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An Exploratory Study on E-Waste Reporting: A Review of Annual Reports from Malaysian Public Listed Companies

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ABSTRACT:
Electronic waste (e-waste) has emerged as a critical global issue due to the environmental and health impacts. Moreover, a significant portion remains unrecorded and improperly managed. Hence, effective e-waste management is crucial to mitigating associated risks and ensuring environmental sustainability. The current study examined e-waste reporting practices among Malaysian Public Listed Companies (PLCs), assessed PLC commitments to environmental sustainability, and explored the legitimacy theory in understanding e-waste reporting.
This study focused on Malaysian PLCs. The sample comprises 114 PLCs distributed across various sectors, such as construction, consumer products and services, energy, financial services, healthcare, and technology, which represented 15% of the total population. A content analysis approach was employed to identify relevant information in annual reports. Subsequently, a categorisation scheme with eight content categories across four dimensions was adapted from previous research to analyse e-waste reporting practices.
The findings revealed that the e-waste reporting among PLCs was low as the information was primarily declarative and neutral. Varying commitment levels were also observed across different sectors, which highlighted the communication methods of PLCs on e-waste management practices. The legitimacy theory was applied to appraise the factors contributing to e-waste reporting behaviours.
The findings contributed to a deeper understanding of how different industries managed e-waste and valuable insights into the most optimal practices to be adopted across sectors. The study results also underscored the need for standardised reporting frameworks to enhance transparency and corporate responsibility towards environmental sustainability.

Keywords: E-waste Reporting, Malaysian Public Listed Companies, Legitimacy Theory, Environmental Sustainability, Content Analysis

1. Introduction

The Environmental Protection Agency 2016 defined waste as "anything that is unwanted or unusable and is generally classified as hazardous or non-hazardous and includes, among others, plastic, garbage, chemical waste, organic waste, nuclear waste". Similarly, electronic waste (e-waste) or waste electrical and electronic equipment (WEEE)

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will be produced when electrical and electronic equipment have exhausted usability and become obsolete before being discarded without the intention to reutilise (Abd-Mutalib et al., 2023). The rapid increase in the e-waste amount due to the increasing demand for electronic and electrical equipment (EEE) has become a growing global concern. The global e-waste production in 2022 reached 62 million metric tonnes (Mt), which doubled the amount in 2010. Comparatively, waste management systems remain inadequate, with above 75% of e-waste unrecorded. Only 22.3% of global e-waste at approximately 14 million Mt was documented as collected and properly recycled in 2022 (Alves et al., 2024).

E-waste has emerged as a crucial issue owing to negative impacts on the environment, human beings, and animals. Mercury, lead, cadmium, beryllium, polyvinyl chloride (PVC), and bromine are several dangerous substances existing in e-waste (DOE, 2020). For example, cadmium is carcinogenic and could damage soil health and the ecosystem when being incinerated, whereas mercury is harmful to the body, brain, and nervous system (DOE, 2020). Previous studies discovered that being exposed to e-waste could lead to more spontaneous abortions and premature deliveries (Grant, 2019). Individuals residing or working in or near e-waste recycling sites exhibited more deoxyribonucleic acid (DNA) damage. Furthermore, e-waste can cause changes in thyroid functions and impair lung functions. Effective e-waste treatment is essential for a healthy environment due to the detrimental effects of e-waste on the environment, humans, and animals (Grant, 2019).

Baldé et al. (2017) underscored significant challenges across Asian countries in effectively collecting and recycling e-waste, which produced a significant gap between generated and properly recycled waste. The disparity not only poses environmental hazards but also risks exposing vulnerable groups, such as women, children, and teenagers, to the toxicity associated with improperly managed e-waste (WHO, 2021). Hence, urgent and effective regulatory actions are imperative to safeguard public health and mitigate environmental degradation stemming from e-waste mismanagement (Murthy and Ramakrishna, 2022). Governments and regulators have emphasised business organisations to properly dispose of e-waste and to report employed actions on obsolete EEE for business operations to reduce the detrimental impacts of improperly managed e-waste. For instance, e-waste reporting under the environmental aspect of sustainability is compulsory in the current Malaysian sustainability reporting guide (Rudyanto and Pirzada, 2021).

The current study aims to examine the commitment of publicly listed companies (PLCs) towards environmental sustainability, especially in e-waste management as portrayed in their annual reports. The study objectives are as follows:

i. To identify the e-waste reporting of Malaysian PLCs.
ii. To determine the extent of e-waste reporting by the number of sentences.
iii. To assess the news type of e-waste reporting, namely 'good news', 'bad news', or neutral;
iv. To evaluate e-waste reporting methods, namely monetary, non-monetary, or declarative;
v. To pinpoint the e-waste reporting location in the annual report, namely the chief executive officer's statement, sustainability or environmental reporting, or other sections;

vi. To determine the applicability of the legitimacy theory in delineating e-waste reporting.

2. Literature Review

2.1. Legitimacy theory

The legitimacy theory is one of the commonly employed theories in social and environmental reporting research (Buniamin et al., 2008; Haladu and Salim, 2016; Ofoegbu et al., 2018). Legitimacy is defined as a link between organisational operations and public expectations based on the concept of a social contract, which confines organisational behaviours to the standards prescribed by society (Woodward et al., 1996). The organisation will continue to operate and receive support from stakeholders if relevant operations are safe or useful to society. Contrarily, the organisation will be required to bridge the legitimacy gap by enhancing the current performance, managing societal expectations, improving public perceptions of organisational performance, or deflecting the general public attention from the current issue (Lindblom, 1994). One of the most effective strategies for educating stakeholders to close the legitimacy gap is disclosure in the company report.

The legitimacy theory is considered a valid explanation for the sudden increase in environmental disclosure that occurred recently as businesses seek to operate more sustainably (Braam et al., 2016; Prasad et al., 2017). The theory posits that business firms must engage in sustainability activities to prove respective rightfulness (Deegan, 2002; Sulaiman et al., 2014) to ensure quality and sufficient resources in fulfilling sustainability commitments. The theory was also applied in the present study owing to a comprehensive framework provided for thoroughly comprehending the motivations and implications behind e-waste reporting. Simultaneously, the framework could aid in elucidating the rationales of Malaysian PLCs disclosing e-waste management practices, the approaches to addressing legitimacy gaps, and the role of transparency and accountability in maintaining legitimacy. Resultantly, deeper insights into the corporate committments and communication strategies on sustainable practices to respective stakeholders were provided.

2.2 Sustainable Development Goals (SDGs)

Sustainable development goals advocate development in fulfilling present needs without compromising the ability of future generations to fulfil respective needs (United Nations, 2015). The SDGs consist of 17 goals from 2015 to 2030 as illustrated in Figure 1. Global experts' knowledge and the opinions of governments, organisations, educational institutions, and millions of citizens were incorporated to establish the SDGs, which could significantly benefit individuals, communities, small businesses, and large corporations (Jones et al., 2016).

Figure 1: Sustainable Development Goals (SDGs)

Inadequate e-waste treatment poses serious health risks due to hazardous components that can contaminate air, water, and soil, which will endanger human health. Dismantling processes without proper means, facilities, and trained personnel also exacerbate the negative impacts on both humans and the planet. Thus, effective waste management plays a crucial role in achieving sustainable development by addressing environmental, social, and economic challenges. Aligning waste management practices with the SDGs can assist Malaysia in significantly contributing to global efforts towards a more sustainable future. A comprehensive understanding with effective e-waste management practices will assist in accomplishing several goals stipulated in the 2030 Agenda for Sustainable Development adopted by Malaysia in 2016. The goals include SDG 3 (Good Health and Well-being), SDG 6 (Clean Water and Sanitation), SDG 8 (Decent Work and Economic Growth), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 14 (Life Below Water).

2.3 Electrical and electronic waste (E-waste)

The evolution of electrical and electronic devices has revolutionised individuals' lives in households, offices, communication networks, and other aspects. Nonetheless, rapid innovation and the need for smarter EEE have generated a massive e-waste amount, which is one of the rapidly growing waste and environmental issues worldwide (Forti et al., 2018). According to Nik Azman et al. (2022), e-waste originates from numerous sources, including households, businesses, and governments, and encompasses six categories, namely temperature exchange equipment, screens and monitors, lamps, large equipment, small equipment, and small information technology (IT) and telecommunication equipment.

Alves et al. (2024) demonstrated Asia accounts for approximately half of the global e-waste with China being the largest producer. Nevertheless, Europe generates the highest e-waste amount per capita with approximately 18 kilograms per individual in 2022. The DOE data demonstrated that Malaysia generated 2,459 tonnes of household e-waste in 2021. Annually, Malaysia produces over 365,000 tonnes of e-waste, which surpasses the combined weight of the Petronas Twin Towers. Therefore, a significant concern exists about the total e-waste production in Malaysia, which has reached 280,000 tonnes equivalent to 8.8 kilograms per capita. While Malaysia transitions from a middle-to-high-income to a high-income nation, e-waste production is expected to increase. Malaysia is projected to generate over 24.5 million units of e-waste by 2025 (Akhtar and Tsang, 2024).

Summarily, e-waste is the globally fastest-growing domestic waste stream spurred by higher EEE usage rates, short life cycles, and limited options for repair.

2.4 E-waste accountability and reporting research in Malaysia

Malaysian awareness concerning e-waste and corresponding impacts is low (Mahat et al., 2019). Nevertheless, Ya'acob et al. (2022) discovered that Malaysian public awareness of e-waste was on an increasing trend as the PLCs in recent years have been motivated to provide environmental information to account for internal and external factors, such as stakeholders' and investors' concerns and pressures on environmental issues (Bram et al., 2020). Environmental reporting is considered a significant component of corporate responsibility to stakeholders. Nevertheless, the quality and level of environmental information disclosed by Malaysian PLCs require further improvements compared to international practices (Asibey et al., 2023). Several studies also discovered that corporate governance factors and characteristics, including board size, board independence, and ownership structure, were significantly associated with environmental reporting (Shwairef et al., 2021).

The Malaysian Code of Corporate Governance 2021 delineates that the board of directors is primarily responsible for long-term corporate success and the delivery of sustainable value to shareholders and stakeholders, including environmental, social, and governance sustainability. According to Alrazi et al. (2015), external determinants encompass stakeholder pressure (regulators and media), geographical locations, and industrial factors. For example, media coverage or mass media is recognised as the primary source of environment-related information (Liu et al., 2023), which enables interactions between users and facilitates public discussions.

Prior research on environmental reporting was continuously conducted in Malaysia, (Abd-Mutalib et al., 2023), although insufficient studies were conducted on e-waste reporting. Currently, only three relevant studies exist, namely Abd-Mutalib et al. (2021), Selahudin et al. (2021), and Nik Azman et al. (2022), which could be due to inadequate e-waste indicators. For instance, Nik Azman et al. (2022) reported only one e-waste indicator stipulated under the Sustainability Reporting Guide for PLCs. A specific provision for e-waste information exists, in which corporations from the technology and telecommunications sectors are recommended to disclose the "amount of e-waste disposed of (Bursa Malaysia, 2018, p. 68). The indicator should be mandatory for all industries to disclose e-waste reporting as Malaysia is moving towards digital economy. Relevant firms should announce respective obligations in managing e-waste to facilitate and support the corporate sustainability and societal values.

E-waste management has become a focal point of extensive research and discourse in Malaysia (Sofian et al., 2023). The Malaysian government has implemented various initiatives to resolve the increasing e-waste challenges. The initiatives encompass rigorous data collection on e-waste generation, the enforcement of stringent regulatory frameworks, and the exclusive authorisation of licensed facilities for e-waste treatment and recovery processes (Saha et al., 2021). Nevertheless, Saha et al. (2021) advocated for stricter regulations to ensure comprehensive collection, processing, and recovery of all e-waste by accredited facilities. Establishing robust standards to safeguard both environmental integrity and the well-being of personnel involved in e-waste management is pivotal.

Continuous monitoring and strategic planning are also essential to enhance the efficacy of e-waste management practices across Malaysia.

Previous research on e-waste reporting in Malaysia concentrated more on addressing citizens' awareness of e-waste issues and management compared to the commitment and reporting of business organisations. While past researchers extensively examined environmental reporting or waste disclosure among Malaysian PLCs (Abdulrazak and Amran, 2017; Buniamin et al., 2011; Khan et al., 2013), scarce evidence was available on e-waste disclosure. Recently, Nik Azman and Salleh (2020) and Abd-Mutalib et al. (2021) elucidated the state of e-waste reporting and commitment among Malaysian companies in the technology and telecommunications sectors. Nik Azman and Mohd Salleh (2020) demonstrated only 57% of firms disclosed e-waste information, which indicated improvement areas in transparency and accountability. Abd-Mutalib et al. (2023) also revealed that only 15.79% of sampled firms announced explicit commitments to e-waste management in annual reports, which signified inadequacies in corporate sustainability initiatives despite potential environmental benefits.

3 Methodology

3.1 Sample selection and data collection

The study population comprises PLCs on Bursa Malaysia. According to Bursa Malaysia (2022), every PLC is required to disclose a sustainability statement and environmental policies. A total of 777 enterprises were listed on Bursa Malaysia in 2022. This study included all 2022 annual reports published during the data collection process. Annual reports were assessed to identify the existence of e-waste reports. The current sample included only 114 companies. While the sample size represented only 15% of the total number of companies (see Table 1), the companies were evenly distributed across sectors, namely, construction, consumer products and services, energy, financial services, healthcare, industrial products and services, plantation, property, real estate investment trusts, technology, telecommunication and media, transportation and logistics, and utilities. The list of companies is detailed in Appendix A.

Table 1: Population and Sample Distribution

Sector	Population	Sample	Population Representation
Construction	51	5	10%
Consumer Products and Services	169	16	9%
Energy	28	3	11%
Financial Services	30	6	20%
Healthcare	17	1	6%
Industrial Products and Services	222	31	14%
Plantation	41	8	20%
Property	100	6	6%
Real Estate Investment Trusts	20	4	20%
Technology	43	14	33%
Telecommunications and Media	16	9	56%

Transportation and Logistics	29	6	21%
Utilities	11	5	45%
Total	**777**	**114**	**15%**

3.2 E-waste disclosure measurement

According to Krippendorf and Lough (2005), content analysis is a research technique to perform replicable and valid inferences from texts or other meaningful subjects. E-waste-related keywords, including 'e-waste', 'electronic waste', 'electrical waste', 'e-scrap', 'WEEE', and 'end-of-life electronics', were employed to search for relevant information to identify corporate e-waste reporting. According to Milne and Adler (1999), constructing a categorisation scheme is an essential stage in content analysis research, which involves selecting and developing categories for pertinent content units (Tilling and Tilt, 2010). The measurement instrument contains eight content categories within four testable dimensions. The measurement was adopted from Nik Ahmad et al. (2003) and Alrazi (2014) as follows:

i. Disclosure amount: The number of sentences
ii. News type: Good news, bad news, and neutral
iii. Evidence: Monetary, non-monetary, and declarative
iv. Locations in annual reports: The chief executive officer's statement, sustainability or environmental reporting, or other sections

Definitions of each e-waste reporting category were provided to ensure a reliable coding process. The details of each category are presented in Table 2. Specifically, the two researchers received a detailed briefing from the first researcher on what constituted e-waste reporting and an explanation of different reporting categories and disclosure types. The first researcher employed several different annual reports to illustrate various disclosure types. Subsequently, each researcher was provided with several annual reports for categorisation. The researchers reviewed the categorisation and classification upon completing the preliminary round of classification. The three researchers also regularly updated each other and discussed any issues encountered during the process. Any ambiguities regarding disclosure items were also thoroughly reviewed.

Table 2: E-Waste Categorisation and Classification

Category	Sub-Category	Description
Disclosure Amount	N/A	The number of disclosed sentences in the annual report.
News Type	Good News	"Statements beyond the minimum which include (for example) specific details where these details have a creditable or neutral reflection on the company; any statement which reflects credit on the company; upbeat analysis/discussion/ statements." (Gray, 2006, p. 99)
	Bad News	"Any statement which reflects/might reflect discredit on the company." (Gray, 2006, p. 99)
	Neutral News	"Statement of policy or intent within statutory minimum with no details of what or how; statement of facts whose credit/discredit to the company is not obvious – which are unaccompanied by editorialising." (Gray, 2006, p. 99)

Evidence	Monetary	"All environmental information expressed in monetary terms." (Niskala & Pretes, 1995, p. 457)
	Non-Monetary	"Environmental measures such as emissions levels and forest materials consumed in production by volume." (Niskala & Pretes, 1995, p. 457)
	Declarative	"All verbal disclosure." (Niskala & Pretes, 1995, p. 457)
Location in the Report	N/A	The location of e-waste reporting in the annual report.

Source: Alrazi, 2014

3.3 Analyses and results

E-waste management and reporting have become increasingly significant to ensure corporate sustainability and environmental responsibility. Table 2 offers a comprehensive insight into the approaches employed by Malaysian PLCs across different sectors in disclosing e-waste management efforts in annual reports. Four categories were discovered after measuring e-waste disclosure, namely evidence, news types, disclosure amounts, and locations in the annual report. Table 3 depicts the disclosure amount, which refers to the number of sentences reported in the annual report as a quantitative analysis of e-waste reporting. Table 3 also highlights the minimum and maximum degrees of disclosure to understand the reporting patterns. The minimum and maximum numbers of sentences are based on the individual sample company. Specifically, the results demonstrated varying degrees of engagement and transparency among Malaysian PLCs across different sectors.

Table 3: The Disclosure Amount

Sector	Number of Samples	Total	Minimum	Maximum
Construction	5	15	1	6
Consumer Products and Services	16	36	1	8
Energy	3	10	1	5
Financial Services	6	20	1	5
Healthcare	1	2	2	2
Industrial Products and Services	31	50	1	7
Plantation	8	8	1	1
Property	6	15	1	9
Real Estate Investment Trusts	4	16	1	9
Technology	14	46	1	12
Telecommunications and Media	9	36	1	9
Transportation and Logistics	6	12	1	6
Utilities	5	13	1	5
Overall	**114**	**279**	**2**	**12**

Sectors directly involved with technological products and services, such as technology, telecommunications, and media, achieved higher total and maximum sentences of disclosure. The findings reflected higher responsibility and possibly stricter

regulatory scrutiny in e-waste management. These sectors are inherently more engaged in the utilisation and disposal of electronic devices. Due to their e-waste management policies, these businesses are consequently under increased scrutiny from environmental organisations and consumers. As a result, the study indicated higher accountability and potentially more rigorous regulatory oversight in the management of electronic waste.

This discrepancy can partly be attributed to specific reporting standards, such as the Sustainability Accounting Standards Board (SASB) guidelines. For instance, SASB requires technological sectors to disclose metrics like the "Weight of end-of-life products and e-waste recovered, percentage recycled," applicable to industries such as Electronic Manufacturing Services, Hardware, and Original Design Manufacturing. Another SASB requirement is the "disclosure of compliance standards for entities to which e-waste is transferred", applying to sectors like Fuel Cells & Industrial Batteries, Semiconductors, and Telecommunications Services.

Additionally, the Bursa Malaysia Sustainability Reporting Guide mandates that companies in the technology and telecommunications sectors provide specific disclosures on the "amount of e-waste disposed of". These standards create an environment where companies within these sectors are subject to more rigorous reporting requirements, potentially driving the higher levels of e-waste disclosure observed in this study.

The consistent minimum disclosure amount across sectors also indicated that e-waste management is universally recognised as an integral issue despite varying reporting levels. Furthermore, the significant difference between minimum and maximum disclosure sentences within sectors highlighted a disparity in reporting practices. While certain firms provided detailed accounts of e-waste management efforts, other corporations offered minimal information that might impact stakeholders' abilities to comprehensively assess corporate sustainability commitment. To achieve standardisation in e-waste reporting across industries, it may be necessary for the authorities to take a proactive approach in monitoring and enforcing regulations, in order to enhance the degree of e-waste disclosure.

The legitimacy theory was applied and the disclosure patterns posited that companies in highly scrutinised sectors might disclose more to align existing operations with societal expectations to maintain legitimacy. Comprehensive reporting assists in establishing trust and credibility with stakeholders, whereas minimal disclosures might reflect a strategic choice to avoid potential negative scrutiny. The variability demonstrates the differences in the perceived importance of e-waste management, stakeholder pressure, and regulatory requirements. Therefore, companies should strive for more detailed and consistent reporting on e-waste management practices to enhance transparency and stakeholder trust. The balanced approach can demonstrate a genuine commitment to sustainability, which is consistent with societal expectations and contributes to more environmental practices and corporate accountability.

Table 4 portrays the news types, which provide a detailed breakdown of how different sectors report e-waste management practices. The three news types are good, bad, or neutral news, which assist in comprehending the overall sentiment and approach of Malaysian PLCs in communicating e-waste initiatives via annual reports. The good news in e-waste reporting encompasses positive information, such as successful initiatives and achievements. Statements exceeding the minimum number of sentences positively or neutrally reflected the company, including specific details and upbeat analysis. The data

revealed that the majority of e-waste reporting by Malaysian PLCs was classified as good news, with a total of 169 sentences. Sectors, such as technology and consumer products and services, led the category with 28 and 27 sentences respectively, which indicated a proactive approach to highlighting positive aspects of e-waste management practices. Telecommunications and media sectors also highly performed with 22 sentences, which demonstrated a strong commitment to transparent and positive e-waste reporting.

Table 4: The News Types of E-Waste Reporting

Sector	Good News	Bad News	Neutral	Total
Construction	11	0	4	15
Consumer Products and Services	27	2	7	36
Energy	7	0	3	10
Financial Services	16	0	4	20
Healthcare	2	0	0	2
Industrial Products and Services	15	1	34	50
Plantation	2	0	6	8
Property	8	0	7	15
Real Estate Investment Trusts	16	0	0	16
Technology	28	0	18	46
Telecommunications and Media	22	1	13	36
Transportation and Logistics	7	0	5	12
Utilities	8	1	4	13
Total	**169**	**5**	**105**	**279**
Percentage	**60%**	**2%**	**38%**	**100%**

The bad news refers to any statement that reflects or may reflect poorly on the company, including disclosures of failures or challenges in managing e-waste. The bad news was the least reported category in the present study, with only five sentences in total equivalent to 2% of the total reported e-waste. Firms from the sectors of consumer products and services, industrial products and services, telecommunications and media, and utilities reported bad news sentences, in respective annual reports. The findings posited minimal negative disclosures related to e-waste management. Meanwhile, neutral news provides information that is neither explicitly positive nor negative, which offers a balanced perspective on e-waste management efforts. A total of 105 neutral sentences existed in the current study, with the industrial sector leading with 34 sentences and indicating a predominant focus on factual reporting without clear credit or discredit. Particularly, 50 neural sentences reported by the industrial product and service sector was the primary reporting trend. Contrarily, other sectors, such as healthcare and real estate investment trust sectors emphasised positive approaches to e-waste management, which contributed to a comprehensive overview of industrial practices.

The prevalence of good news across sectors reflected a strategic emphasis on showcasing positive e-waste management practices. The results aligned with the legitimacy theory, wherein companies sought to enhance public image and maintain stakeholder

support through positive disclosures to be consistent with societal expectations (Gray et al., 1995). The scarcity of bad news suggested that corporations were cautious about disclosing negative aspects of e-waste management practices to avoid reputational damage or maintain a positive corporate image. The strategic silence on negative aspects underscored the selective nature of corporate disclosures in annual reports. Meanwhile, the prevalence of neutral news demonstrated a careful approach to e-waste reporting by focusing on factual statements complying with regulatory requirements without overtly influencing stakeholder perceptions. The approach postulated a combination of transparency and discretion in corporate reporting practices. Table 4 also revealed significant variations in e-waste reporting practices. The industrial sector was the most active in e-waste reporting, with a total of 50 instances primarily announcing neutral news. The technology and consumer products and services sectors provided 46 and 36 total instances respectively, with a stronger emphasis on good news. The healthcare sector was the least active, with only two positive instances.

Table 5 categorises e-waste reporting into three main types, namely monetary, non-monetary, and declarative. Each type provided unique insights into how companies communicate commitment and efforts towards managing e-waste. The breakdown of reporting types further elucidated the strategies employed in communicating e-waste efforts. While only a marginal percentage of companies opted for monetary reporting and expressing e-waste efforts in financial terms, most firms preferred non-monetary and declarative reporting. Monetary evidence, which encompassed financial data related to e-waste management, was limited, with only one instance observed in the real estate investment trust sector. The finding represented only 0.36% of the total reporting instances, which suggested that financial aspects of e-waste management were rarely disclosed in the annual reports of Malaysian PLCs.

Non-monetary evidence included quantitative data not financial in nature, such as the amount of e-waste generated or recycled and the number of initiatives implemented by the company. Non-monetary evidence accounted for 17.20% of the total annual reports, which were observed across several sectors with the highest occurrences in the consumer product and service and telecommunication and media sectors (eight and nine instances respectively). While non-monetary reporting was more common than monetary reporting, non-monetary reporting represented a relatively small portion of the overall reporting practices. Comparatively, declarative evidence involving narrative descriptions and qualitative information about e-waste management practices, policies, and achievements was the predominant method. A total of 230 declarative instances were discovered, which constituted 82.44% of the total reported sentences. The highest numbers were observed in the industrial product and service sector with 44 sentences and the technology sector with 41 sentences. The high usage of declarative reporting propounded that enterprises preferred qualitative over quantitative disclosures of e-waste reporting.

A sector-wise analysis demonstrated significant variations in e-waste reporting practices. The consumer product and service sector led the number of total reports, with a significant emphasis on declarative reporting (28 out of 36 total sentences). The industrial sector also demonstrated a high reporting level with 50 sentences, especially declarative (44). Similarly, the technology sector was active in e-waste reporting with 46 sentences that

were primarily declarative (41). Meanwhile, the utility sector exhibited the least overall reporting with only 13 sentences, which were primarily declarative (10). The healthcare sector demonstrated minimal engagement with only two declarative reports. Notably, the real estate investments trust sector was unique in containing the sole instance of monetary reporting, which underscored the potential improvement area in other sectors.

Table 5: Evidence on Monetary, Non-Monetary, and Declarative E-Waste Reporting

Sector	Monetary	Non-Monetary	Declarative	Total
Construction	0	4	11	15
Consumer Products and Services	0	8	28	36
Energy	0	2	8	10
Financial Services	0	5	15	20
Healthcare	0	0	2	2
Industrial Products and Services	0	6	44	50
Plantation	0	2	6	8
Property	0	2	13	15
Real Estate Investment Trusts	1	2	13	16
Technology	0	5	41	46
Telecommunications and Media	0	9	27	36
Transportation and Logistics	0	0	12	12
Utilities	0	3	10	13
Total	**1**	**48**	**230**	**279**
Percentage	**0.36%**	**17.20%**	**82.44%**	**100%**

Table 6 provides a detailed breakdown of the locations in the annual reports where Malaysian PLCs disclose e-waste initiatives, namely the chief executive officer's (CEO) statement, sustainability or environmental reporting, and other sections. The CEO's statement section generally serves as a strategic platform for communicating key messages and priorities directly from top management to stakeholders. This study discovered the presence of disclosures in the CEO's statement section was minimal across sectors, with only three companies from the sectors of consumer products and services, property, and utilities reporting e-waste initiatives. The limited representation suggested that e-waste management might not be perceived as a high strategic priority by CEOs in the three sectors. Contrastingly, other sustainability or operational issues might be more frequent in direct communications from executive leadership. The majority of e-waste disclosures were concentrated in the sustainability or environmental sections of annual reports, which reflected a deliberate effort to integrate environmental considerations with broader sustainability narratives.

Table 6: Locations of E-Waste Reporting in Annual Reports

Sector	Sample	CEO's Statement		Sus. / Env. Report	Others		Total
		N	%	N	N	%	%

Construction	5	0	0	4	80	1	20	100
Consumer Products and Services	16	1	6	14	88	1	6	100
Energy	3	0	0	1	33	2	67	100
Financial Services	6	0	0	6	100	0	0	100
Healthcare	1	0	0	0	0	1	100	100
Industrial Products and Services	31	0	0	28	90	3	10	100
Plantation	8	0	0	7	88	1	12	100
Property	6	1	17	4	66	1	17	100
Real Estate Investment Trusts	4	0	0	2	50	2	50	100
Technology	14	0	0	14	100	0	0	100
Telecommunications and Media	9	0	0	5	56	4	44	100
Transportation and Logistics	6	0	0	6	100	0	0	100
Utilities	5	1	20	3	60	1	20	100
Overall	**114**	**3**	**3**	**94**	**82**	**17**	**15**	**100**

Note: Sus. / Env. Report = Sustainability or Environmental Report**.**

Table 6 portrays that 94 companies (82%) report e-waste initiatives in the sustainability or environmental section to emphasise commitment to environmental stewardship and respond to stakeholder expectations for transparent reporting on sustainability initiatives. Specifically, all companies from the sectors of financial services, technology, and transportation and logistics perform e-waste reporting in this section. The remaining 17 companies (15%) reported e-waste in the 'Others' section, which included corporate value, management discussion, highlights, and leadership insights. The findings posited varied integration approaches in the annual reports, in which certain sectors incorporated e-waste management information into operational or compliance-related sections to adhere to sector-specific reporting norms or regulatory requirements.

4. Discussion

E-waste management has become increasingly significant for Malaysian PLCs, which reflects the broader trends towards corporate sustainability and environmental stewardship. The findings demonstrated several significant insights into organisational approaches and disclosures of respective e-waste management efforts. Particularly, Malaysian PLCs across different sectors employed varied e-waste reporting methods, which ranged from minimal to detailed disclosures. Sectors directly involved in technological and industrial activities, such as technology and industrial sectors, led in both the total number and depth of disclosures. The results propounded a proactive stance in addressing e-waste issues potentially driven by regulatory requirements, stakeholder expectations, and operational impacts. In addition, the majority of e-waste disclosures were primarily declarative, which indicated a tendency to provide narrative descriptions rather than quantitative or monetary metrics. The approach aligned with the legitimacy theory, wherein corporations emphasised respective commitment to societal expectations through qualitative disclosures. Nevertheless, the limited usage of quantitative reporting metrics

might hinder stakeholders' abilities to assess the tangible impacts and effectiveness of e-waste management practices. Furthermore, information expressed in declarative (or narrative) form is less objective, usually not verified, and thus, subjected to manipulation (Alrazi, 2014). This approach could also help companies manage stakeholder perceptions by avoiding the accountability and scrutiny associated with specific quantitative metrics, allowing them to present their sustainability initiatives in a more favorable light.

The current results discovered the prevalence of good news reporting, which suggested a strategic emphasis on positive outcomes and initiatives related to e-waste management. The results corresponded to the broader corporate communication strategy aimed at enhancing reputational capital and maintaining stakeholder trust. Contrarily, the limited instances of bad news reporting underscored potential challenges or negative impacts associated with e-waste practices that might be underreported or mitigated through framing techniques. Meanwhile, e-waste disclosures were primarily available in the sustainability or environmental section of annual reports across most sectors. The strategic placement highlighted corporate efforts to integrate e-waste management into broader sustainability narratives in enhancing transparency and demonstrating proactive environmental stewardship. Nonetheless, the minimal presence of e-waste disclosures in the CEO's statement section postulated a potential gap in aligning e-waste issues with top-level strategic priorities and direct CEO communication. CEOs play a critical role in corporate sustainability, and their visibility on issues like e-waste can signal its importance across the organization. As modern leadership adopts the "triple bottom line" framework, which balances people, planet, and profit, CEOs are expected to align their companies with broader environmental goals, including waste management and recycling initiatives (Boeske, 2023), thereby incorporating e-waste management into the broader scope of Environment, Social and Governance (ESG) and ethical leadership.

4.1 Implications and recommendations

Malaysian PLCs should consider enhancing the depth and specificity of disclosures to strengthen e-waste reporting practices. Quantitative metrics can be included whenever feasible, such as the recycled or reutilised e-waste volumes, costs associated with disposal, and environmental impact assessments. Data-driven disclosures not only provide stakeholders with clearer insights but also demonstrate measurable progress towards sustainability goals. Nevertheless, the current low e-waste reporting level among PLCs could be owing to a lack of comprehensive reporting guidelines. Without addressing these inconsistent guidelines, PLCs may continue to face significant challenges in reporting, ultimately hindering Malaysia's sustainability efforts. Revisiting and updating these guidelines are therefore critical for ensuring that companies can meet stakeholder expectations and align with global best practices.

Nik Azman et al. (2022) revealed that the three guidelines, namely the Global Reporting Initiative (GRI), SASB standards, and Bursa Malaysia sustainability reporting guide, provide inconsistent requirements and insufficient focus on e-waste. Hence, the gap suggests a need to revisit the existing guidelines to ensure more comprehensive, comparable, and consistent reporting in the future. A holistic solution, such as the Corporate E-Waste Accountability Model (CrEAM), would not only address the current gaps but also provide a standardized approach that companies can easily adopt, leading to

more consistent and transparent e-waste reporting across sectors. The revisit could lead to the development of this holistic corporate e-waste accountability model for PLCs, which would support the realisation of Malaysian sustainability and health agendas. A holistic guideline also ensures all PLCs potentially achieve more efficient e-waste reporting and management in the future.

Furthermore, a notable limitation of this study is the reliance on content analysis of annual reports, which may not fully capture all e-waste management practices. Companies might underreport or omit details that are not mandated by regulatory bodies. To gain a more comprehensive view of corporate e-waste activities, future research should consider incorporating other data sources, such as direct interviews, surveys, website reporting or third-party audits. Increasing the CEO's involvement in e-waste reporting can elevate the strategic importance of environmental issues within organisations. The CEOs play a crucial role in developing corporate agendas and communicating priorities to stakeholders. Prioritising e-waste management as a core part of corporate strategy can foster a culture of environmental responsibility and reinforce the organisational commitment to sustainable practices. By making e-waste management a top-down initiative, with direct CEO involvement, companies can shift from merely complying with regulatory standards to becoming industry leaders in sustainability. This commitment would send a powerful message to stakeholders and could inspire sector-wide change.

Moreover, enterprises should tailor reporting approaches to reflect industry-specific challenges and opportunities by recognising the diversity of e-waste impacts across sectors. Sectors with high e-waste generation, such as technology and industrial sectors, should ensure comprehensive disclosures and proactive management strategies. Conversely, sectors with lower impacts can continuously provide meaningful disclosures to reflect the commitment to minimising environmental footprints and complying with regulatory standards. Adhering to evolving regulatory frameworks and adopting the most optimal industrial practices in e-waste management is pivotal to maintaining compliance and enhancing corporate reputation. Firms should frequently be updated with the latest regulatory updates, engage in industrial collaborations, and participate in voluntary reporting initiatives to uphold transparency standards while alleviating reputational risks associated with inadequate e-waste management practices.

The study's findings on the low level of e-waste reporting further underscore the need for future research to develop a more holistic Corporate E-Waste Accountability Model (CrEAM). This model could address current reporting gaps and encourage companies to adopt more transparent and consistent reporting practices, which are vital for enhancing corporate environmental responsibility and achieving sustainability goals. Collaboration between regulatory bodies, industries, and stakeholders will be essential in developing and implementing comprehensive guidelines that ensure transparency, accountability, and environmental responsibility in e-waste management.

5. Conclusion

The current findings provide an in-depth understanding of e-waste reporting among Malaysian PLCs. The findings also underscored the diversity in reporting practices across sectors and emphasised the need for standardised and comprehensive reporting

frameworks to facilitate informed decision-making and foster higher corporate responsibility towards environmental sustainability. While this study highlights the urgent need for such frameworks, future research should critically assess their effectiveness in enhancing transparency and accountability. Evaluating the impact of existing guidelines such as the GRI, SASB standards, and the Bursa Malaysia sustainability reporting guide on e-waste reporting practices is crucial. Understanding how these guidelines influence corporate behavior and identifying areas for refinement will provide valuable insights for developing more effective reporting frameworks.

By thoroughly exploring existing reporting patterns and encouraging the broader adoption of best practices, stakeholders can effectively collaborate in establishing a more transparent and sustainable approach to managing e-waste. Simultaneously, the present insights contributed significant implications to environmental sustainability. Specifically, higher declarative reporting highlighted narrative transparency among Malaysian PLCs. The approach could also benefit from complementary quantitative disclosures to provide a more comprehensive perspective on e-waste management performance

The study's sector-specific findings also highlight opportunities for targeted interventions and policy enhancements. For instance, sectors with lower reporting levels, such as healthcare and utilities, could greatly benefit from tailored guidelines or incentives to improve their disclosure practices. Additionally, encouraging more companies to adopt both monetary and non-monetary reporting can enhance comparability and accountability across the board of directors, enabling stakeholders to better assess corporate e-waste management efforts. In sum, advancing the dialogue on the development and practical effectiveness of standardized reporting frameworks is essential to fostering greater environmental accountability and supporting corporate sustainability goals.

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Appendix A

No.	Company Name	Sector
1	ADVANCECON HOLDINGS BERHAD [S]	CONSTRUCTION
2	AEON CO. (M) BHD [S]	CONSUMER PRODUCTS & SERVICES
3	AMTEL HOLDINGS BERHAD [S]	TELECOMMUNICATIONS & MEDIA
4	ANN JOO RESOURCES BERHAD [S]	INDUSTRIAL PRODUCTS &SERVICES

5	ASTRO MALAYSIA HOLDINGS BERHAD	TELECOMMUNICATIONS & MEDIA
6	PRESTARIANG BERHAD [S]	TECHNOLOGY
7	AXIATA GROUP BERHAD [S]	TELECOMMUNICATIONS & MEDIA
8	AXIS REAL ESTATE INVESTMENT TRUST [S]	REAL ESTATE INVESTMENTS TRUST
9	BATU KAWAN BERHAD [S]	PLANTATION
10	BLD PLANTATION BHD. [S]	PLANTATION
11	BOUSTEAD HEAVY INDUSTRIES CORPORATION BHD [S]	TRANSPORTATION & LOGISTICS
12	BOX-PAK (MALAYSIA) BERHAD	INDUSTRIAL PRODUCTS & SERVICES
13	BRITISH AMERICAN TOBACCO (MALAYSIA) BERHAD	CONSUMER PRODUCTS & SERVICES
14	CAN-ONE BERHAD	INDUSTRIAL PRODUCTS &SERVICES
15	CAPITAL A BERHAD [S]	CONSUMER PRODUCTS & SERVICES
16	CENSOF HOLDINGS BERHAD [S]	TECHNOLOGY
17	CHIN TECK PLANTATIONS BERHAD	PLANTATION
18	CONCRETE ENGINEERING PRODUCTS BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
19	CUSCAPI BERHAD [S]	TECHNOLOGY
20	DATAPREP HOLDINGS BHD [S]	TECHNOLOGY
21	DIGI.COM BERHAD [S]	TELECOMMUNICATIONS & MEDIA
22	DKSH HOLDINGS (MALAYSIA) BERHAD [S]	CONSUMER PRODUCTS & SERVICES
23	DUFU TECHNOLOGY CORP. BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
24	EASTERN & ORIENTAL BERHAD [S]	PROPERTY
25	FGV HOLDINGS BERHAD [S]	PLANTATIONS
26	G3 GLOBAL BERHAD [S]	CONSUMER PRODUCTS & SERVICES
27	GADANG HOLDINGS BHD [S]	CONSTRUCTION
28	GAS MALAYSIA BERHAD [S]	UTILITIES
29	GENTING MALAYSIA BERHAD	CONSUMER PRODUCTS & SERVICES
30	GHL SYSTEMS BERHAD [S]	TECHNOLOGY
31	GLOBETRONICS TECHNOLOGY BERHAD [S]	TECHNOLOGY
32	GREEN PACKET BERHAD [S]	TELECOMMUNICATIONS & MEDIA
33	GUH HOLDINGS BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
34	HAP SENG CONSOLIDATED BERHAD	INDUSTRIAL PRODUCTS & SERVICES
35	HARTALEGA HOLDINGS BERHAD [S]	HEALTH CARE
36	HEITECH PADU BERHAD [S]	TECHNOLOGY
37	HEKTAR REAL ESTATE INVESTMENT TRUST	REAL ESTATE INVESTMENT TRUSTS
38	HENGYUAN REFINING COMPANY BERHAD [S]	ENERGY
39	HIBISCUS PETROLEUM BERHAD [S]	ENERGY
40	HONG LEONG BANK BERHAD	FINANCIAL SERVICES
41	HONG LEONG INDUSTRIES BERHAD [S]	CONSUMER PRODUCTS & SERVICES

42	HUBLINE BERHAD [S]	TRANSPORTATION & LOGISTICS
43	HUME CEMENT INDUSTRIES BERHAD	INDUSTRIAL PRODUCTS & SERVICES
44	IGB COMMERCIAL REAL ESTATE INVESTMENT TRUST	REAL ESTATE INVESTMENT TRUSTS
45	IJM CORPORATION BERHAD [S]	CONSTRUCTION
46	IMASPRO CORPORATION BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
47	INARI AMERTRON BERHAD [S]	TECHNOLOGY
48	IQ GROUP HOLDINGS BERHAD [S]	CONSUMER PRODUCTS & SERVICES
49	KELINGTON GROUP BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
50	KENANGA INVESTMENT BANK BERHAD	FINANCIAL SERVICES
51	KIM HIN INDUSTRY BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
52	KIM LOONG RESOURCES BERHAD [S]	PLANTATION
53	KKB ENGINEERING BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
54	KUALA LUMPUR KEPONG BERHAD [S]	PLANTATION
55	KUB MALAYSIA BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
56	KUMPULAN PERANGSANG SELANGOR BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
57	LAND & GENERAL BERHAD [S]	PROPERTY
58	LION INDUSTRIES CORPORATION BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
59	MALAKOFF CORPORATION BERHAD [S]	UTILITIES
60	MALAYSIA BUILDING SOCIETY BERHAD	FINANCIAL SERVICES
61	MALAYSIAN PACIFIC INDUSTRIES BERHAD [S]	TECHNOLOGY
62	MARCO HOLDINGS BERHAD	CONSUMER PRODUCTS & SERVICES
63	MATRIX CONCEPTS HOLDINGS BERHAD [S]	PROPERTY
64	MAXIS BERHAD [S]	TELECOMMUNICATIONS & MEDIA
65	MCT BERHAD [S]	PROPERTY
66	MEDIA PRIMA BERHAD	TELECOMMUNICATIONS & MEDIA
67	MEGA FIRST CORPORATION BERHAD [S]	UTILITIES
68	MELEWAR INDUSTRIAL GROUP BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
69	MSM MALAYSIA HOLDINGS BERHAD [S]	CONSUMER PRODUCTS & SERVICES
70	MY E.G. SERVICES BERHAD [S]	TECHNOLOGY
71	MYCRON STEEL BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
72	NEGRI SEMBILAN OIL PALMS BERHAD	PLANTATION
73	OLYMPIA INDUSTRIES BERHAD	CONSUMER PRODUCTS & SERVICES
74	OM HOLDINGS LIMITED [S]	INDUSTRIAL PRODUCTS & SERVICES
75	ORNAPAPER BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
76	PCCS GROUP BERHAD [S]	CONSUMER PRODUCTS & SERVICES
77	PENSONIC HOLDINGS BERHAD [S]	CONSUMER PRODUCTS & SERVICES
78	PENTAMASTER CORPORATION BERHAD [S]	TECHNOLOGY

79	PESTECH INTERNATIONAL BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
80	PETRONAS DAGANGAN BHD [S]	CONSUMER PRODUCTS & SERVICES
81	POS MALAYSIA BERHAD [S]	TRANSPORTATION & LOGISTICS
82	PRESS METAL ALUMINIUM HOLDINGS BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
83	PUBLIC BANK BERHAD	FINANCIAL SERVICES
84	QL RESOURCES BERHAD [S]	CONSUMER PRODUCTS & SERVICES
85	RCE CAPITAL BERHAD [S]	FINANCIAL SERVICES
86	ROHAS TECNIC BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
87	SALCON BERHAD [S]	UTILITIES
88	SAPURA ENERGY BERHAD [S]	ENERGY
89	SARAWAK CABLE BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
90	SCIENTEX BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
91	SCIENTEX PACKAGING (AYER KEROH) BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
92	SENHENG NEW RETAIL BERHAD [S]	CONSUMER PRODUCTS & SERVICES
93	SKP RESOURCES BHD [S]	INDUSTRIAL PRODUCTS & SERVICES
94	STAR MEDIA GROUP BERHAD [S]	TELECOMMUNICATIONS & MEDIA
95	STELLA HOLDINGS BERHAD [S]	CONSTRUCTION
96	SUNWAY BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
97	SUNWAY REAL ESTATE INVESTMENT TRUST	REAL ESTATE INVESTMENT TRUSTS
98	SUPERLON HOLDINGS BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
99	SURIA CAPITAL HOLDINGS BERHAD [S]	TRANSPORTATION & LOGISTICS
100	SWIFT HAULAGE BERHAD [S]	TRANSPORTATION & LOGISTICS
101	SYMPHONY LIFE BERHAD [S]	PROPERTY
102	TIME DOTCOM BERHAD [S]	TELECOMMUNICATIONS & MEDIA
103	TUNE PROTECT GROUP BERHAD	FINANCIAL SERVICES
104	UEM EDGENTA BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
105	UEM SUNRISE BERHAD [S]	PROPERTY
106	UNISEM (M) BERHAD [S]	TECHNOLOGY
107	UNITED MALACCA BERHAD [S]	PLANTATION
108	VERSATILE CREATIVE BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
109	VITROX CORPORATION BERHAD [S]	TECHNOLOGY
110	VSTECS BERHAD [S]	TECHNOLOGY
111	WCT HOLDINGS BERHAD [S]	CONSTRUCTION
112	WESTPORTS HOLDINGS BERHAD [S]	TRANSPORTATION & LOGISTICS
113	YLI HOLDINGS BERHAD [S]	INDUSTRIAL PRODUCTS & SERVICES
114	YTL CORPORATION BERHAD	UTILITIES