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LEARN, UNLEARN AND RELEARN – INSIGHTS FROM CORPORATE E-WASTE REPORTING LITERATURE AND GUIDELINES

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Abstract

The global e-waste generation has been rising steadily in recent years and is expected to continue as the world is moving rapidly towards digitalisation. This trend is alarming since improper and unsafe management of e-waste could be detrimental to the environment and to human health, which in turn, pose significant challenge to the achievement of Sustainable Development Goals. This scenario calls for a concerted effort from parties at all levels, including business organisations, to reduce the generation of e-waste. Environmental accountability entails the requirement to act responsibly towards the environment and to report on all (in)actions to organisational stakeholders. In this regard, corporate reporting plays a crucial role to inform the stakeholders as to how (environmental) values being created, preserved, and eroded over time. This research aims to review the extant literature and guidelines on corporate e-waste reporting. It enables us to understand the current practice of reporting (learn), evaluate the reporting guidelines (unlearn), and recommend agenda for improvement in research and practice (relearn). This research brings to the fore the importance of revisiting the existing reporting guidelines to ensure more comprehensive, consistent, and comparable practices.

Keywords: E-waste, corporate reporting, literature review, GRI, SASB, Bursa Malaysia

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1. Introduction

E-waste, electronic waste, e-scrap, waste electrical and electronic equipment (WEEE) and end-of-life electronics are terms often used to describe used electronics that are nearing the end of their useful life, and are discarded, donated, or given to a recycler (Geneva Environment Network, 2022). E-waste comes from many sources including households, businesses, and governments. It covers six waste categories:

Table 1. Categories of e-waste

Categories	Examples
Temperature exchange equipment	Refrigerators, freezers, air conditioners, and heat pumps.
Screens, monitors	Televisions, monitors, laptops, notebooks, and tablets.
Lamps	Fluorescent lamps, high intensity discharge lamps, and LED lamps.
Large equipment	Washing machines, clothes dryers, dishwashing machines, electric stoves, large printing machines, and copying equipment.
Small equipment	Toasters, electric kettles, electric shavers, scales, calculators, radio sets, video cameras, and electrical and electronic toys.
Small IT and telecommunication equipment	Mobile phones, Global Positioning Systems (GPS), pocket calculators, routers, personal computers, printers, and telephones.

Source: Forti et al. (2018)

Due to rapid changes in technology, e-waste has become one of the fastest-growing waste streams. According to Baldé et al. (2022), E-waste Monitor Series found that the world generated 44.4 million metric tons (Mt) of e-waste in year 2014. The amount generated keep increasing year on year, and it is expected to increase to 74.7 Mt in year 2030. With the projection of global growth population increases to 9.7 billion in year 2050 (UN, 2019), e-waste generation is not impossible to reach as much as 110 Mt in year 2050 if no serious actions being taken and current practices being left unmodified (see Figure 1).

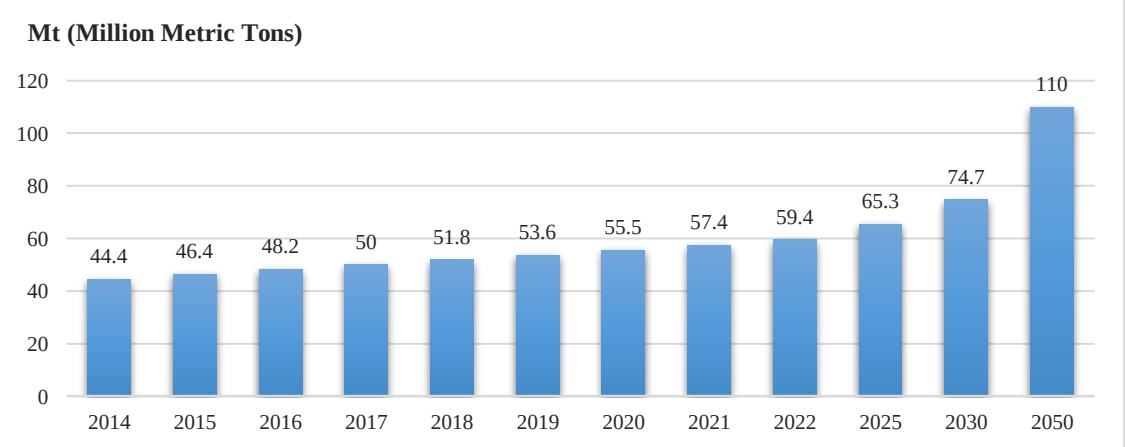

Figure 1. Total annual global e-waste generation (Baldé et al., 2022)

Malaysia is a country located in the Southeast Asia region. It is one of the world's most open economies and in the process of transitioning itself to a high-income economy by the year 2024 (World Bank, 2022). In terms of social and environmental agenda, Malaysia together with other 192 UN members

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have adopted the 2030 Agenda for Sustainable Development and its 17 goals, known as Sustainable Development Goals (SDGs) (UN, 2022). Recently, the Government has launched the national fund (MySDG Fund) with an initial contribution of RM20 million to help spur activities that could help the country to achieve the SDG targets (MOF, 2022). Despite this promising scenario, like other countries, e-waste could potentially be problematic. In particular, the Department of Environment (DOE, 2020) reported that Malaysia has generated 12.34 million units of e-waste in year 2016 and a massive generation of e-waste is expected to increase up to 24.5 million units in year 2025 (see Figure 2).

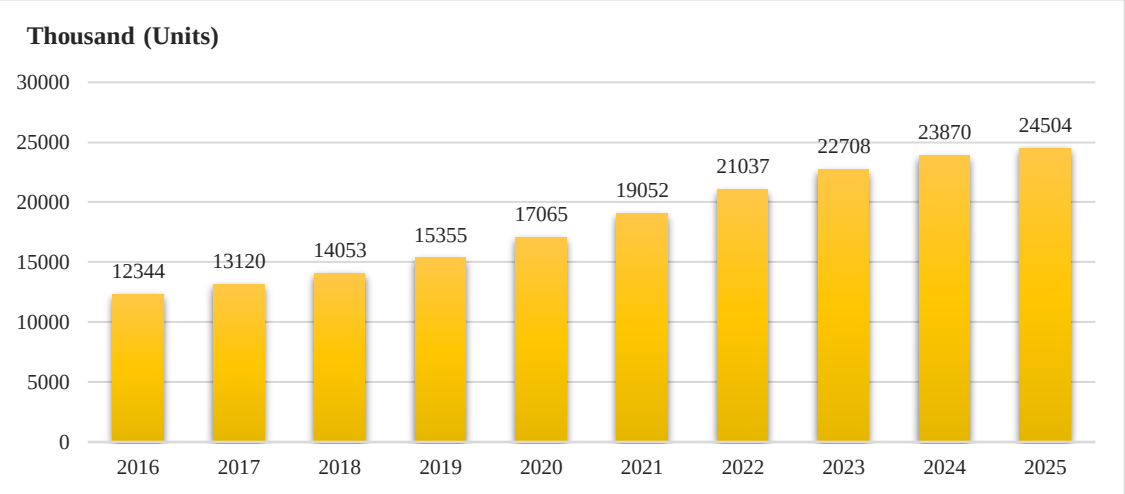

Figure 2. Total units of e-waste generation in Malaysia (DOE, 2020)

Improper disposal of e-waste, including sending them to landfills, has garnered enormous attention from parties at all levels. Besides containing toxic materials such as lead, mercury and cadmium, e-waste is also not biodegradable and it accumulates in the environment, in the soil, air, water and living things. Directly they have detrimental effect on the environment and human health (Shad et al., 2020). Hazardous components in e-waste can lead to irreversible health effects, including brain development disruption, kidney failure, lung cancer, heart damage and so on. Furthermore, electronic goods also have carbon footprint and consequently escalating problems related to climate change. In a similar vein, e-waste problem poses challenge to the achievement of SGDs, particularly 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) and SDG 14 (Life Below Water) (Forti et al., 2020). As for SDG 12, Target 12.4 aims to achieve the environmentally sound management of chemicals and all waste throughout the life cycle, significantly reduce their release into air, water, and soil in order to minimise their adverse impacts on human health and the environment. In addition, Target 12.5 aims to reduce waste generation through prevention, reduction, repair, recycling, and reuse. Therefore, this scenario calls for concerted effort from parties at all levels, including business organisations in reducing the rate of e-waste generated.

Organisations do not exist in vacuum; hence their operations impact a wide array of stakeholders, including the community whose demand for information needs to be satisfied. This is consistent with the concept of accountability which entails two types of responsibility, i.e., responsibility to take (in) actions

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and responsibility to provide account on those (in)actions. Gray et al. (2014) defines accountability as "the duty to provide an account or reckoning of those actions for which one is held responsible" (p. 50). In the context of environmental sustainability, organisations not only need to undertake actions that could minimise harm to the environment (including waste) and to monitor their performance, but they also need to report on the actions taken and the resultant performance to the stakeholders (Alrazi et al., 2015). Over the years, organisations have been using various media, both formal and informal, to communicate environmental information to their stakeholders. One of the important media is the annual reports which are increasingly labelled as integrated reports (KPMG, 2020), with the aim of communicating how (environmental) values are being created, preserved, or eroded over the years (IFRS Foundation, 2021).

The adverse impact of e-waste mismanagement on the environment and human health coupled with the importance of corporate reporting for organisations to demonstrate their environmental responsibility to the stakeholders become the motivation of this research. Specifically, it aims to review prior empirical research that have investigated the corporate e-waste reporting and evaluate the existing reporting guidelines addressing e-waste (if any). This research contributes to the identification of gaps in the literature and weaknesses in the reporting guidelines which are of paramount importance to improve the reporting practice in the future.

The remaining sections of the paper are structured as follows. Section 2 describes the research methods. Section 3 presents the findings. Section 4 provides discussion and way forward. Section 5 concludes the paper.

2. Research Methods

In order to search for empirical research on corporate e-waste reporting, there was a need to strike balance between obtaining quality output from the search (Phulwani et al., 2020) and the realisation that e-waste (or even waste) reporting is rather a new topic, as compared to reporting related to emissions (see, for example, He et al., 2022; Borghei, 2021; Velte et al., 2020) and water (Botha et al., 2022; Gilsbach et al., 2022; Hewawithana et al., 2021). Therefore, the search was made through Google Scholar, using the following keywords: "waste reporting" OR "waste disclosure" AND "accounting". The period was set between 2014 and 2022. The year 2014 was selected since it was the first year The Global E-Waste Monitor report being published by United Nations University (Baldé et al., 2015) while year 2022 is the most recent year for data collection. The search produced 347 results. The title and abstract of each paper were read carefully to decide their relevance to the context of research. This process resulted into ten empirical research in the form of journal articles and a thesis. They were downloaded for further reading.

For organisations to have effective communication with the stakeholders on matters pertaining to e-waste, there should be guidelines detailing the type and nature of information to be reported. This research focused on three guidelines for further evaluation. The first guideline is GRI Standards published by Global Reporting Initiative (GRI) and has undergone several improvements since it was first launched in year 2000 (GRI, 2022). Such a longevity is a testament to the quality of the Standards. According to KPMG (2020), more than 75 percent of the world's large companies in their survey made GRI as the basis to prepare their sustainability reports. The standard on waste, GRI 306: Waste 2020, was released to the public on 19 May 2020 and was used for analysis in this research (GRI, 2020). Another guideline that has received widespread

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usage among organisations is SASB Standards under the purview of SASB Standards Board (KPMG, 2020). The industry-based Standards were published in October 2018 after six years of extensive research, including input from the market (IFRS Foundation, 2022). At present, there are 77 standards to cater for different industries and guideline for waste reporting was assessed from each individual standard (SASB, 2018). Finally, we also analysed Bursa Malaysia's Sustainability Reporting Guide (Bursa Malaysia, 2018). The Guide, in its second edition, is published by taking into consideration of GRI Standards, relevant SDGs and Task Force on Climate-related Financial Disclosures' (TCFD) recommendations.

3. Findings

3.1. Empirical research on corporate waste (or e-waste) reporting

Table 1 provides a summary of prior empirical literature on waste (including e-waste) reporting. The table reports on the sample used for each research, how the authors measured waste (or e-waste) and the brief findings. The majority of these studies are country-specific with three studies on Malaysia (Abd-Mutalib et al., 2021; Selahudin et al., 2021; Nik Azman & Mohd Salleh, 2020) and one study each on India (Adler et al., 2021), South Africa (Kirchner, 2021), the US (Benjamin et al., 2020) and Serbia (Knežević et al., 2018). The other three studies involved international comparison, including one which focused on companies operating in the electricity sector (Gull et al., in press; Gull et al., 2022; Maia et al., 2021).

Table 2. Summary of previous literature

No	Authors	Sample	Waste/e-waste measurement	Findings
1	Gull et al. (in press)	1,581 firms from 37 countries for year 2002-2017	• Waste generation - total hazardous and non-hazardous wastes generated in tonnes • Recycling activities - ratio of the recycled waste to total waste generated	• Board gender diversity enhances waste management
2	Gull et al. (2022)	2,284 firms from 41 countries for year 2002–2019	• Refer Gull et al. (in press)	• Firms with lower generated waste but higher recycled waste had better financial performance (as measured by return on assets and Tobin's q)
3	Abd-Mutalib et al. (2021)	92 firms from the telecommunication and technology industries in Malaysia for year 2019	• The extent and quality of e-waste information in the annual/sustainability reports • Extent: number of words and sentence • Quality: 0-3 scale	• Low level of disclosures with average of 11.36 words, 0.41 sentences and 0.27 quality score • Firm size as a significant factor
4	Adler et al. (2021)	30 leading firms in India for year 2012-2018	• 35 waste items, measured on a 1-0 basis, in the annual/ sustainability reports • Item 7: Company has a specific waste management policy (or e-waste management policy)	• Albeit increasing over the years, disclosure level was low • Average number of firms reported Item 7 was 31%
5	Kirchner (2021)	13 food producing firms in South Africa for year	• 24 items, measured on a yes/no/not available basis, in the annual reports.	• Only eight firms were serious about waste.

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No	Authors	Sample	Waste/e-waste measurement	Findings
			• The items focused on whether the firms were serious about waste governance and management, reported the total weight of the hazardous and non-hazardous waste (together with the disposal methods), and indicated the approach undertaken to determine the waste disposal method.	• Reuse, recycle and landfill were the mostly used methods. • The majority were responsible for their waste (i.e., did not involve any contractor)
6	Maia et al. (2021)	26 global electricity companies for year 2017-2019	• Quantity, typologies (hazardous versus non-hazardous) and disposal options of waste in the sustainability reports	• Total wastes: 50.84 Mt (non-hazardous), 0.39 Mt (hazardous) • Landfills was the preferred option (54.9%)
7	Selahudin et al. (2021)	58 Malaysian firms for year 2018	• E-waste reduction score from Thomson Reuters' database	• CEO duality had marginal impact on e-waste reduction score
8	Benjamin et al. (2020)	S&P 500 Index companies for year 2010-2015	• Total amount of waste in metric tonnes	• Firms with greater amount of waste had higher level of cash holdings, particularly those with strong governance and operating in environmentally sensitive industries
9	Nik Azman & Mohd Salleh (2020)	Refer Selahudin et al. (2021)	• Refer Selahudin et al. (2021)	• E-waste reduction score was not correlated with financial performance
10	Knežević et al. (2018)	30 Serbian firms from the banking industry for year 2013-2016	• Whether or not published waste management reports	• The trend of reporting had increased but less than half prepared the report to the government and a very low disclosed to other stakeholders

Several aspects of waste (or e-waste) reporting had been used in the literature as a proxy of its measurement. These include total waste generated (Gull et al., in press; Gull et al., 2022; Maia et al., 2021; Benjamin et al., 2020), waste recycling ratio (Gull et al., in press; Gull et al., 2022), waste reduction score (Selahudin et al., 2021; Nik Azman & Mohd Salleh, 2020), the publication of waste management report (Knežević et al., 2018) and the disclosure volume and/or quality (Abd-Mutalib et al., 2021; Adler et al., 2021; Kirchner, 2021). It is interesting to note that there are only three studies specifically examining e-waste reporting. Selahudin et al. (2021) and Nik Azman & Mohd Salleh (2020) sourced the data from Thomson Reuters' database which included e-waste reduction score as one of the indicators for environmental, social, and governance (ESG). The indicator assesses firms' initiatives in recycling, reusing, reducing, substituting, treating or phasing out e-waste. Higher scores indicate better e-waste management. Abd-Mutalib et al. (2021) conducted content analysis of annual/sustainability reports to determine the extent and quality of e-waste reporting. The extent was counted on the basis of number of words and sentences representing the e-waste information, while the quality was calculated by the assigning the e-waste information along a scale, in which a score of zero (0) was assigned for non-disclosure and three (3) for quantitative information. Although not specifically on e-waste, the 35-item disclosure index developed

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by Adler et al. (2021) had incorporated one item on e-waste, i.e., existence of an e-waste management policy.

Analysis of the findings reveal that non-hazardous waste represented the large proportion of waste generated (Maia et al., 2021) and sending to landfills was the dominant approach of disposal, other than reusing and recycling (Kirchner, 2021; Maia et al., 2021). In terms of reporting practice, although there was an increasing trend of disclosure (Adler et al., 2021; Knežević et al., 2018), the extent and/or quality was still low (Abd-Mutalib et al., 2021; Adler et al., 2021; Knežević et al., 2018) and less likely to go beyond information relevant to the government (Knežević et al., 2018). Significant determinants of waste (or e-waste) reporting include board gender diversity (Gull et al., in press), firm size (Abd-Mutalib et al., 2021) and CEO duality (Selahudin et al., 2021). There is also evidence that firms with more effective waste management had better firm performance (Gull et al., 2022) and lower level of cash holdings (Benjamin et al., 2020).

3.2. Corporate waste (or e-waste) reporting guidelines

GRI 306: Waste 2020 is the GRI Standard providing the requirements and recommendations for reporting on corporate waste information, including e-waste (GRI, 2020). Generally, there are five items under two disclosure categories, namely topic management disclosures and topic disclosures. For topic management disclosures, organisations are required to provide discussion on waste generation and significant waste-related impacts (Disclosure 306-1) and management of significant waste-related impacts (Disclosure 306-2). Organisations need to describe any actual and potential impacts of their inputs, activities and outputs and determine whether they are attributed to organisation's own operations or to their value chains'. Furthermore, they need to explain the actions undertaken to reduce the waste, whether a third party being contracted to manage their waste, and the processes involved in collecting and monitoring the waste data. For topic disclosures, which are related to the indicator-type information, the following are required: waste generated (Disclosure 306-3); waste diverted from disposal (Disclosure 306-4); and waste directed to disposal (Disclosure 306-5). Organisations need to provide such information in both total and breakdown according to several categories including composition of the waste, type of waste (hazardous or non-hazardous), recovery operations, disposal operations, and location (onsite or offsite). Reference to e-waste is made in Guidance for Disclosure 306-3-a, 306-4-a and 306-5-a when the Standard states:

"When reporting composition of the waste, the organisation can describe:

- *the waste streams, relevant to its sector or activities (e.g., tailings for an organisation in the mining sector, electronic waste for an organisation in the consumer electronics sector, or food waste for an organisation in the agriculture or in the hospitality sector)"* (GRI, 2020, p. 12-13 & 15)

The abovementioned excerpt indicates that organisations operating in the consumer electronics sector need to disclose the total e-waste generated, diverted from disposal and directed to disposal together with their respective breakdowns in their reports.

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SASB (2018) published a series of sustainability accounting standards covering 77 different sectors. Some of the standards contain reference to e-waste. They are summarised in Table 2 below. Apart from the requirements and Standards identified in Table 2, there are also other Standards with provisions related to waste under the topics of waste management (e.g., Auto Parts, Coal Operations and Construction Materials), hazardous waste management (e.g., Aerospace & Defense, Chemicals and Electrical & Electronic Equipment), materials efficiency and recycling (Automobiles), waste and hazardous materials management (Metals & Mining), hazardous materials management (Oil & Gas – Refining & Marketing) and food and packaging waste management (Restaurant). The common accounting metrics across these Standards are the amount of waste generated and percentage recycled.

Table 3. Reference to e-waste in SASB

No	Disclosure requirements	Applicable standards
1	"The entity shall discuss its participation in extended producer responsibility (EPR) initiatives, including…whether the initiative is voluntary or mandatory (e.g., in order to maintain compliance with EU Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) or the Japan home appliance recycling law)" (p. 12)	Appliance Manufacturing
2	"Weight of end-of-life products and e-waste recovered, percentage recycled"	Electronic Manufacturing Services & Original Design Manufacturing, Hardware
3	"The entity shall disclose the standard(s) with which the entities it has transferred e-waste to are compliant"	Electronic Manufacturing Services & Original Design Manufacturing, Fuel Cells & Industrial Batteries, Hardware, Semiconductors, Solar Technology & Project Developers, Telecommunication Services
4	"Amount of electronic waste collected, percentage recovered through recycling" (p. 7, 32)	Waste Management

Another reporting guideline of relevance especially to public listed companies in Malaysia is Bursa Malaysia Sustainability Reporting Guide. In this Guide, there is a specific provision for e-waste information in which companies from the technology and telecommunications sectors are recommended to disclose the "amount of electronic waste (e-waste) disposed e.g., mobile phones, computers etc." (Bursa Malaysia, 2018, p. 68). Apart from this recommendation, waste disclosure shall consider volume of waste by type (hazardous or non-hazardous) and disposal methods, volume of waste sent to landfills and ratio of waste to production.

4. Discussion and the Way Forward

The previous section has analysed the literature on corporate e-waste reporting and the guidelines available for organisations to report on their e-waste information. Despite the significant impact e-waste has on the environment and to human health, the level of its reporting among business organisations is low (Abd-Mutalib et al., 2021; Adler et al., 2021; Knežević et al., 2018). In a similar vein, there has been a dearth of literature examining corporate e-waste reporting. This is in stark contrast with literature examining

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households' behaviour towards e-waste (e.g., Gilal et al., 2021; Islam et al., 2021; Phulwani et al., 2021, 2020). Some possible reasons could be attributed to this scenario.

Firstly, the amount of e-waste generated might be small in comparison to the total waste generated by organisations. For example, in a study by Maia et al. (2021), they found that hazardous waste accounted for less than one percent of the total waste generated by the sample companies. Since e-waste is hazardous (Forti et al., 2020), it is less practical to provide the breakdown of hazardous waste further due to materiality principle. According to Integrated <IR> Framework, a matter is material "if it could substantively affect the organisation's ability to create value in the short, medium or long term" (IFRS Foundation, 2021, p. 53). Since the amount is small, it might have no substantive effect on the organisation's ability to create values. Perhaps this could also be the reason for e-waste information requirement being specified for certain sectors only (see the analysis of SASB and Bursa Malaysia Sustainability Reporting Guide earlier). In this regard, e-waste can be deemed as sector specific. Therefore, future research may consider examining corporate e-waste reporting among specific industries to enhance our understanding on the reporting practices. Moreover, since there has been a scant attention on this issue among the researchers, there is a need to investigate factors influencing the corporate e-waste reporting. For example, Dienes et al. (2016), in reviewing literature on sustainable reporting, found the important role of corporate characteristics (i.e., firm size, profitability, capital structure and firm age), corporate governance (structure and ownership) and media visibility.

Secondly, low level of reporting could be due to lack of comprehensive reporting guideline. Based on our analysis of the guidelines, there have been lack of focus on e-waste. Additionally, the requirements are inconsistent across the guidelines. For example, GRI (2020) also emphasises on recovery operations, disposal operations, and location, while SASB (2018) and Bursa Malaysia (2018) only focus on quantity generated and recycled. Due to this lack of detailed attention and inconsistent requirements, Adler et al. (2021) had to refer to many references in devising their waste disclosure index. This situation calls for the need to revisit these guidelines to ensure more comprehensive, comparable and consistent reporting in the future. Certainly, there is a need for engaging stakeholders such as regulators, government agencies, environmental management companies, stock exchanges as well as representatives from the academia and business organisations in the endeavour to strike balance between information need of the stakeholders and the constraints facing the organisations.

5. Conclusion

The significant negative impact of e-waste towards the environment and human health has become the main driver of this research. The objectives of this study are two-fold; namely to review prior empirical research that have investigated the corporate e-waste reporting, and to evaluate the guidelines addressing e-waste reporting. Based on the review of previous studies on corporate e-waste reporting, we learned that there is a dearth of literature in this area. We attributed this scenario due to the lack of companies reporting e-waste information in their corporate reports for materiality factor and the sector-specific nature of e-waste generation.

The assessment on current reporting guidelines suggests the insufficiency of these guidelines to help companies discharge their accountability. Furthermore, they are inconsistent from one to another causing

uncertainty to companies on how best to report on their e-waste information. Since the existing guidelines do not promote comprehensive, consistent, and comparable practices, there is a need for companies to 'unlearn' (depart) from their current reporting practices and the guidelines they used to disclose e-waste information.

Consequently, as part of relearning process, future research should focus on certain sectors in order to better understand the reporting practice and factors associated with it. Moreover, the reporting guidelines need to be revisited and, to ensure a more holistic development of such a guideline, involvement from the wider groups of stakeholders in the development process is exemplary.

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