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Abstract

The increasing concern about environmental and energy conservation leads industries to serve the sustainability development as one of important issues. Reverse logistics can manage product returns effectively and play an important role in achieving the sustainability goals of any organization. As a result, many companies have been paying close attention to reverse logistics and made it a strategic decision. Despite the fact that reverse logistics can significantly increase the organization's sustainability performance, there has been little research into the relationship between reverse logistics and sustainability performance. Thus far, few researchers have examined the impact of reverse logistics disposition decisions on the triple bottom line (TBL), which includes economic, environmental, and social performance. Thus, this paper aims to review the impact of reverse logistics on sustainable performance and examine which option of the disposition decision is more suitable for the sustainable performance. Also, content analysis was used to analyse the selected papers on reverse logistics and sustainability performance. Ultimately, this study concludes that the impact of reverse logistics on social aspect have been largely neglected. Also, this study suggests that future researchers should concentrate on the empirical studies on how each disposition option of reverse logistics may influence the sustainability performance.
Keywords: Sustainability, Sustainable Performance, Triple Bottom Line, Reverse Logistics, Disposition Options

Introduction

According to the World Meteorological Organization, 2015-2019 was the warmest period on record, with a 0.2 percent rise in global climate change over 2011-2015. (WMO, 2019). One of the causes for this shift was a 20% increase in global carbon emissions, which has reached 410 parts per million of carbon emissions at the end of 2019. In addition, 831 climate-related extreme events caused a total of US$166 billion in global economic losses and a new high of 55.3 Gt of CO_2 equivalent emissions in 2018 (Zhang et al., 2020). As a result of the growing socio-environmental problem, involving climate change, pollution, and multiple health concerns caused by pollutions, all countries are now concerned about sustainable development (Khan et al., 2019). All the United Nation member nations adopted the Sustainable Development Goals (SDGs) in 2015 to eradicate poverty, safeguard the

environment, and ensure prosperity by 2030. In this period of sustainable development, all companies are suggested to increase awareness to pursuit sustainability development goals concerned with social well-being, economic development, and environmental protection (Tsalis et al., 2020). Also, numerous organizations have included sustainability into their missions, and they have made ongoing attempts to fulfil their commitment to sustainability (Digalwar et al., 2020).

The term sustainability refers to a generation's ability to meet their own needs without jeopardizing the needs of future generations. The existence of three critical elements (social, environmental, and economic) for product manufacturing can be defined as the fundamental concept of sustainability. Adopting sustainable principles can help businesses make more surplus and stay in business for the long term. Sustainability development has been one of critical issues. On a company level, reverse logistics (RL) makes the most contribution to better global sustainability. Well-managed RL initiatives can attain sustainability and generate a competitive advantage through boosting profits, lowering expenses, and enhancing customer happiness.

Furthermore, reverse logistics enables industries to recapture value that would otherwise be lost. For example, a remanufactured engine can significantly reduce emissions by 565 kg CO_2, 6.09 kg CO, and 3.98 kg SO_2 compared to a new engine (i.e., no remanufactured products) (Kasman et al., 2015; Zhang and Chen, 2015). Moreover, the retail price of a remanufactured product is often 50% to 70% less than that of a new one (Hazen et al., 2017). In terms of job creation, the social viewpoint must also be taken into account when determining the need for reuse, recovery, and recycling operations (reverse logistics activities). However, the global unemployment rate was 5%, which can be reduced in the future due to an increase in the number of jobs generated internationally (Kühn, 2019). This demonstrates that increasing the usage of reuse, recycling, and recovery operations will promote resource conservation and result in more job creation and a lower unemployment rate around the world.

However, much of the previous research has concentrated on the economic and environmental advantages of RL. There is a paucity of research examining the relationship between RL and sustainability, as well as analyzing how RL disposition alternatives, involving recycle, reuse, repair, remanufacturing, can improve sustainability performance by integrating the three sustainability pillars (Banihashemi et al.,2019). To fill up the gaps in the literature, this study examines the literature on RL and sustainability performance and assesses the performance of the RL disposition options in three dimensions of sustainability: environmental, economic, and social.

Concepts and Definitions
Reverse Logistics
The reverse logistics concept has received increased attention because of multiple factors, including competition among organizations, environmental interference, social marketing, and economic elements (Kabir, 2013; Alkahtani et al., 2021). Reverse logistics can reroute flows from the point of consumption back to the point of origin to recover value or dispose of waste properly. Reverse logistics refers to the flow of information and materials backwards for reuse, recondition and recycling valuable parts that can be resold in the market after undergoing transformation into new products (Anne et al., 2016). Nevertheless, from a comprehensive viewpoint, reverse logistics is deemed as a management process, including the cost-effective and efficient inputs flow, partially completed products, end products, and the related information from the end-user to the organization that initially sold the products

to capture the value and for environmental protection through appropriate disposal (Murphy, 2012). According to this review, the study definition considers the sustainable development aspect. Thus, in this study, reverse logistics mainly denote returning products from the consumption point to the origin location. The objective of reverse logistics does not only pursuit economic and environmental benefits but also pursuit social performance.

Sustainability Performance

The term sustainability has been coined as the present generation's ability to fulfil their necessities without bargaining with the future generations' needs. The vital sustainability concept can be defined as the presence of three crucial elements (social, environmental, and economic) in manufacturing products (Beske et al., 2014). Firms and businesses do not focus only on the economic sustainability aspect. However, they strive for environmental and social performances as these two indicators have gained impetus despite the complications in measuring the performance. Thus, many organizations shift to sustainable results as stakeholders emphasize society and the environment (Kang, 2015).

Various literature (e.g., Fahimnia et al., 2015; Tajbakhsh and Hassini, 2015; Mariadoss et al., 2016) studied the significant implications where environmental and social sustainable supply chain strategies adoption positively impact sustainable economic performance. Carter and Rogers (2008) stated that organisations emphasising the three bottom lines could attain better economic performance than organisations focusing on either one or two of the components (Mirkouei, 2017; Moktadir, 2018). Higher economic gains encourage organisations to adopt better social responsibility (Mota, 2015). Organisations with robust economic strength can splurge additional money on treating pollution, offer advantages to the society and enhance the employees' wellbeing (Cao and Zhang, 2011; Li et al., 2014).

This research's sustainability performance mainly refers to firms need to operate manufacturing activities by considering all three basic dimensions (economic, social and environmental performance). Subsequently, the firms can minimise the cost of returns, improve customers' satisfaction, reduce community complaints, highlight the design of recyclable pallets and packaging, decrease unwarranted deliveries, and utilise green substances on product design to minimise environmental influences. Thus, sustainability performance can be assessed according to the economic, society, and environmental impact (Chopra and Meindl, 2016).

Methodology

The content analysis method was selected to conduct the literature evaluation in this study since it is ideal for observational research and can systematically assess the symbolic content of all sorts of written records. The content analysis approach also aids researchers in identifying and analysing literature to shape various categories, which can aid in the development of a new research domain.

This research exclusively includes papers published in English-language academic journals and conference articles between 2010 and 2021. As a result, papers written in other languages are no longer accepted. Scopus, Web of Science, Emerald, and Google Scholar databases were used to compile the data for this study. The keywords "reverse logistics," "sustainability," "sustainability performance," and "sustainable development" were used to find articles. Table 1 lists all the review process. A total of 309 papers were collected after being checked for substance and relevance, and 49 papers were chosen and examined.

Table 1. Review process

Steps	Process	Systematization of data
Define Research Problem	Define research themes of reverse logistics and sustainability performance.	
Article searching	Searching articles in Scopus, Web of Science, Emerald and Google Scholar databases with keywords.	309
Exclusion	To capture recent developments in the topic, the search includes both journal and peer-reviewed conference publications.	307
Limited	Following several rounds of refining, it was determined to limit the research fields (known as "subject area" in databases) to environmental science, engineering, business, economic, social sciences, and decision sciences.	255
Inclusion	Search String with Article Inclusion Criteria: ● Full-text articles can access. ● The paper should contain the research subject, which are "reverse logistics" or "sustainability performance". ● The objective of articles should match the paper.	59
Articles identification	Comprehensive investigation of research articles.	49

Results and Discussion

Classification the Journals

The title, abstract, and objective of all the publications were assessed using the inclusion criteria, resulting in the rejection of 196 papers (77 per cent of the total). The introduction and conclusion of the chosen 59 papers (23 per cent) were read, resulting in 49 papers being selected. In the last ten years, the selected publications have appeared in 29 different journals. The distribution of publications by the journal is depicted in Figure 1. (Bule bars). The Journal of Cleaner Production produced the most papers (7 publications), which can be explained by the journal's strong connection to cleaner production, environmental issues, and sustainability concerns. Furthermore, the International Journal of Production Research and Benchmarking: An International Journal and the International Journal of Production Research and Benchmarking: An International Journal each presented four and three publications, respectively, which could be attributed to the primary focus of the journals as mentioned above and their relationship to the current question in focus. The remaining articles come from several periodicals covering a wide range of topics, including mechanical and sustainable design, renewable energy, production economics, and clean technology. Finally, the 49 publications were thoroughly investigated, and 24 were selected to examine sustainability performance metrics.
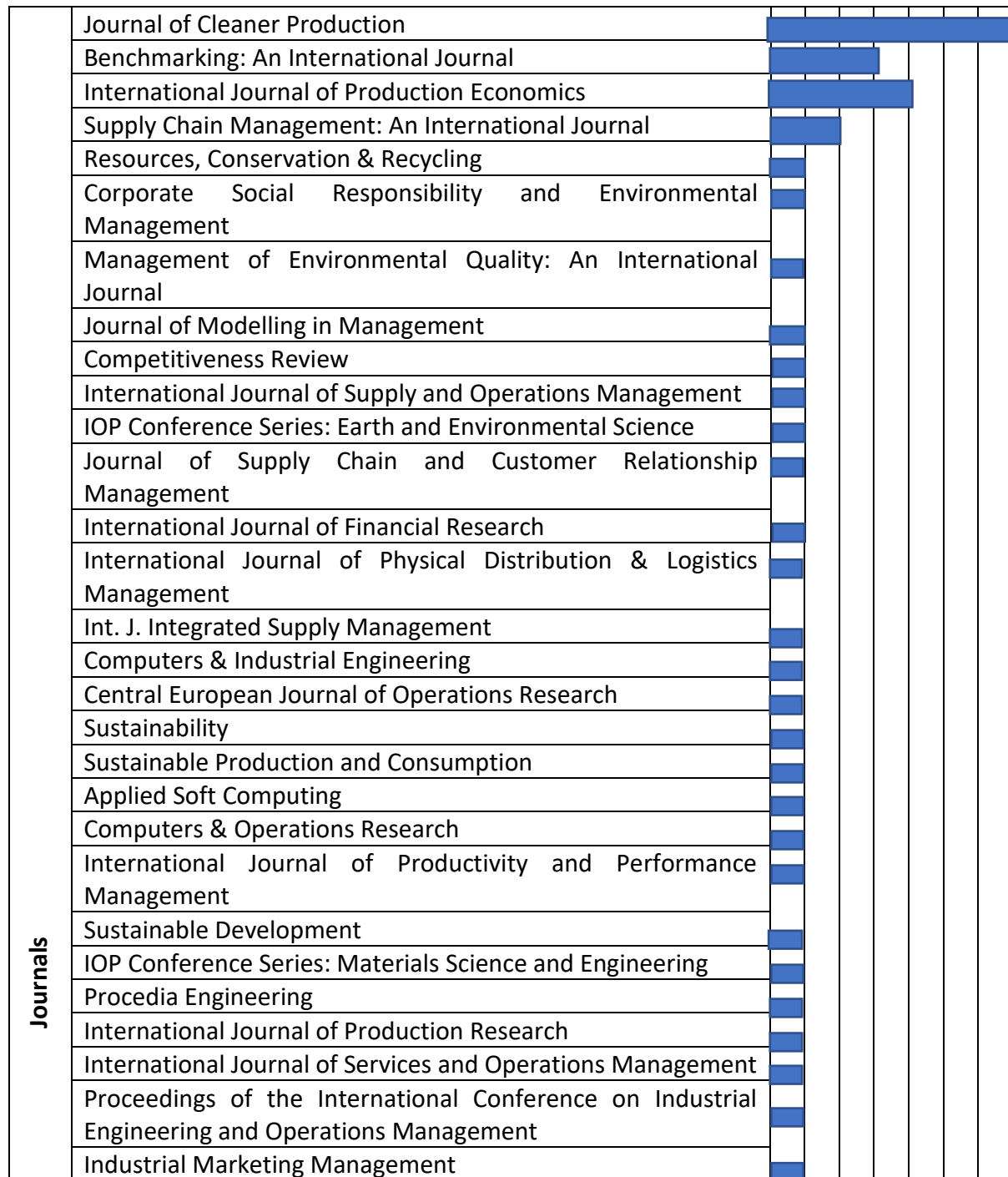
Fig. 1. Journal distribution of selected publications (in blue)

Analysis of Performance Indicator Classification According to TBL Dimensions
Economic Performance

Economic performance is an integrated dimension in sustainability performance (Ahmad et al., 2019), indicating that corporates pursue long-term profit development (Delai and Takahashi, 2011). The long-term economic value primarily suggests that firms should focus on the share value, profit growth, sales growth and market competitiveness while maintaining social and environmental responsibilities (Ahi and Searcy, 2013; Luthra et al., 2019). The companies should reduce the cost to reap maximum profits for economic sustainability by optimising resources and raw materials utilisation (Mandal, 2013).

Profit and cost are the common economic indicators (Ahmad, 2018). The economic indicators of the past decade were reviewed (Refer to Figure 2). The indicators are categorised under two aspects: profits and cost. The first indicator, namely 'reduce the cost', focuses on reducing the purchased inputs cost, energy consumption cost and operational expenses, such as waste management. The second indicator, 'profitability', emphasises sales revenue and profits. Comparatively, the focus of economic evaluation and assessment is more on profit analysis than cost analysis.

Most studies include profit-based indicators. Nevertheless, 12 papers evaluated the cost-related indicators. For example, Faisal (2012); Sangwan et al (2019); Narimissa et al (2020) and Neri et al (2021) have excluded the cost dimension. These studies considered profits maximisation as the goal of supply chain optimisation and scheduling. Alternatively, many studies considered the cost of waste management, resources (e.g., packing and raw materials) and energy as economic performance indicators (Uysal, 2012; Chardine-Baumann, 2014; Gopal and Thakkar, 2015; Baba et al., 2019). These studies emphasised that economic sustainability's goal is the logistic cost reduction or profit maximisation in various supply chain actions across the product's lifecycle stages.

This study describes economic performance as the cost reduction effort by managing manufacturing-related activities to incur a lower cost and generate profits or attain higher revenue growth via increased sales and returns in investments. Supply chains are valuable resources for organisations that support achieving cost reduction and producing high-quality products on time to fulfil market demands and generate profits. Therefore, manufacturers that suit the organisations' objectives must be selected and developed to achieve better economic performance.

Environmental Performance
Environmental performance indicates that companies minimise environmental damage by reducing pollution, recycling and reusing waste products, and reducing excessive use of resources (Touboulic and Waler, 2015). Figure 2 displays all the environmental indicators. These indicators are categorised into three categories, including environmental input, environmental output, and product stewardship. The analysis demonstrated that the environmental assessment indicators were not engaged equivalently in the previous studies that were reviewed. For example, environmental output was identified to be frequently investigated than product stewardship. The focus on environmental output could have resulted from broader global consideration and emphasis on air and solid emissions (Liu et al., 2016).

Besides, the environmental output is highlighted frequently because of scenarios where solid waste from the manufacturing industry causes the landfills to pollute the air, soil and groundwater and causes grave harm to human health (Varsei et al., 2014; Verdecho et al., 2020). Figure 2 demonstrates that environmental input is based on numerous indicators, such as resource, energy, materials, and others. Thus, the efficiency of environmental input has proven to save costs and energy in supply chain activities within the manufacturing industry (Tajbakhsh and Hassini 2015; Sopadang et al., 2017).

This study evaluated environment performance from the perspective of prevention and reduction efforts. Reduction efforts involve reducing emission, raw materials input, and utility usage, whereas prevention efforts include using alternate environment-friendly resources, production methods and energy sources for environment preservation activities implemented by an organisation (Gomes et al., 2014; Eikelenboom et al., 2019).

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Social Performance

Social performance is among the sustainability dimensions that should not be overlooked (Shibin, 2017). Ethics and social values are the inevitable dimensions of sustainability performance in organisations (Gunasekaran and Spalanzani, 2012). Social performance denotes the dynamic values of undesirable and social concepts, and the ways personal goals are incorporated to serve social objectives (Akotia, 2014). Nevertheless, products should meet the demands and needs of the population to attain social sustainability (Mandal, 2013). The social indicators are classified by stakeholders or affected parties, including customers, employees, and the community (Qureshi et al., 2017). Figure 2 shows the analysis and review of social indicators in the past decade. According to Sopadang et al (2017) and Ahmad et al. (2019), the indicators are first categorised according to the stakeholders, including employees, community, and customers. The employee category was highlighted frequently in all the reviewed studies (Varsei et al., 2014; Stindt, 2017). In Sopadang et al (2017) study, the customers' satisfaction is deemed the main output of social performance.

Nevertheless, the community category was comparatively less highlighted from the perspective of sustainability assessment. The total sustainability score might assist in identifying key issues of contention among supply chain stakeholders (employees, community, and customers). In contrast, the overall sustainability score in the community (75%) indicated that the community is imperative in social sustainability (Sopadang et al., 2017).

The primary interests in the employee category focus on fundamental labour rights that are based on indicators, such as wage or salary (Hassini et al., 2012; Reefke and Trocchi, 2013; Gopal and Thakkar, 2015; Izadikhah and Saen, 2018), safe working conditions (Varsei et al., 2014; Stindt, 2017; Narimissa et al., 2020), training (Hassini et al., 2012; Chardine-Baumann, 2014; Gopal and Thakkar, 2015; Tajbakhsh and Hassini, 2015; Baba et al., 2019), and development (Ahi and Searcy, 2015; Sopadang, 2017; Narimissa et al., 2020). Nonetheless, other indicators of the employee category, such as labour satisfaction (Neri et al., 2021), was less employed in the reviewed studies. Hassini et al (2012); Ahi and Searcy (2015), and Sopadang (2017) demonstrated that the identified key indicators in the social dimension of performance are customer and employee satisfaction.

Therefore, social performance measurement in this study used the organisations activities concerning stakeholders' health and safety, equal treatment and satisfaction. Unacceptable working conditions in industry include child labour, hazardous chemicals usage, safety issues in factories, forced labour, and low wages. The unacceptable working conditions are among the social concerns (Köksal et al., 2017) related to the social risks in the supply chain that a company could face.
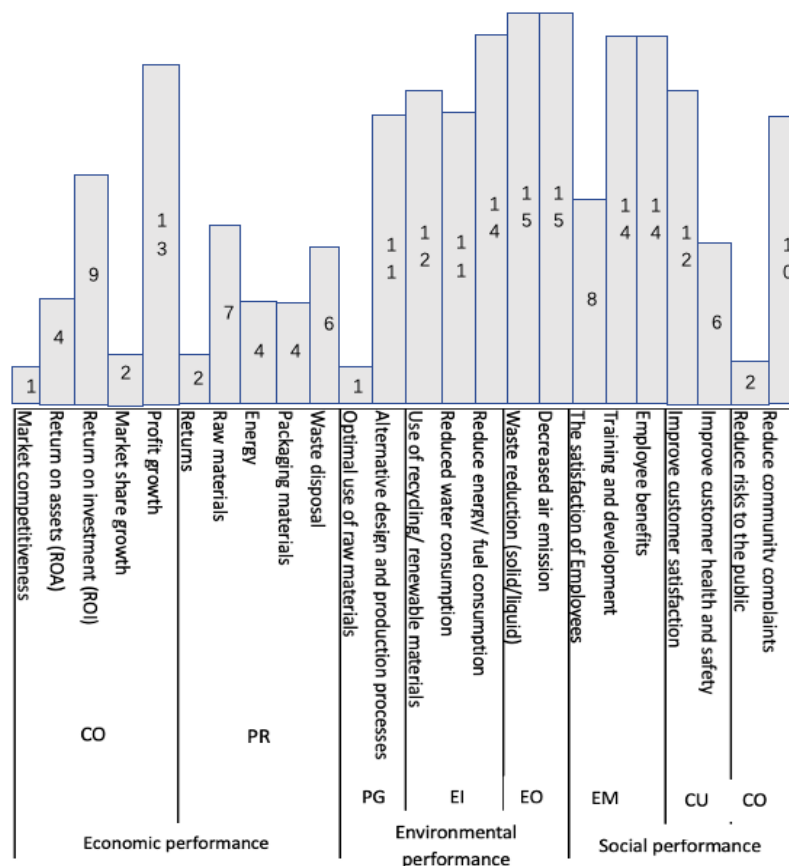
Fig. 2. Total number of performance indicators capturing sustainability performance dimensions and corresponding aspects, where grey bars highlight aspects, covered by indicators most frequently proposed in the literature.
[Note=Co: Cost; PR: profit; PG: Product Stewardship; EI: environmental Input; EO: Environmental Output; EM: Employee; CU: Customer; CO: Community]

Reverse Logistics Dimensional Framework
Based on the sustainability concept, waste prevention via reverse logistics practice has recently drawn scholars' attention (Plaza-Úbeda et al., 2020). Reverse logistics practice is defined as recovery of the goods whose lifetime fails to end. Similarly, reverse logistics can also be considered to salvage goods that are not beneficial for users (Afum, 2019). Organisations implement various reverse logistics methods. Several researchers (e.g., Eshikhati, 2014; Ndung'u and Moronge, 2017; Agrawal and Singh, 2019) recognised remanufacture, reuse, repair, recycle, and disposal as the generally implemented reverse logistics methods.
Figure 3 shows the typical reverse logistics practices that include recycling, reuse, remanufacture, repair and disposal (Agrawal and Singh, 2019), updated from Alkahtani et al. (2021). Reverse logistics has been recognized as an important part of the sustainable supply chain management (SSCM) strategy (Afum, 2019). Furthermore, recalling customers' used products to reuse, remanufacture, recycle, repair, and disposal can enhance the value of returned items while lowering the overall cost (Sharma et al., 2011). Campos et al. (2017) denoted that salvaging used products is more economical than direct disposal. Thus, deciding dispositions appropriately, including reuse, repair, remanufacture or recycling, is necessary for organisations to recapture value (Basnihashemi et al., 2019).
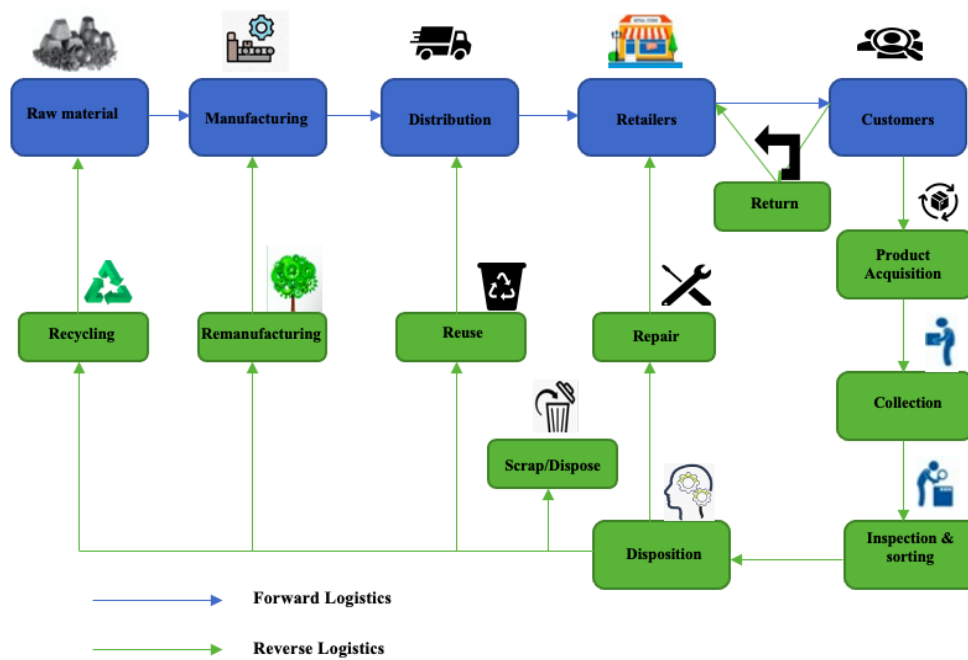
Fig. 3. The basic concept of reverse logistics practices (Updated from Alkahtani et al., 2021)

The Impact of Reverse Logistics on Sustainability Performance
The Impact of Reverse Logistics on Economic Performance
Reverse logistics boost the improvement of a company with profits and strategic benefits. Firms with products subjected to renewal can save equal to 60 % of the new product's total estimated cost (Janusz et al., 2014). The review of alternative reverse logistics disposition options and economic performance is shown in Table 2 (updated from Banihashemi et al., 2019). A literature review found that recycling and reuse are more significant than disposal activities (O'Connell et al., 2013; Vahabzadeh et al., 2015; Khor et al., 2016; Ahmed et al., 2016; Wanjiku and Mwangangi, 2019), as shown in Table 8. For example, reuse and recycle are correlated with the economic significance of decreasing costs of input materials and managing value-adding activities (O'Connell et al., 2013; Zanghelini et al., 2014; Nußholz and Whalen, 2019).

Similarly, recycling and reuse play a significant role in cost reduction and higher market share (Ahmed et al., 2016; Jindal and Sangwan, 2016; Wanjiku and Mwangangi, 2019). Additionally, the economic elements focus on regaining value from the products that are returned, including salvaging integrated circuit boards from electrical products or obtaining valued components from the product via recycling and reuse processes (Vahabzadeh et al., 2015; Ahmed et al., 2016; Khor et al., 2016). Nevertheless, Jindal and Sangwan (2016) discussed that repair is the best recovery process followed by remanufacturing and recycling in profit and energy consumption. The recovery of products for repair through proper disposition is a good advantage for companies (Agrawal et al., 2016).

Table 2. The review on different disposition reverse logistics and economic performance options

Authors	Reverse logistics disposition options				
	Reuse	Repair	Remanufacture	Recycle	Disposal
Vahabzadeh et al (2015)	√	√	√	√	√
Khor et al (2016)	√	√	√	√	√
Jindal and Sangwan (2016)	√	√	√	√	
Agrawal et al (2016)	√	√	√	√	√
Ahmed et al (2016)	√	√	√	√	
Oliveira and Magrini (2017)					
Wibowo et al (2014)				√	
Sabharwal and Garg (2013)			√		
Yalabik et al (2014)			√		
Zanghelini et al (2014)					
O'Connell et al (2013)	√				
Bahrami and Jafari (2019)					
Wanjiku and Mwangangi (2019)	√			√	
Nußholz and Whalen (2019)	√				
Oliveira Neto and Correia (2019)				√	

The Impact of Reverse Logistics on Environmental Performance

Reverse logistics stimulate alternative resource usage that is cost-effective and environmentally friendly via lengthening the product life cycle (Abdul, 2017). Table 3 (updated from Banihashemi et al., 2019) shows the review on different disposition reverse logistics options and environmental performance. Several researchers examined the environmental performance of reverse logistics implementation and disposition alternatives (Ye et al., 2013; Huang and Yang, 2014; Khor et al., 2016). The studies concluded that implementing reverse logistics could be a factor to improve environmental sustainability performance. As shown in Table 2, recycle is ranked at the top, followed by remanufacturing and finally, reuse. Khor et al (2016) demonstrated that recycling was most profitable for organisations when regulatory pressure is absent.

Similarly, as highlighted by several studies, recycling is the most preferred sustainable management alternative (Wibowo et al., 2014; Agrawal et al., 2016; Ahmed et al., 2016). Recycled materials are beneficial as these materials leave a lower carbon footprint compared to raw materials turned into completed goods in an intensive carbon process (Wibowo et al., 2014; Zanghelini et al., 2014). Furthermore, recycling is a technique utilised to decreases the solid waste stream volume, although the reverse logistics channels used seem to have received minimal attention (Vahabzadeh et al., 2015; Oliverira Neto and Correia, 2019; Wanjiku and Mwangangi, 2019).

Table 3. The review on different reverse logistics and environmental performance disposition options

| Authors | Reverse logistics disposition options | | | | |
	Reuse	Repair	Remanufacture	Recycle	Disposal
Vahabzadeh et al (2015)		√	√	√	√
Khor et al (2016)		√	√	√	√
Jindal and Sangwan (2016)		√	√	√	
Agrawal et al (2016)	√	√	√	√	√
Ahmed et al (2016)	√	√	√	√	
Oliveira and Magrini (2017)				√	√
Wibowo et al (2014)				√	
Sabharwal and Garg (2013)					
Yalabik et al (2014)			√		
Zanghelini et al (2014)			√	√	√
O'Connell et al (2013)	√				
Bahrami and Jafari (2019)				√	
Wanjiku and Mwangangi (2019)					
Nußholz and Whalen (2019)					
Oliveira Neto and Correia (2019)				√	

The Impact of Reverse Logistics on Social Performance

By repairing or restoring broken-down products, reverse logistics can play an important role in customer happiness and loyalty (Banihashemi et al., 2019). Table 4 offers an evaluation of several reverse logistics disposal strategies and social sustainability performance. Hence, recycling is the most vital reverse logistics disposition option for social performance (O'Connell et al., 2013; Jindal and Sangwan, 2016; Agrawal et al., 2016). Recycling plays a significant role in attaining social performance involving customer satisfaction (Wanjiku and Mwangangi, 2019). Nevertheless, reuse can offer employment to the vulnerable and unemployed equal opportunities provided by recycling if conducted via social enterprises (O'Connell et al., 2013; Jindal and Sangwan, 2016; Khor et al., 2016). By examining the reuse and recycling process, the United States Environmental Protection Agency (US EPA) estimated that 10,000 tons of materials create one job at an incinerator, six jobs at landfills, 36 jobs at recycling centres, and 28 to 296 employees in the reuse business. However, reuse may not develop more employment compared to recycling (Sherien et al., 2016). Recycling and reuse characterise a notable feature that provides employment opportunities and social development (Agrawal et al., 2016; Ahmed et al., 2016).

Table 4. The review on different disposition reverse logistics and social performance options

Authors	Reverse logistics disposition options				
	Reuse	Repair	Remanufacture	Recycle	Disposal
Vahabzadeh et al (2015)					
Khor et al (2016)					
Jindal and Sangwan (2016)		√	√	√	
Agrawal et al (2016)	√	√	√	√	√
Ahmed et al (2016)	√	√	√	√	
Oliveira and Magrini (2017)					
Wibowo et al (2014)				√	
Sabharwal and Garg (2013)					
Yalabik et al (2014)					
Zanghelini et al (2014)					
O'Connell et al (2013)	√				
Bahrami and Jafari (2019)					
Wanjiku and Mwangangi (2019)	√			√	
Nußholz and Whalen (2019)					
Oliveira Neto and Correia (2019)					

In contrast, research on reverse logistics impacts social performance is limited. The environmental and economic performance of reverse logistics are emphasised more, but the significance of social benefits is overlooked. The economic element of reverse logistic processes identified through numerous cost-benefit analyses has been modelled and debated. Conversely, the social implications of reverse logistics, contributing factors, and critical measures were not comprehensively analysed (Banihashemi et al., 2019).

Conclusions

This research conducted a thorough analysis of the literature to assess the effectiveness of reverse logistics in terms of three dimensions of sustainability: environmental, economic, and social. Furthermore, most former studies have concentrated on analyzing the influence of reverse logistics on sustainability performance in general without considering the impact of reverse logistics disposal decision-making, which includes recycling, reuse, remanufacture, repair, and disposition. As a result, this study aims to determine which reverse logistics disposal option is best for improving sustainability performance, which could help future research to further investigate the impact of reverse logistics on sustainability performance. Overall, the main findings of this review can support organizations to identify that reverse logistics is an effective tool to achieve sustainability performance, involving economic performance, social performance and environmental performance. It is significant for the top management to implement reverse logistics in the supply chain of the industry. This study also has important implications concerning the disposition for sustainable performance of reverse logistics. It is found that recycling is the most vital disposition decision of reverse logistics for improving customer satisfaction, lowering carbon footprint, reducing cost, and making a higher market share. The results provide guidelines for improved performance of reverse logistics with the aid of disposition decision making. Also, the produced results will be helpful for academicians, industries. The findings suggest that limited studies have looked at reverse logistics' impact on social performance, provided a gap for future research. Finally, practitioners should assess the impact of various reverse logistics disposition alternatives on

the triple-bottom-line among different industries. Empirical studies on how each disposition option may affect sustainability performance should be conducted.

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