a highly urbanized setting, where e-waste generation is expected to be higher due to increased access to electronic devices and rapid technological advancements (Khan et al., 2023). These institutions provide valuable insights into how universities in urban environments manage e-waste amidst stricter regulatory enforcement and greater availability of recycling facilities. Finally, University F represents Southern Malaysia, a region experiencing rapid industrial and technological growth.

By selecting universities from different geographical regions, this study captures variations in e-waste management practices, regulatory compliance, and institutional initiatives. The findings will offer valuable insights into the strengths and challenges faced by universities in different parts of Malaysia, ultimately contributing to the development of more effective and region-specific e-waste management strategies.

The Technique of Data Analysis

The acquired data were analyzed using thematic analysis, which is a method for detecting, analyzing, and reporting patterns in qualitative data. This approach involves familiarization with the data, coding, theme development, and refinement to ensure a coherent and comprehensive representation of the findings (Clarke & Braun, 2019). Thematic analysis facilitates the organization of complex data into meaningful categories, highlighting key barriers and best practices in e-waste management as reported by the participants. This method enables the synthesis of diverse perspectives into actionable insights, informing policy development and practical interventions within the university context.

Findings

A total of six interviews were conducted, with one representative from each university participating in the discussion. The interviews were structured not only to understand the roles and responsibilities of individuals involved in managing electronic waste within their respective institutions, but to explore the policies, procedures, and challenges related to e-waste disposal and management in their institutions.

Table 1
Profile of the Respondents

University	Geographical Area	Position	Department
A	Northern Malaysia	Administrative Assistant	IT Department
B	Northern Malaysia	Director	Department of Development and Asset Management
C	Central Malaysia	Director	Department of Development and Infrastructure
D	Central Malaysia	Head of Operation and Service Section	Occupational Safety and Health Management Office
E	Central Malaysia	Evaluation Officer	Department of Development and Estate Maintenance
F	Southern Malaysia	Deputy Director	Campus Sustainability Office

As shown in Table 1, a total of six respondents participated in the interviews, each representing a different university located across Northern, Central, and Southern Malaysia. The interviewees held diverse positions, including directors, administrative assistants, and officers responsible for operations, infrastructure, development, estate maintenance, safety, and sustainability. Their roles indicate varying levels of involvement in institutional management, making them valuable sources of information on e-waste practices.

The selection of respondents was based on their direct or indirect involvement in e-waste management within their institutions. Each respondent held a key administrative or managerial position related to infrastructure, asset management, sustainability, or operations. Their insights provided a comprehensive understanding of existing e-waste management practices, the challenges encountered, and the most effective approaches used by Malaysian public universities to manage their e-waste.

Barriers to E-Waste Management at Malaysian Public Universities

Despite growing awareness of e-waste management, Malaysian public universities face several challenges in implementing effective e-waste management. At University A, the interviewee highlighted that one of the main barriers to effective e-waste management is the lack of awareness and engagement among university staff and students. The interviewee stated, "There is a significant lack of awareness regarding e-waste among campus members. Even when awareness campaigns are conducted, participation remains low." Additionally, the interviewee pointed out that "staff often do not take e-waste disposal seriously, and many retain outdated equipment instead of following proper disposal procedures."

Similarly, at University B, the challenge of inconsistent engagement and awareness was also noted. The interviewee explained, "There have been one-off campaigns organized by different university entities, but these efforts have not been consistent or continuous." The interviewee further elaborated that "most e-waste management activities are left to the discretion of individual departments (PTJs), which results in an uncoordinated approach."

At University C, a similar concern was raised, where the interviewee noted, "Many staff members and students are not fully aware of proper e-waste disposal procedures, leading to mismanagement and improper handling of electronic waste." Additionally, the interviewee explained that "there is no centralized storage system for e-waste collection, making it difficult to manage large quantities of discarded electronics effectively. Each PTJ is responsible for its own e-waste, which results in inconsistent disposal practices across the university."

At University D, awareness and compliance were also recognized as major challenges. The interviewee stated, "Initially, there was a lack of understanding regarding the importance of proper e-waste disposal. Many staff members found it difficult to differentiate between scheduled waste and general waste, leading to improper disposal practices." The interviewee also added that "resistance to change and a lack of commitment from some individuals remain ongoing challenges."

The issue of inadequate storage facilities and lack of coordination was also highlighted by the respondent at University E. The respondent explained, "There is no designated storage area for e-waste, so departments have to store discarded electronics in their own spaces until disposal. This leads to clutter and inconsistent disposal practices." The respondent also added, "The lack of a centralized system means that each department must handle e-waste disposal independently, which results in inefficiencies and delays."

At University F, the problem of inconsistent participation in e-waste programs was noted. The interviewee mentioned, "Although there are periodic e-waste collection initiatives, participation from staff and students is inconsistent, leading to waste accumulating in various locations." The interviewee also stated, "There is a lack of a systematic approach to managing personal e-waste, as disposal largely depends on voluntary participation rather than a structured policy."

The absence of a structured e-waste policy is another common issue across the universities. At University A, the interviewee pointed out, "We do not have a dedicated policy on e-waste management. The current disposal methods follow general asset disposal guidelines issued by the Ministry of Finance rather than focusing on e-waste-specific concerns." At University B, a similar problem was noted: "We follow general asset disposal guidelines rather than implementing targeted measures to handle e-waste effectively. Without a clear policy, there is no structured framework to ensure responsible recycling and disposal of electronic waste." At University C, the interviewees similarly highlighted, "Although there are guidelines for general asset disposal, there is no specific policy dedicated to e-waste. This lack of regulation leads to inefficiencies in the disposal process and delays in asset clearance." Likewise, at University D, the issue was described as follows: "There is no real-time data collection system to monitor e-waste disposal systematically. Without a proper tracking mechanism, it becomes difficult to predict trends in e-waste generation and allocate

resources efficiently for its disposal." At University E, the respondent further emphasized, "Without a university-wide policy, departments handle e-waste in an ad-hoc manner, leading to inconsistent disposal methods and potential environmental risks." At University F, the interviewee added, "While we have an e-waste collection program, there is no enforced policy requiring participation, making the overall management of electronic waste less effective."

Another significant challenge shared by all six universities is the bureaucratic and procedural hurdles involved in e-waste disposal. At University A, the interviewee expressed, "Government financial regulations prevent direct transactions between departments, making it difficult to sell e-waste to the Department of Environment unless through a third party." The interviewee also mentioned that "the process of obtaining approvals for disposal is slow, sometimes taking months due to administrative bottlenecks." Similarly, at University B, the interviewee explained, "The process of obtaining approval for e-waste disposal is lengthy and bureaucratic, involving multiple levels of verification." At University C, the respondent also noted, "E-waste disposal procedures require multiple layers of approval, which slow down the process significantly. The current system relies heavily on administrative clearance, making it inefficient." At University D, this issue was further emphasized, with the respondent stating, "The disposal of e-waste at our university involves multiple steps, including obtaining approvals from the asset disposal committee and securing quotations from licensed waste disposal companies registered with the Department of Environment. These administrative processes can be time-consuming, leading to delays in the removal of e-waste from campus facilities." At University E, a similar sentiment was expressed: "Approval for e-waste disposal takes a long time due to bureaucratic processes, delaying the removal of electronic waste from university premises." At University F, the challenge was described as "Disposal requests must go through multiple departments, and without a streamlined system, delays are common." Table 2 provides a summary of the key challenges faced by each university.

Table 2
Summary of the Key Barriers to E-Waste Management

University	Key Barriers to E-Waste Management
University A	Lack of awareness and engagement among staff and students; Staff retain outdated equipment instead of proper disposal; No dedicated e-waste policy; Bureaucratic hurdles and slow approval process.
University B	Inconsistent awareness campaigns; E-waste management left to individual departments, leading to uncoordinated efforts; No dedicated e-waste policy; Lengthy approval process for disposal.
University C	Lack of awareness of proper disposal procedures; No centralized storage system, leading to inconsistent disposal practices; No dedicated e-waste policy; Multiple layers of approval slow down disposal.
University D	Difficulty differentiating scheduled waste from general waste; Resistance to change and lack of commitment; No real-time data collection system; Bureaucratic approval process delays disposal.
University E	No designated storage area for e-waste, causing clutter; Departments handle e-waste independently, leading to inefficiencies; No university-wide policy, resulting in inconsistent disposal; Slow approval due to bureaucratic processes.
University F	Inconsistent participation in e-waste programs; No structured approach for personal e-waste disposal; No enforced policy for e-waste collection; Disposal requests go through multiple departments, causing delays.

Best Practices in E-Waste Management at Malaysian Public Universities

Universities worldwide have developed various strategies to effectively manage e-waste, promoting sustainability while adhering to environmental rules. In Malaysia, public universities have also implemented best practices tailored to their institutional needs.

At University A, the institution follows a structured approach based on external benchmarking. "We modeled our e-waste management system after University B, particularly its Kampus Sejahtera initiative, which has been effective in handling electronic waste," stated the interviewee. University A ensures proper asset categorization and follows government procurement circulars when disposing of electronic waste. University B, known for its sustainability efforts, integrates e-waste management with its broader green campus initiatives. University B ensures that electronic waste is handled by certified vendors and emphasizes compliance with environmental regulations to minimize hazardous impacts.

University C has also developed systematic procedures. "Before disposal, we require verification and documentation, including filling out disposal forms and obtaining approval from the asset management committee," explained the respondent. The university does not have a centralized storage facility but has designated collection points for temporary e-waste storage before disposal by certified contractors. University D, on the other hand, operates a centralized approach under its Occupational Safety and Health (OSH) office. "We conduct disposal exercises every three months, with each faculty or department required to appoint an e-waste coordinator," explained the interviewee. UPM also utilizes a "Waste Bank" for smaller electronic waste items, collaborating with companies like Maxis for mobile device recycling.

At University E, e-waste is categorized within the broader asset management framework. "We have specific contractors for e-waste disposal, ensuring that ICT-related waste and other types of electronic waste are handled separately," stated the interviewee. University E follows a structured timeline, where "disposal is carried out within six months after receiving approval," aligning with financial regulations. Lastly, University F employs a unique program-driven approach. "We have e-waste collection boxes at every faculty and conduct annual recycling campaigns," noted the respondent. University F also collaborates with external recyclers to ensure proper disposal, and "we plan to introduce a centralized drop-off center where students and staff can bring their personal e-waste for responsible recycling".

These universities demonstrate that effective e-waste management requires structured policies, stakeholder collaboration, and educational initiatives to enhance awareness and participation. A summary of each university's best practices is provided in Table 3.

Table 3
Summary of the Best Practices in E-Waste Management

University	Best Practices in E-Waste Management
University A	Follows a structured approach based on external benchmarking; Modeled system after University B's Kampus Sejahtera initiative; Ensures proper asset categorization and compliance with government procurement circulars.
University B	Integrates e-waste management with green campus initiatives; Ensures electronic waste is handled by certified vendors; Emphasizes compliance with environmental regulations.
University C	Requires verification and documentation before disposal; Uses disposal forms and approval from the asset management committee; Designated collection points for temporary e-waste storage before certified contractor disposal.
University D	Centralized e-waste management under the Occupational Safety and Health (OSH) office; Conducts disposal exercises every three months; Each faculty/department appoints an e-waste coordinator; Operates a Waste Bank for smaller electronic waste items in collaboration with external companies.
University E	Categorizes e-waste within the broader asset management framework; Uses specific contractors for ICT and other electronic waste; Follows a structured timeline for disposal within six months after approval.
University F	Program-driven approach with e-waste collection boxes at every faculty; Conducts annual recycling campaigns; Collaborates with external recyclers; Plans to introduce a centralized drop-off center for personal e-waste recycling.

Recommendations for Malaysian Public Universities

Several policy recommendations can be made considering the study's findings to enhance e-waste management in Malaysian public universities.

First, the necessity of the establishment of a formal university-wide e-waste policy. The implementation of the unified policy would provide clear guidelines for electronic waste disposal, facilitate better tracking and accountability, and ensure compliance with environmental regulations. By standardizing disposal methods, universities can create a more structured and efficient approach to managing e-waste.

Second, mandatory awareness and education programs should be introduced at the institutional level. Since low engagement has been identified as a major barrier, universities should integrate e-waste management into their sustainability programs and curriculum. Awareness campaigns should be continuous rather than occasional, and participation should be encouraged through incentives such as rewards for responsible disposal practices.

Third, administrative procedures for e-waste disposal should be streamlined to reduce delays. Universities should adopt digital tracking systems that allow real-time monitoring of e-waste inventory, disposal approvals, and recycling activities. By reducing bureaucratic inefficiencies, universities can ensure faster and more effective waste management.

Fourth, collaborations with certified recyclers and government agencies should be strengthened. Establishing long-term contracts with licensed disposal vendors, as seen in some universities, has proven effective in ensuring compliance and efficiency. Expanding such partnerships to all universities would improve the sustainability of e-waste management programs.

Lastly, universities should invest in dedicated storage and collection facilities. The lack of centralized storage has been a major challenge at some universities, leading to clutter and inefficient disposal practices. Establishing designated e-waste collection centers on campus would provide a more organized and systematic approach to waste management.

Conclusion

This study has provided a comprehensive analysis of e-waste management practices in six Malaysian public universities, highlighting both the challenges and best practices in their disposal and recycling strategies. One of the most significant barriers identified is the lack of awareness and engagement among university staff and students, which has resulted in inconsistent participation in e-waste management programs. Many universities have attempted to address this issue through periodic awareness campaigns, but these efforts have generally lacked continuity and impact.

Another major challenge is the absence of a centralized and standardized e-waste policy across the universities. While existing guidelines govern general asset disposal, they do not specifically cater to the complexities of e-waste management. This lack of regulation has led to variations in disposal practices, inefficiencies in asset clearance, and delays in recycling initiatives.

Additionally, bureaucratic and procedural hurdles have been found to be common obstacles in e-waste disposal. The requirement for multiple layers of approval and lengthy administrative processes has led to significant delays in the removal of e-waste, often resulting in the accumulation of obsolete electronics on campus. Furthermore, universities have faced logistical challenges due to inadequate storage facilities and inconsistent collection mechanisms, which have further complicated e-waste management efforts. Despite these challenges, several best practices have been observed. Some universities have implemented structured e-waste disposal cycles, ensuring regular and systematic removal of electronic waste. Other universities have introduced decentralized collection systems, placing e-waste disposal bins in various locations to encourage student and staff participation. Additionally, long-term contracts with certified recyclers, as practiced by one of the universities, have proven effective in ensuring compliance with environmental regulations and streamlining the disposal process.

Future Research Directions

While this study has provided valuable insights into e-waste management at Malaysian public universities, further research is needed to explore additional aspects of sustainable e-waste practices. In the future, research should concentrate on quantifying e-waste generation trends across universities to develop data-driven policies. Additionally, comparative research with international universities could provide insights into global best practices that could be adapted to the Malaysian context.

Moreover, research on how technology may improve e-waste management, such as digital tracking tools and waste sorting systems powered by artificial intelligence, could assist universities develop innovative solutions to enhance efficiency. Finally, examining the economic viability of e-waste recycling programs in universities could provide a better understanding of how sustainability efforts can be aligned with financial considerations.

Concluding Remarks

In conclusion, effective e-waste management is essential for Malaysian public universities to promote sustainability and environmental responsibility. Although universities face significant challenges, including awareness gaps, policy limitations, bureaucratic inefficiencies, and storage constraints, various best practices have demonstrated that these obstacles can be overcome. By implementing structured policies, enhancing awareness, streamlining administrative processes, and fostering collaborations with recyclers, universities can develop more sustainable and efficient e-waste management systems. Moving forward, continued research and innovation in this area will be crucial in ensuring that Malaysian universities play a leading role in promoting responsible electronic waste disposal practices.

Author Contributions

Rushanim: Writing - original draft, Conceptualization. **Nurul Azita**: Methodology, Visualization. **Jafni Azhan:** Data analysis and Validation. **Fadhilah:** Writing - reviewing, and editing.

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References

Adeel, S., Nayab, A., Qureshi, M. U., & Channa, K. A. (2023). University Students' Awareness of E-waste and Its Disposal Practices in Pakistan: A Construction of the Conceptual Framework. Journal of Material Cycles and Waste Management, May, 1–14.

Ahmad, S., Akram, M., Husain, D., Ahmad, A., Sharma, M., Prakash, R., & Ahmed, M. (2023). Ecological Footprint Assessment of e-Waste Recycling. In Environmental Assessment of Recycled Waste (pp. 67-83). Singapore: Springer Nature Singapore.

Andeobu, L., Wibowo, S., & Grandhi, S. (2021). A systematic review of e-waste generation and environmental management of Asia Pacific countries. International Journal of Environmental Research and Public Health, 18(17), 9051.

Baba-Nalikant, M., Syed-Mohamad, S. M., Husin, M. H., Abdullah, N. A., Mohamad Saleh, M. S., & Abdul Rahim, A. (2023). A Zero-Waste Campus Framework: Perceptions and Practices of University Campus Community in Malaysia. *Recycling*, 8(1), 21. https://doi.org/10.3390/recycling8010021

Bernama. (2024, September 15). Balancing Malaysia's digital growth and e-waste management. Retrieved from https://www.bernama.com/en/thoughts/news.php?id=2332110

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health, 11(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806

Cohen, L., Manion, L., & Morrison, K. (2018). Research methods in education. 8th Edition. New York: Routledge.

Creswell, J. W. & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Fifth Edition. SAGE Publications, Inc.

Dayaday, M. G., & Galleto, F. A. (2022). Electronic waste (E-waste) Management of Higher Education Institutions in South Central Mindanao, Philippines. Environment and Natural Resources Journal, 20(5), 534-542.

Department of Environment Malaysia. (2020). What is E-waste? Retrieved from https://ewaste.doe.gov.my

Garg, S., Ahmad, A., Øivind Madsen, D., & Sohail, S. S. (2023). Sustainable Behavior with Respect to Managing E-Wastes: Factors Influencing E-Waste Management among Young Consumers. International Journal of Environmental Research and Public Health, 20(1), 801.

Ghulam, S. T., & Abushammala, H. (2023). Challenges and Opportunities in the Management of Electronic Waste and Its Impact on Human Health and Environment. Sustainability, 15(3), 1837.

Hashim, R., Salleh, N. A., Ibrahim, J. A., Zahari, F. M., & Cooper, S. (2024). E-Waste Management Practices Through the Eyes of Responsible Departments at Malaysian Public Universities. Journal of Advanced Research in Applied Sciences and Engineering Technology, 52(1), 309-319.

Islam, M. T., Dias, P., & Huda, N. (2021). Young consumers' e-waste awareness, consumption, disposal, and recycling behavior: A case study of university students in Sydney, Australia. Journal of Cleaner Production, 282, 124490.

Ismail, H., & Hanafiah, M. M. (2021). Evaluation of e-waste management systems in Malaysia using life cycle assessment and material flow analysis. Journal of Cleaner Production, 308, 127358.

Janmaimool, P., & Khajohnmanee, S. (2019). Roles of environmental system knowledge in promoting university students' environmental attitudes and pro-environmental behaviors. Sustainability, 11(16), 4270.

Khan, S. A., Ahmed, W., Najmi, A., & Khalid, R. (2023). University Students' Awareness of E-Waste and Its Disposal Practices: A Case Study of Pakistan. Frontiers in Psychology, 14, 10219800. https://doi.org/10.3389/fpsyg.2023.10219800

Malay Mail. (2025, February 7). The growing e-waste crisis in Malaysia: What you need to know and how to act. Retrieved from https://www.malaymail.com/news/malaysia/2025/02/07/the-growing-e-waste-crisis-in-malaysia-what-you-need-to-know-and-how-to-act/164970

Nanath, K., & Ajit Kumar, S. (2021). The Role of Communication Medium in Increasing E-waste Recycling Awareness Among Higher Educational Institutions. International Journal of Sustainability in Higher Education, 22(4), 833-853.

Phrophayak, J., Techarungruengsakul, R., Khotdee, M., Thuangchon, S., Ngamsert, R., Prasanchum, H., Sivanpheng, O., & Kangrang, A. (2024). Enhancing Green University Practices through Effective Waste Management Strategies. Sustainability, 16(8), 3346.

Yusof, Y., Tun Ismail, W. N. A., Mohd Noor, N. A. A., & Abu Bakar, M. A. (2023). E-Waste Management Toward Environmental Sustainability in Malaysia. In Sustainability Challenges in Malaysia (pp. 240-260). Springer, Singapore. https://doi.org/10.1007/978-981-19-8767-1_12