Beyond Recycling: How Laptop Manufacturers Disclose Circular Economy Strategies for Product Lifetime Extension

Chieh-Hua Lu* and Yuh-Ming LEE

Institute of Natural Resources Management, National Taipei University, Taipei, Taiwan
**Corresponding Author E-mail:connie.lu1031@gmail.com*

ABSTRACT

Extending product lifetimes is central to the circular economy because it can reduce resource consumption and delay the generation of electronic waste. Recent European initiatives, including right-to-repair measures and related circular economy policies, have intensified pressure on manufacturers to reconsider product design and life-cycle management. Although previous studies have examined repairability, ecodesign, and circular economy policy, less attention has been paid to how laptop manufacturers combine multiple circular strategies. This study compares the circular economy strategies disclosed by six leading manufacturers—Acer, Apple, ASUS, Dell, HP, and Lenovo—to support product and component lifetime extension. A qualitative content analysis was conducted on their 2023 and 2024 sustainability reports. The reports were assessed using the 10R framework and a four-point scale that captures the specificity of disclosure. The results show that Reduce and Recycle receive the most consistent and detailed disclosure across firms. Reuse and Repair are also widely reported, whereas Refurbish varies considerably and Remanufacture and Repurpose are rarely discussed. The findings reveal an uneven distribution of disclosed corporate activity across the 10R hierarchy: established reduction and recycling practices are well represented, but several strategies capable of retaining products and components at higher value remain weakly documented. The study provides a systematic comparison of manufacturers' disclosed circular strategy portfolios while recognizing that disclosure intensity does not establish implementation scale, circularity, or environmental performance.

Keywords: Circular Economy/ Product Lifetime Extension/ E-Waste Prevention/ Corporate Strategy/10R

1. INTRODUCTION

Rapid technological change and frequent product replacement have contributed to the continued growth of electronic waste (e-waste), creating serious risks to human health, ecosystems, and resource security. Circular economy strategies have consequently become prominent in research, policy, and industry [1,2,3,4]. Among these strategies, product lifetime extension is especially important because it can reduce demand for virgin resources, preserve the value embedded in products and components, and delay waste generation [5,6,7].

The Global E-waste Monitor reports that the world generated 62 billion kg of e-waste in 2022, equivalent to 7.8 kg per person. Only 22.3% was documented as formally collected and recycled. Since 2010, e-waste generation has increased by an average of 2.3 billion kg per year, almost five times the annual growth in documented formal collection and recycling [8,9].

Electronic waste (e-waste) encompasses a wide range of products, and its definition varies across countries and regions. In general, e-waste refers to electrically powered devices that are obsolete, have reached the end of their useful life, or have been discarded. International classification systems cover a wide range of electrical and electronic equipment, including large equipment, small equipment, lamps, temperature exchange equipment, small IT and telecommunication equipment, screens and monitors, such as laptops, notebooks, and televisions [8,10,11].

E-waste is considered the fastest-growing waste stream worldwide. With the rapid proliferation of electronic devices, e-waste has become a major environmental and societal challenge, raising concerns about its impacts on human health and the environment, as well as the depletion of natural resources [12,13,14].

Consumer electronics deserve particular attention because technological change and short replacement cycles can cause functional devices to be discarded prematurely [15,16,17]. Global annual shipments of portable and personal computers are substantial [18,19]. Their environmental burden is not limited to disposal: laptop production requires energy and mineral resources and accounts for a large share of life-cycle greenhouse-gas emissions. Consequently, replacing an operational device with a more energy-efficient model may not offset the environmental burden of manufacturing for many years [20,21].

The circular economy seeks to retain the value of products, components, and materials for as long as possible while minimizing waste and resource losses [22,23,24,25]. The transition to a more circular economy therefore represents an important pathway toward a sustainable, low-carbon, resource-efficient, and competitive economy [26]. Applied to consumer electronics, this principle favors continued use by the original owner, transfer to another user, professional repair or refurbishment, component recovery, remanufacturing, and, only after higher-value options have been exhausted, material recycling or energy recovery [3]. Evidence from laptop studies supports the environmental value of lifetime extension. The average service life of a laptop remains below its estimated desirable life [5,21], and premature replacement is common [18]. Repurposing suitable components and remanufacturing end-of-life laptops can also reduce the environmental burdens associated with new production [17,27].

Research on circular electronics has expanded, but relatively little work compares how major laptop manufacturers represent and combine the full range of circular economy strategies. Existing studies often focus on individual practices, environmental assessment, consumer behavior, or policy. A manufacturer-level comparison can therefore clarify whether corporate attention is concentrated on established material-efficiency and recycling practices or extends to strategies that retain products and components at higher value. Because the present evidence is drawn from corporate reports, the analysis evaluates disclosed strategies and reported practices rather than independently verified implementation or environmental performance.

This study addresses two research questions: (1) How are the 10R circular economy strategies represented in the sustainability reports of major laptop manufacturers? (2) Which disclosed strategies are most prominent in efforts to extend the service life of products and components?

2. METHODOLOGY

The study examines six manufacturers with a major presence in the global personal-computer market: Acer, Apple, ASUS, Dell, HP, and Lenovo. The sample was selected with reference to 2025 market reports published by IDC and Gartner [28,29]. The primary sources are the manufacturers' publicly available sustainability reports for 2023 and 2024. Scholars have argued that sustainability reports can be regarded as one of the most direct means through which companies communicate their sustainability practices, reflecting the extent of their environmental engagement during the reporting period. These reports also provide researchers with valuable insights into corporate circular economy strategies. Moreover, the increasing adoption of standardized reporting frameworks helps enhance the comparability of disclosed information. Accordingly, content analysis of sustainability reports has emerged as an increasingly relevant method for systematically assessing and comparing corporate circular economy practices [30,31,32,33].

The analysis uses the 10R hierarchy proposed by Potting et al.[7]. A range of R frameworks has developed from the early 3R model of Reduce, Reuse, and Recycle to more extensive 9R and 10R frameworks [7,34,35,36,37]. Recent studies have suggested that, compared with other R-frameworks, the 10R framework is more comprehensive and enables a more precise identification of activities through which value is lost [6,38].

Potting et al. [7] and Reike et al. [37] each proposed a 10R framework. Both frameworks include Refuse, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, and Recover. Notably,

Reike et al. also included Re-mine, referring to the retrieval of valuable materials or products from landfills, sometimes undertaken by individuals as a means of sustaining their livelihoods. Such retrieval of materials after the landfill stage represents an often overlooked or neglected resource value retention option (RO).

Table 1. The 10R circular economy strategy framework

Strategy group	Code	Strategy	Operational definition
Smarter use and manufacture	R0	Refuse	Make a product unnecessary by abandoning a function or providing the same function through a fundamentally different product; also includes avoiding unnecessary inputs in production.
	R1	Rethink	Increase product-use intensity, for example through sharing, multifunctional products, product-as-a-service models, or dematerialization.
	R2	Reduce	Use fewer natural resources and reduce energy, material inputs, and waste generation.
Extend product/component life	R3	Reuse	Enable a functioning product to be used again by another user, including donation, resale, leasing, relocation, and product-as-a-service arrangements.
	R4	Repair	Restore a defective product so that it can continue to perform its original function.
	R5	Refurbish	Restore or upgrade an older product so that it reaches an updated condition.
	R6	Remanufacture	Use components from a discarded product to manufacture a product with the same function.
	R7	Repurpose	Use a discarded product or its components in a new product with a different function.
Useful application of materials	R8	Recycle	Process materials to obtain secondary materials of the same or lower quality.
	R9	Recover	Recover energy through the incineration of discarded materials.

Notes: Table 1.10R CE strategies from Potting et al. [7].

A distinctive feature of the 10R framework proposed by Potting et al. is the inclusion of Rethink, which emphasizes smarter product use and manufacturing, such as product sharing and multifunctional products, to increase the intensity of product use. Scholars have suggested that Rethink is particularly relevant to the circular economy and that the 10R framework proposed by Potting et al. provides a well-defined and nearly comprehensive set of ten existing circular economy strategies [6]. As this study focuses primarily on the corporate circular economy strategies adopted by laptop manufacturers to extend product lifespans, Rethink is particularly relevant to the research objective. Therefore, this study adopts the 10R circular economy strategy framework proposed by Potting et al. as the analytical framework.

Potting et al. organize the strategies into three groups: smarter product use and manufacture (R0–R2), extension of product and component lifetimes (R3–R7), and useful application of materials (R8–R9)(See Table 1).

A qualitative content analysis was used to capture the context and substance of corporate reporting rather than merely counting keywords or the space devoted to each topic [30,39,40,41]. Each company-year observation was assessed for the ten strategies. The scoring scale reflects the specificity of disclosure: 0 indicates that the strategy was not mentioned; 1 indicates a brief or general statement without concrete detail; 2 indicates a specific example, identifiable process, or verifiable quantitative evidence; and 3 indicates multiple concrete measures, implementation programs, or extensive data and operational detail. Similar ordinal scoring approaches have been applied in studies of sustainability and circular economy reporting [34,39,40,41]. The score therefore represents disclosure specificity. It is not a direct measure of circularity, implementation scale, or environmental performance.

The two annual reports for each company were reviewed using the definitions in Table 1. Activities were assigned to the R category that most closely matched their reported function. Where terminology differed across reports, classification followed the substantive definition rather than the label used by the company. The resulting scores were compared across strategies, manufacturers, and reporting years.

3. RESULTS AND DISCUSSION

3.1 Overall pattern of disclosed circular economy strategies

Table 2. Specificity of 10R strategy disclosure by company and reporting year

R	Acer		Apple		ASUS		Dell		HP		Lenovo	
	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024
R0	0	2	3	3	3	3	2	2	3	2	3	3
R1	3	2	3	3	3	2	3	3	2	2	2	2
R2	3	3	3	3	3	3	3	3	3	3	3	3
R3	2	3	3	3	2	3	3	3	3	3	3	3
R4	3	3	3	3	3	3	3	2	3	3	3	3
R5	3	1	2	2	2	1	1	2	3	3	2	2
R6	0	0	0	0	0	0	0	0	0	0	1	1
R7	0	0	0	0	0	0	0	1	0	0	0	0
R8	3	3	3	3	3	3	3	3	3	3	3	3
R9	0	0	0	0	0	0	3	3	3	3	3	3

Note: 0 = not mentioned; 1 = general statement; 2 = specific example, process, or quantitative evidence; 3 = multiple concrete measures or extensive implementation detail. Scores measure disclosure specificity, not circularity or environmental performance.

Table 2 summarizes the disclosure scores for the six manufacturers in 2023 and 2024. The scores must be read as indicators of the amount and specificity of reported information. They do not rank the firms' circularity or environmental performance. Across the sample, the most consistent disclosure concerns R2 Reduce and R8 Recycle. All firms received the highest disclosure score for these strategies in both reporting years. This concentration is consistent with the historical prominence of Reduce and Recycle in the 3R model and with evidence that recycling remains the most widely recognized circular economy practice [36,37,42].

R3 Reuse is also strongly represented. All six firms report arrangements that can extend product use through leasing, product-as-a-service models, resale, donation, or support for secondary use. Apple, for example, reports facilitating the reuse of 1.28 million devices. These disclosures suggest that manufacturers increasingly recognize continued use and transfer to another user as part of their circular offerings. However, the reports often cover multiple product categories, and the scores should not be interpreted as laptop-specific market shares or verified reuse outcomes.

R0 Refuse and R1 Rethink receive less uniform treatment. Reported Refuse practices include the elimination or substitution of materials and changes to production processes. Apple reports replacing plastic packaging with fiber-based alternatives and reducing plastic to 1% of packaging in 2024. ASUS reports restrictions on cleaning solvents, chlorine, polyvinyl chloride, and other substances. Acer provides little relevant information in its 2023 report but offers a more explicit life-cycle-management account in 2024. Although the level of detail in describing Rethink varies across manufacturers, all of them have undertaken initiatives in this area. ASUS has established eight sustainable design principles, including design simplification, modularity, and disassemblability. Dell adopts a systematic approach

that begins at the early stages of the product life cycle and encompasses circular design, sustainable materials, packaging, and transportation.

R9 Recover shows a distinct company pattern. Acer, Apple, and ASUS do not report energy recovery from incineration, whereas Dell, HP, and Lenovo provide quantitative information on waste-to-energy activities. Because Recover is the lowest-priority option in the 10R hierarchy, more extensive reporting of this activity should not be interpreted as evidence of a more circular strategy portfolio.

3.2 Strategies for extending product and component lifetimes

The five strategies from R3 to R7 directly address the extension of product and component lifetimes. They seek to retain products, components, and their embedded value within the economic system before materials move to recycling or recovery [6,7,37,43]. These options can reduce waste and resource demand, but their implementation depends on product design, reverse logistics, market acceptance, product quality, supply consistency, and viable business models [6].

Among these strategies, Reuse and Repair receive the most extensive disclosure. All firms report leasing, resale, donation, or other second-use activities. Repair is similarly prominent. HP, for example, describes equipment and component repair, service documentation, professional repair services, design for repairability, and quantitative information on repaired motherboards, liquid-crystal displays, and devices. The results indicate that repair and continued use have become visible components of corporate reporting, even though the reports do not provide a common outcome measure that would permit direct performance comparisons.

Refurbishment displays greater variation. HP reports a structured certified-refurbishment process that includes cosmetic grading, functional testing, data wiping, re-imaging, and the use of HP OEM parts, together with statistics on refurbished equipment. Acer reports donating refurbished desktops, monitors, laptops, and accessories in 2023 but provides limited information on the refurbishment process. Cross-company comparison is complicated by inconsistent use of the terms refurbishment and remanufacturing, a problem also recognized in the literature [37].

Remanufacture and Repurpose are rarely disclosed. Lenovo refers to remanufacturing within its product end-of-life management program but provides little operational detail. Dell briefly refers to repurposing in its APEX service without explaining the relevant process. The limited disclosure may reflect more than corporate inattention. Remanufacturing and repurposing can depend on modular product architecture, component availability, cost structures, warranties, intellectual property, market demand, and organizational change [6,38]. Repurposing is also less applicable to some product types and may occur more frequently in small-scale design or craft contexts. Nevertheless, these medium-length loops can preserve more value than material recycling and therefore warrant further corporate, policy, and research attention [6,37].

3.3 Interpretation of the corporate strategy portfolios

Taken together, the reports reveal an uneven circular strategy portfolio. Manufacturers provide rich information on established reduction and recycling activities and substantial information on reuse and repair. By contrast, refurbishment is inconsistent and remanufacturing and repurposing are largely absent. The pattern suggests that corporate circular economy reporting remains concentrated in familiar strategies and does not yet provide an equally developed account of all higher-value lifetime-extension options. Because the evidence measures disclosure, the results cannot determine whether weakly reported strategies are absent in practice or simply classified and communicated differently.

4. CONCLUSIONS

This study demonstrates that the circular economy strategies disclosed by major laptop manufacturers are not evenly distributed across the 10R hierarchy.While manufacturers have

incorporated a range of circular practices into their sustainability reporting, corporate attention remains concentrated on relatively established strategies. At the same time, strategies that may retain products and components at higher value are less consistently documented. These findings highlight both the progress made in corporate circular economy practices and the opportunities for moving beyond conventional resource efficiency and end-of-life management toward more comprehensive product and component lifetime extension.

1. Circular economy reporting remains centered on established strategies. Reduce and Recycle receive the most consistent and detailed disclosure, while Reuse and Repair are also widely represented. This pattern suggests that corporate circular economy portfolios continue to emphasize strategies that are already well established in environmental management and sustainability reporting. Although these activities contribute to resource conservation and waste reduction, the uneven distribution across the 10R hierarchy indicates that circular economy strategies have not yet developed equally across different forms of value retention.

2. Product lifetime extension is increasingly visible, but higher-value retention strategies remain underdeveloped in corporate reporting. Although Reuse and Repair are prominent, Refurbishment is unevenly reported. Remanufacture and Repurpose receive limited attention. This gap is significant because these strategies can preserve the functional and economic value embedded in products and components before they enter lower-value material recycling or recovery processes. Their limited disclosure therefore points to an important area for further corporate innovation, policy support, and research.

3. More transparent and product-specific evidence is needed to evaluate the transition from circular economy commitments to measurable outcomes. The results measure disclosure specificity rather than implementation scale or environmental performance. Sustainability reports differ in terminology, reporting scope, and level of detail, and the absence of disclosure does not necessarily mean that a strategy is absent in practice. Future research should complement corporate reports with product-level documentation, repairability evidence, reverse-logistics data, and environmental performance data. This would help assess whether disclosed strategies translate into measurable product lifetime extension and e-waste prevention.

Acknowledgement

The authors declare that they have no known competing financial interests or third-party interference that could have appeared to influence the work reported in this paper.

References

[1] Bressanelli, G., Saccani, N., Pigosso, D. C., & Perona, M. (2020). Circular Economy in the WEEE industry: a systematic literature review and a research agenda. Sustainable Production and Consumption, 23, 174-188.

[2] Gaur, T. S., Yadav, V., Mittal, S., & Sharma, M. K. (2024). A systematic review on sustainable E-waste management: challenges, circular economy practices, and a conceptual framework. Management of Environmental Quality: An International Journal, 35(4), 858-884.

[3] Meloni, M., Souchet, F., & Sturges, D. (2018). Circular consumer electronics: An initial exploration. Ellen MacArthur Foundation. https://www.ellenmacarthurfoundation.org/circular-consumer-electronics-an-initial-exploration

[4] Wojnarowska, M., Sołtysik, M., Więckowski, J., Frączek, M., Filek, J., Stanisławska-Mischke, A., & Jarosz, S. (2026). Consumer as a driver of the circular economy. *Business Strategy and the Environment*.

[5] Bakker, C., Wang, F., Huisman, J., & Den Hollander, M. (2014). Products that go round: exploring product life extension through design. *Journal of cleaner Production*, 69, 10-16.

[6] Morseletto, P. (2020). Targets for a circular economy. *Resources, conservation and recycling,* 153, 104553.

[7] Potting, J., Hekkert, M. P., Worrell, E., & Hanemaaijer, A. (2017). Circular economy: Measuring innovation in the product chain (PBL publication no. 2544). PBL Netherlands Environmental Assessment Agency.

[8] Baldé, C. P., Kuehr, R., Yamamoto, T., McDonald, R., D'Angelo, E., Althaf, S., Bel, G., Deubzer, O., Fernandez-Cubillo, E., Forti, V., Gray, V., Herat, S., Honda, S., Iattoni, G., Khetriwal, D. S., Luda di Cortemiglia, V., Lobuntsova,

Y., Nnorom, I., Pralat, N., & Wagner, M. (2024). The global e-waste monitor 2024. International Telecommunication Union & United Nations Institute for Training and Research.

[9] Forti, V., Baldé, C. P., Kuehr, R., & Bel, G. (2020). The global e-waste monitor 2020: Quantities, flows and the circular economy potential. United Nations University/United Nations Institute for Training and Research, International Telecommunication Union, & International Solid Waste Association.

[10] Liu, K., Tan, Q., Yu, J., & Wang, M. (2023). A global perspective on e-waste recycling. Circular Economy, 2(1), 100028.

[11] Lysaght, O., Forti, V., Bel, G., Bottausci, S., Schubert, M., Yamamoto, T., Shyla, H., Blepp, M., Cenni, F., de Linde, S., Escobar Ocampo, D., Iattoni, G., Khwamsawat, K., Kuehr, R., Korajčević, S., Ngumba, L., Magpantay, E., Martínez, L. H., Menton, N., ... Baldé, C. P. (2026). E-waste statistics: Guidelines on classifications, reporting and indicators (3rd ed.). UNITAR-SCYCLE. https://doi.org/10.5281/zenodo.18328494

[12] Cao, D., Puntaier, E., Gillani, F., Chapman, D., & Dewitt, S. (2024). Towards integrative multi-stakeholder responsibility for net zero in e-waste: A systematic literature review. Business Strategy and the Environment, 33(8), 8994-9014.

[13] Shittu, O. S., Williams, I. D., & Shaw, P. J. (2021). Global E-waste management: Can WEEE make a difference? A review of e-waste trends, legislation, contemporary issues and future challenges. Waste Management, 120, 549-563.

[14] Tansel, B. (2017). From electronic consumer products to e-wastes: Global outlook, waste quantities, recycling challenges. *Environment International,* 98, 35-45.

[15] McMahon, K., Hultink, E. J., & Mugge, R. (2025). Laptops at work: The laptop user as a stakeholder in organizational ICT circularity. Resources, Conservation and Recycling, 217, 108186.

[16] Puca, A., Carrano, M., Liu, G., Musella, D., Ripa, M., Viglia, S., & Ulgiati, S. (2017). Energy and eMergy assessment of the production and operation of a personal computer. Resources, Conservation and Recycling, 116, 124-136.

[17] Yuksek, Y. A., Haddad, Y., Pagone, E., Jagtap, S., Haskew, S., & Salonitis, K. (2023). Sustainability assessment of electronic waste remanufacturing: The case of laptop. Procedia CIRP, 116, 378-383.

[18] Woidasky, J., & Cetinkaya, E. (2021). Use pattern relevance for laptop repair and product lifetime. Journal of Cleaner Production, 288, 125425.

[19] Omdia. (2026, January 12). Global PC shipments grew 9% in 2025, but memory and storage supply issues threaten 2026 outlook. https://omdia.tech.informa.com/pr/2025/dec/global-pc-shipments-grew-9percent-in-2025-but-memory-and-storage-supply-issues-threaten-2026-outlook

[20] Ferreira, M., Domingos, I., Santos, L., & Ferreira, J. (2025). Environmental impact analysis of computers and electronic devices: A review of life cycle assessment studies. In 2025 5th International Conference on Electrical, Computer and Energy Technologies (ICECET) (pp. 1–6). IEEE. https://doi.org/10.1109/ICECET63943.2025.11472278

[21] Prakash, S., Liu, R., Schischke, K., & Stobbe, L. (2012). Timely replacement of a notebook under consideration of environmental aspects (Texte 45/2012; Project No. 363 01 322). Umweltbundesamt (German Federal Environment Agency).

[22] Dalhammar, C., Richter, J. L., & Fernandez-Montenegro von Schack, P. S. (2024). Drivers and barriers for “circular” consumer electronics in the European Union. In Electronics Goes Green 2024+ Conference Proceedings. IEEE. https://doi.org/10.23919/EGG62010.2024.10631178

[23] Lynch, J., & Serrenho, A. C. (2023). What really matters to reduce the energy demand of household electronics? Global sensitivity analysis of circular economy strategies for the United Kingdom. Journal of Cleaner Production, 432, 139746.

[24] Moraga, G., Huysveld, S., De Meester, S., & Dewulf, J. (2022). Resource efficiency indicators to assess circular economy strategies: A case study on four materials in laptops. Resources, Conservation and Recycling, 178, 106099.

[25] Parajuly, K., Fitzpatrick, C., Muldoon, O., & Kuehr, R. (2020). Behavioral change for the circular economy: A review with focus on electronic waste management in the EU. Resources, Conservation & Recycling: X, 6, 100035.

[26] European Commission. (2015). Closing the loop—An EU action plan for the circular economy (COM(2015) 614 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614

[27] Coughlan, D., Fitzpatrick, C., & McMahon, M. (2018). Repurposing end of life notebook computers from consumer WEEE as thin client computers–A hybrid end of life strategy for the Circular Economy in electronics. Journal of Cleaner Production, 192, 809-820.

[28] International Data Corporation. (2025, April 8). The PC market enters volatile 2025 on strong results, according to IDC. https://my.idc.com/getdoc.jsp?containerId=prUS53304025

[29] Gartner. (2026, January 20). Gartner says worldwide PC shipments increased 9.3% in fourth quarter of 2025 and 9.1% for the full year. https://www.gartner.com/en/newsroom/press-releases/2026-1-20-gartner-says-worldwide-pc-shipments-increased-9-point-3-percent-in-fourth-quarter-of-2025-and-9-point-1-percent-for-the-full-year

[30] Opferkuch, K., Caeiro, S., Salomone, R., & Ramos, T. B. (2021). Circular economy in corporate sustainability reporting: A review of organisational approaches. Business Strategy and the Environment, 30(8), 4015-4036.

[31] Rhein, S., & Sträter, K. F. (2021). Corporate self-commitments to mitigate the global plastic crisis: Recycling rather than reduction and reuse. Journal of Cleaner Production, 296, 126571.

[32] Sihvonen, S., & Partanen, J. (2017). Eco-design practices with a focus on quantitative environmental targets: An exploratory content analysis within ICT sector. *Journal of cleaner production*, 143, 769-783.

[33] Stewart, R., & Niero, M. (2018). Circular economy in corporate sustainability strategies: A review of corporate sustainability reports in the fast-moving consumer goods sector. Business Strategy and the Environment, 27(7), 1005-1022.
[34] Atif, S., & Hassan, A. (2025). From bane to boon: How global fortune 500 companies disclose about using servitisation and Industry 4.0 as circular economy strategy. Corporate Social Responsibility and Environmental Management, 32(4), 5277-5301
[35] Campbell-Johnston, K., Vermeulen, W. J., Reike, D., & Brullot, S. (2020). The circular economy and cascading: towards a framework. Resources, Conservation & Recycling: X, 7, 100038.
[36] Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. Resources, *conservation and recycling*, 127, 221-232.
[37] Reike, D., Vermeulen, W. J., & Witjes, S. (2018). The circular economy: new or refurbished as CE 3.0?—exploring controversies in the conceptualization of the circular economy through a focus on history and resource value retention options. Resources, *conservation and recycling*, 135, 246-264.
[38] Rahman, S. M., Pompidou, S., Alix, T., & Laratte, B. (2021). A review of LED lamp recycling process from the 10 R strategy perspective. Sustainable Production and Consumption, 28, 1178-1191.
[39] Papoutsi, A., & Sodhi, M. S. (2020). Does disclosure in sustainability reports indicate actual sustainability performance?. Journal of Cleaner Production, 260, 121049.
[40] Roberts, L., Georgiou, N., & Hassan, A. M. (2023). Investigating biodiversity and circular economy disclosure practices: Insights from global firms. Corporate Social Responsibility and Environmental Management, 30(3), 1053-1069.
[41] Yadava, R. N., & Sinha, B. (2016). Scoring sustainability reports using GRI 2011 guidelines for assessing environmental, economic, and social dimensions of leading public and private Indian companies. Journal of Business Ethics, 138(3), 549-558.
[42] Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner production, 114, 11-32.
[43] Bocken, N. M., Olivetti, E. A., Cullen, J. M., Potting, J., & Lifset, R. (2017). Taking the Circularity to the Next Level: A Special Issue on the Circular Economy: A Special Issue on the Circular Economy. Journal of Industrial Ecology, 21(3), 476-482.