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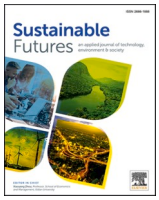

The effect of commitment to sustainable supply chain management and reverse logistics on performance in context of UAE food industry

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ABSTRACT

The objective of the study is to assess the impact of commitment to sustainable supply chain management and commitment to sustainable reverse logistics on the capabilities of sustainable reverse logistics and operational performance. This will be achieved by gathering and analyzing data from the food industry in the UAE. A proposed research model illustrates the anticipated correlation between sustainable commitment to sustainable supply chain management, commitment to sustainable reverse logistics, sustainable reverse logistics capacity, and operational performance. The gathered data was validated and examined by various methodologies, including confirmatory analysis, reliability analysis, linear regression, correlation analysis, and structural equation modeling. The research model and hypotheses were tested based on data obtained through an online survey conducted among 315 enterprises operating in the food industry in the UAE. The statistical analysis of the gathered data confirms the presence of a favorable correlation between the commitment to sustainable supply chain management, the commitment to sustainable reverse logistics, and the sustainable reverse logistics capability. Furthermore, the statistical study provides evidence for the favorable correlation between sustainable reverse logistics capability and operational performance. The sample size may limit the generalizability of the study's findings. This paper proposes an effective operational framework for the food business in the UAE. The findings indicate that effectively implementing a commitment to sustainable supply chain management and a commitment to sustainable reverse logistics will enhance sustainable reverse logistics capability and operational performance. This study is part of a limited number of studies that aim to assess the influence of companies' commitment to sustainable supply chains and reverse logistics on performance in the Gulf region and the Middle East. The findings of this study highlight the significance of companies' dedication to sustaining supply chains due to their positive effect on enhancing performance and mitigating environmental pollution. This study underscores the need to establish enduring reverse logistics capabilities from a managerial standpoint. Managers should realize that possessing these talents is crucial for creating and strengthening a firm's competitive performance.

1. Introduction

In today's ever-changing market environment, businesses from small to large firms are modernizing their business systems to guarantee continued productivity and viability in the global market and adopting sustainable supply chain management (SSCM) systems [1]. These companies are enhancing their operational performance through effective supply chain management [2–4]. Since the supply chain comprises the core organization to activities performed in all stages, from the generation of goods or services to their usage, it is a crucial component in determining the effectiveness of a company [3]. Several studies have demonstrated that reverse logistics (RL) is a component of SSCM and reusing, recycling, and remanufacturing are seen as RL tasks that facilitate the achievement of SSCM.

RL deployment as a business approach has developed a great deal of interest amongst organizations due to its implications for sustainable growth [5–7]. The fundamental tenet of logistics activities is that many items that are deemed useless or unwanted by the customers are valuable and can be put back into circulation with minimal change and repair [8–10]. Almost 80 % of supply chain expenses are determined by logistical issues [11]. In addition to the expenses, carbon emissions-related environmental issues, customer awareness, regulatory pressure, and potential economic advantages have sparked tremendous attention in the development of the RL supply chain network [9,12]. To

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cope with the present competitive environment, efficient RL must be utilized as a competitive advantage, a promising revenue source, a cost-cutting means, and a client satisfaction component [13,14]. Several studies have demonstrated that the usefulness of returned products can strengthen the desire to utilize the resources to increase the financial performance of an organization [15–17]. However, proper utilization of RL requires commitment to use RL, proper planning, and the development of RL capabilities to achieve organizational efficiency [6,18], and these capabilities include the discovery and analysis of elements that promote greater RL operations, such as dealing with customers and sustainability considerations [14,17]. Therefore, the establishment of an effective supply chain network taking RL into account is crucial for organizational performance. Although SSCM and RL are expected to contribute significantly to enhancing the performance of businesses, little study has been conducted on the association of RL and SSCM sustainability with performance. In this study, we hypothesized that the commitment of a company to invest resources in recovery activities such as recycling and reprocessing of return items and SSCM might have a positive effect on financial benefits and organizational performance and analyzed their relationship. Therefore, this article provides a comprehensive assessment of the impacts of commitment to SSCM and RL on sustainability performance, as well as presenting future research prospects.

The field of sustainable supply chain and reverse logistics is constantly evolving, but there are still some significant gaps in the literature that need to be addressed. Some of the existing research on sustainable supply chain and reverse logistics is theoretical in nature. There is a need for more empirical studies that test and validate these theories in real-world settings. This would help to provide companies with concrete evidence of the benefits of sustainable practices. Most of the research on sustainable supply chain and reverse logistics has focused on Europe and USA. More research is needed on how these practices can be adapted in different regions. This study aims to address previous gaps by examining the effect of adopting a sustainable supply chain and reverse logistics on performance within the food industry in the UAE.

2. Literature review

2.1. Sustainable reverse logistics

All logistical procedures for goods that are approaching the end of their respective service lives or that need a number of additional operations are referred to as RL [19]. Sustainable RL, also known as "aftermarket supply chain," is the process of gathering and aggregating items, components, and materials after the end of their useful lives for repurposing, recycling, and repatriation. The American Reverse Logistics Executive Council (ARLEC) defines RL as an effective process for planning, implementing, and controlling the transportation of raw materials, ongoing holdings, finished goods, and relevant documents from an intended destination to an origin point with the objective of recovering to capture value or proper disposal [20].

RL is typically driven by the requirement for product returns in retail businesses; producers may send back raw materials to the providers if they are not of high grade, excessive or otherwise superfluous, unwanted, or out-of-spec [18]. In addition to production problems, due to business returns, unwanted out-of-season items, and incorrect deliveries, companies may recall their goods, such as automobile brake systems [21,22]. In developed countries, consumers are entitled to return things that are undesirable or, under guarantee, have reached the end of their useful life or usefulness [23]. Financially, the chance to recuperate resources inexpensively and add value by changing them into other assets with greater substantial assets motivates businesses to engage in RL operations [9,24].

Reverse logistic operations may significantly facilitate the adoption of effective waste management procedures and the decrease of environmental degradation in established supply chains [25]. Choi, Min, and Joo [26] illustrated that customers get the opportunity to return defective or end-of-life items with ongoing warranty periods, which increases the application of RL. The overall objective of RL is to optimize or make aftermarket activities more effective, with the end result being cost savings for the company involved [12,27,28]. This is accomplished by including all the actions that are related to a product or service after the point of sale.

2.2. Reverse logistics capabilities

RL is not a new approach, but it is a coordinated system that needs to be developed to support a circular economy dependent on RL activities [29]. Organizations need to develop RL capabilities for proper collection and transportation of commodities in order to organize them for reprocessing, repairing, refurbishing, or recycling [14,30]. The firms must be able to handle the need for returnable goods while preventing the production of trash and pollution. The RL capabilities of an organization involve the precision and accessibility of the data utilized, as well as the method and reliability of RL data [31,32]. RL capabilities are associated with the business' customer approach, client opportunism, resource logistics commitments, and contractual obligations and these qualities are in turn, associated with RL cost reductions [16]. In addition to these features, RL capabilities also encompass internal and external communication and the usability of the information [33]. These competencies reflect a collection of information-based approaches that help a business to manage and maintain its RL operations, which may result in cost reductions [31,34]. RL capabilities help businesses to strengthen return policies and overall cost position [8,35].

2.3. Sustainable supply chain management (SSCM)

The supply chain achieves optimum success by enhancing the relationships between its enterprises to optimize profitability in all stages of business activities. SSCM practices are the approaches, policies, and processes followed by businesses in order to minimize or remove waste, pollution, and harmful substances [3,4,6]. These environmental practices encompass supply chain operations such as eco-design, RL, transportation, green procurement, internal environmental conservation, environmental data management in the organization, and supply chain management [36]. SSCM establishes goals for itself in the areas of the economy, the environment, and society. It also controls the resources, information, revenue, and connections between businesses across the supply chain. The struggle among financial, social, and environmental goals is the most ambiguous aspect of the sustainability idea when it is considered in its three aspects [37]. To cope with the current competitive landscape, organizations must be conscious of and implement SSCM. Long-term SCM is concerned with environmental protection, social obligations, financial growth, and prosperity. Implementing RL is considered a "corrective" strategy that reduces the negative environmental effects of infrastructure projects and makes the construction industry more efficient, resulting in economic advantages and sustained competitiveness [38].

2.4. Operational performance (OP)

OP refers to an organization's capacity to produce and distribute goods to potential consumers, thus enhancing its market dominance and boosting its possibilities of promoting its goods in worldwide markets [39] more reliably. Hadli [40] demonstrated that OP is significant to businesses as it aids in increasing the efficacy of manufacturing operations and the quality of goods, resulting in greater profitability and revenue. Different activities designed to reduce scrap rates as well as turnaround times, boost product quality, reduce stock levels, and increase capacity utilization [41,42] help to strengthen collaboration with suppliers and clients. This relationship may assist businesses in

enhancing their organizational competencies, which may subsequently result in enhanced OP. The OP of an organization can be increased in different ways, including waste reduction, and one of the best approaches for this is RL and green practices. Acquaye et al. [43] demonstrated that businesses may enhance their OP by using successful RL strategies and developing RL capabilities.

2.5. Relationship between sustainable SCM and sustainable RL capability

RL has emerged as a growing competitive need for supply chain strategies in general and has drawn a lot of attention for its capacity to retrieve value from discarded and even used goods [27]. RL facilitates waste recuperation and decreases waste production. Organizations are switching their priority to RL to cope with environmental protection laws, smaller goods lifecycles, and more waste production [44]. Bag and Gupta [45], in a survey of 250 automotive manufacturing firms in South Africa, observed that commitment to SSCM has a moderate impact on accessibility to sustainable human capital, the adoption of RL, and the effectiveness of remanufacturing OP.

Although most businesses are used to redistributing returns, few accept ownership of items that have reached the end of their useful lives, and those that do often only do so to adhere to regional or national environmental rules [46]. Previous studies have shown that logistic activities contribute significantly to the greening of conventional supply chains by reducing environmental pollution and implementing innovative waste management techniques [47,48]. Therefore, companies should think about how effectively they manage their existing resources, in addition to how successfully they reposition themselves and create different capabilities through long-term and short-term sustainability--generating practices [49].

Most companies are receiving instructions from their corporate headquarters on how to conduct the RL procedure, but the process is not yet in full flow [19]. There are several causes, including a lack of understanding of RL practices at the shop level, less support from manufacturers and suppliers, and a lack of government participation in the adoption of RL practices at the store level and other stakeholder levels [50–52]. There are reputable worldwide brands in every industry that recycle and remanufacture their discarded items regularly. However, in the case of some organizations, their primary objective is to maximize product sales, which may explain why they do not take a very firm position regarding RL practices [6,53]. Sharma et al., [54] suggested that effective RL can only be implemented if the manufacturer agrees to dispose of used or damaged items, since they have a better understanding of where and how to destroy or reuse them.

Based on the studies above, the following hypothesis can be suggested:

H1. Commitment to sustainable SCM has a direct and positive effect on sustainable RL capability.

2.6. Relationship between sustainable RL and sustainable RL capability

Commitment to sustainable RL involves engaging and involving resource suppliers, service providers, vendors, transporters, and end consumers in a collaborative effort to mitigate or eradicate detrimental effects on the environment resulting from their activities [55]. With growing concern about environmental degradation and material waste, most industrial companies have discovered that the recuperation of discarded items is an eco-friendly means of promoting sustainable development [17,56,57]. Companies committed to sustainable RL are recovering and collecting returned and used goods in addition to producing environmentally sustainable items due to legal regulations, social obligations, environmental considerations, economic incentives, and increasing awareness among consumers [45,58,59].

The allocation of resources makes RL activities more efficient and productive. Retailers develop RL capabilities to execute their returns policies and transport returned goods upstream [5]. Jack, Powers, and Skinner, [16] conducted a survey on 295 retailers and found that resource commitments have a significant positive effect on capabilities related to RL, and that these capabilities lead to reductions in cost. Commitment to sustainable resource management may stimulate innovation, cost savings, and business longevity [4,60]. Therefore, the resources need to be utilized to build novel return-handling skills and strategies. For many retail firms that lack the resources to adopt a RL strategy, consumer returns may pose a potential financial burden, with the costs surpassing the advantages. Skinner, Bryant, and Glenn Richey, [61] observed that under instances of active resource commitment to RL programs, operations and supply chain managers may expect superior performance by choosing destroying, recycling, refurbishing, and/or remanufacturing of product. Richey, Genchev and Daugherty, [28] observed that smaller enterprises' resource commitment was not shown to be strongly associated to RL capabilities, presumably due to the number of accessible resources, whereas larger organizations can devote more resources, resulting in improved performance relative to smaller enterprises. However, many organizations have an issue: how to include the recovery of used items into their current forward logistics chains. Huang and Yang, [49] demonstrated that many companies consider RL as a "necessary evil" as opposed to a successful breakthrough and ignore or misunderstand the impact of RL. In this instance, it is required to rebuild a fresh sustainable RL network of supply chain by restructuring the existing products and services into blended processing operations [62].

But most of the studies have shown that commitment to sustainable resources serves as a positive mediator in the interrelationship between RL and performance outcomes. Therefore, the following hypothesis can be developed:

H2. Commitment to sustainable RL has a direct and positive effect on sustainable RL capability.

2.7. Relationship between sustainable RL capability and operational performance

SCM strategies along the entire supply chain, which encompass upstream, internal business processes, and downstream operations, have a substantial influence on the operational success of the organization [1,2]. The concept of RL has become more popular over the last few decades due to growing awareness about resource waste, releases of greenhouse gases, and ecological imbalance [12,63].

In a study conducted >10 years ago, Hazen, Cegielski, and Hanna [53] observed that people consider remanufactured and repurposed items inferior to brand-new commodities. According to the findings of the study, participants rated the quality of items manufactured using recycled materials on par with that of brand-new products. But the level of awareness regarding sustainability has gradually increased, both among organizations and customers since the last decade. Therefore, customers are also inclined toward companies inclined toward SSCM and, more specifically, sustainable RL [9,31]. Businesses have also started to recognize that the deployment of reverse logistic operations has the potential to generate a substantial amount of income or profit while lowering expenses, allowing them to stay market-competitive and sustainable [19,30,58].

RL has significant financial impacts for both the organization and the supplier. RL plays a critical role in the enhancement of a firm's OP, which in turn enhances its competitiveness and decreases the expenses incurred throughout the whole network [19,38,61]. Younis, Sundarakani, and Vel [39] revealed that businesses improve RL capabilities by boosting product quality, reducing lead times, and collaborating with people in the upstream and downstream supply chains from the design phase through disposal. They also found that adopting green purchasing practices led to an improvement in OP. In a survey-based study, Vlachos [59] found that capabilities related to RL influence business performance. The importance of institutional variables was significantly higher than that of supply chain elements, and closed-loop capabilities

were the most important feature. Jack, Powers, and Skinner [16] claimed that the capabilities of RL serve as a mediator in the interaction between resource commitments, contractual arrangements, and cost reductions in RL. In another study, Bag and Gupta [45] found that the availability of green human resources RL positively impacted the achievement of OP. They also observed that the opportunism of customers has a negative correlation with the capability of RL. When RL activities are aimed at sustainability, RL innovation increases an organization's capacity to investigate innovative, unconventional, or new perspectives and thus boosts the OP of the organization [14]. Fernando, Shaharudin, and Abideen [29] claim that successful product return handling as a mediating factor can increase a company's dedication to careful resource utilization, resulting in financial advantage.

H3. Sustainable RL capability has a direct and positive effect on operational performance.

This study adheres to the Structure-Conduct-Performance framework, which proposes that when firms allocate resources to sustainable supply chain management through reverse logistics, they establish organizational frameworks within and across the supply chain that led to enhanced performance. As per the sustainable supply chain management concept established by Carter and Rogers [64], commitment to sustainable supply chain management is defined as the dedication of a company's resources towards achieving its sustainability objectives within a supply chain. Organizational resource commitments for sustainable supply chain management may encompass allocated workforce time, clearly defined tasks and objectives, and staff training. Establishing an internal organizational framework within the company to implement its strategy necessitates securing the support of logistics employees regarding the strategy, providing training to employees to accomplish sustainability targets, and communicating explicit goals and duties to employees. Reverse logistics involves allocating extra resources to manage the movement of goods in the opposite direction, from consumers back to manufacturers. The categorization of firm resources includes four main categories: financial, managerial, technological, and physical [65]. Efficiently handling the movement of products in the opposite direction necessitates the utilization of transportation vehicles (physical assets), software for monitoring the flow of goods (technological assets), a workforce to supervise the operation (managerial assets), and financial assets to fund the operation's expenses. According to Menon and Menon [66], corporations will allocate significant resources to sustainable initiatives if they believe it might give them a possible competitive edge. Thus, companies can allocate their resources strategically to gain a competitive edge by dedicating increased quantities of these specific resources to sustainable reverse logistics. Commitment to sustainable reverse logistics is defined as the dedicated deployment of a company's financial, managerial, technological, and physical resources towards achieving the sustainable goals of recycling, remanufacturing, and reuse. Based on the Structure-Conduct-Performance theory, the organizational structure variables mentioned earlier (commitment to sustainable supply chain management and commitment to reverse logistics) contribute to the successful implementation of a sustainable reverse logistics capability. This, in turn, is believed to result in improved operational performance. We suggest that the conduct phase in the Structure-Conduct-Performance framework can be elucidated by employing the Resource-Based View (RBV) idea of capabilities. A competence is developed by combining business resources that are deemed valuable, unusual, difficult to imitate, and cannot be easily replaced [67]. These intricate resource bundles consist of distinct amalgamations of talents, information, and assets that can be arranged in distinctive manners to generate a competitive edge [68,69]. Companies that can effectively utilize resources for specific initiatives are more likely to achieve exceptional success. We focus primarily on analyzing a sustainable reverse logistics capability. A reverse logistics competence refers to an organization's capacity to adapt to evolving consumer needs by effectively managing reverse logistics procedures ([70]; p. 12). This capacity is a result of the operational procedures within a supply chain's reverse logistics program(s) [51]. Prior studies have examined similar procedures under the domains of information technology management, innovation, and responsiveness [28]. Incorporating this idea into contemporary sustainability research (e.g. [71–74]), we establish a sustainable reverse logistics capability as the capacity of an organization to devise strategies for addressing evolving partner, customer, and environmental sustainability demands through effective management of reverse logistics processes. The combination of Structure-Conduct-Performance and the capabilities perspective, enhanced by RBV, forms a process model that helps us comprehend the performance outcomes that arise from the development of a sustainable supply chain returns strategy. The main emphasis lies on a crucial intermediary factor referred to as a sustainable reverse logistics capability. Firms can develop a sustainable reverse logistics competence by allocating resources to sustainability programs and reverse logistics. We anticipate that establishing a sustainable reverse logistics capability is crucial in transforming reverse logistics procedures from being a source of expenses to becoming a source of profits. The investigation examines a mediated model represented in Fig. 1. Applying the Structure-Conduct-Performance framework, the structural variables of commitment to sustainable supply chain management and commitment to sustainable reverse logistics impact the behavior of sustainable reverse logistics. This behavior, in turn, results in improved operational performance. Developing supply chain procedures necessitates making resource commitments to establish a structure, which in turn demands the ability to elicit improved performance. Thus, a mediated model is suggested to examine the connections between the variables.

3. Methodology

A survey based on past studies was created to test the suggested research model. The research variables' measurements were modified from prior studies and changed as needed to match the context of the current investigation [17,75,76]. Subsequently, this instrument underwent a pretest conducted by six highly knowledgeable academics who possess extensive expertise in the discipline of Supply Chain Management. The survey items presented in appendix 1. The final survey was distributed to supply chain managers from all food firms in the UAE. There are 550 food companies in the UAE; the survey was produced in Google Docs and delivered to supply chain managers through email; follow-up emails and phone calls were conducted to encourage managers to complete the survey and clarify any queries you may have. A total of 315 completed questionnaires were returned, giving a 57 % response rate, Table 1 shows a summary of respondents' profile.

Prior to commencing the survey, the participants were presented with a precise explanation of sustainable supply chain management (SCM) and were subsequently requested to confirm their firm's involvement in sustainable SCM by selecting either "yes" or "no". The respondents who answered "no" were redirected and denied the opportunity to complete the poll. Extra measures were implemented to guarantee that participants were diligently completing the survey. Before doing the study, the researchers also considered the duration of time that the participants took to complete the survey. Respondents who completed the survey in less three minutes were excluded due to their lack of careful consideration, leading to the elimination of 19 participants. After conducting an initial screening of work titles before the survey, we excluded ten respondents during our evaluation of job titles after the survey. The participants hold various job titles that involve engaging with supply chain tasks within the company, such as operations analyst, VP production, and quality engineer.

The food industry was chosen since it is one of the most important industries in the UAE, contributing considerably to the country's economic growth. In 2022, the food industry employed over 80,000 people, with a production value of more than $9 billion and exports worth more than $4 billion. Furthermore, the UAE food market is expected to earn US$37.89 billion in revenue in 2023, with a 4.39 % annual growth rate.

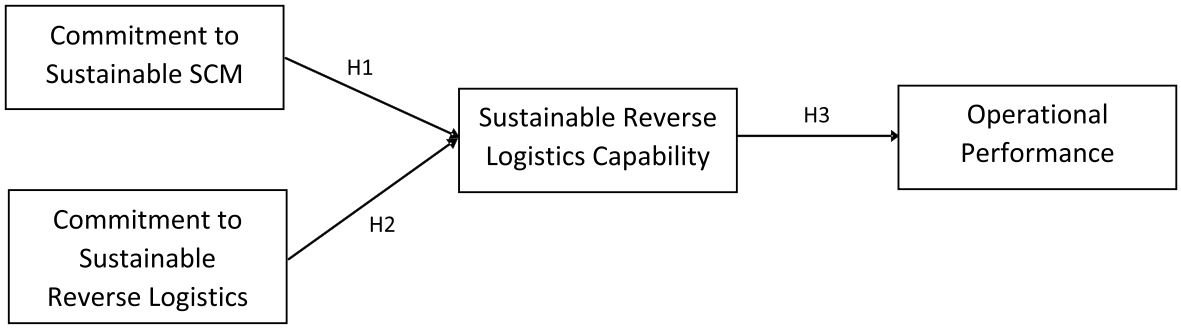

Fig. 1. Research Model.

Table 1
Respondents profile.

Demographic information	
Firm size–number of employees	
<51	43
51–200	145
201–500	112
501–1000	15
Annual gross sales in US$	
Less than $1000,001	35
$1000,001 – $5000,000	157
$5000,001 – $10,000,000	109
$10,000,001 – and above	14
Managerial Level	
Middle level	298
Top management	17
Age	
25 and below	10
26–36	74
37–46	215
47 and above	16
Gender	
Male	274
Female	41

[77]. (2024, January 10). Statista. https://www.statista.com/topics/10373/food-and-beverages-market-in-the-united-arab-emirates/).

4. Data analysis and results

4.1. Validity and reliability measures

The statistical analysis commenced by conducting assessments to assess the reliability and validity of the scales. The validity of the scales was evaluated using the normed-fit index (NFI). Table 2 presents the NFI values for all variables, illustrating that every variable exhibits convergent validity over 0.9. That conclusion aligns with the assessment of strong convergent validity for all scales, as proposed by Ahire et al. [78].

Table 3 summarizes the outcomes of the correlation investigation carried out on all variables. The highest correlation coefficient observed is 0.584, whereas the lowest coefficient is 0.469. As stated by Kenny [79], it is observed that there is no significant correlation between any two variables that is equal to ±1 or near it. This outcome implies strong discriminant validity. Furthermore, the correlation analysis results presented in Table 3 indicate a robust connection among all the variables, suggesting a favorable level of predictive validity for the scales employed, as posited by Garver and Mentzer [80].

The reliability of the measures was evaluated by Cronbach's alpha coefficient. According to Garver and Mentzer [80], Table 4 presents the Cronbach's alpha coefficients for the scales used, every one of which surpasses 0.9. This shows that the scales reflect a high level of dependability. The adequacy of the fit between each of the variable scales has been verified by confirmatory analysis.

The outcomes of the confirmatory analysis are displayed in Table 5, revealing an adequate conformity between the scales of the variables and the data gathered, as indicated by Koufteros [81].

4.2. Correlation analysis

Commitment to Sustainable Supply Chain Management (SCM) was found to have a statistically significant positive link with Commitment to Sustainable Reverse Logistics, Sustainable Reverse Logistics Capability, and Operational Performance, as shown in Table 3. Additionally, there was a positive correlation between commitment to sustainable reverse logistics and operational performance. This correlation has been established with a degree of confidence equal to or greater than 99 %. In addition, there is a significant association between sustainable reverse logistics and both sustainable reverse logistics capability and operational performance, and the level of confidence in this correlation is 99 %. Both concepts are related to sustainable reverse logistics. There is a statistically significant positive link between operational performance and sustainable reverse logistics capability, which is supported by a confidence level of 99 %. The findings of the correlation study offer support for the hypothesis that there is a strong positive link between all the variables that were investigated.

4.3. Linear regression analysis

In order to investigate the connections between the different aspects of the study, a linear regression model was developed. According to the findings of the linear regression analysis, which are detailed in Table (6), the corrected R2 values are as follows: 0.045, 0.091, and 0.167. These principles imply that a commitment to sustainable SCM and a commitment to sustainable reverse logistics have a positive and significant effect on a company's ability to do reverse logistics. In addition, the

Table 2
Dimensionality and Convergent Validity Assessment.

Scale	Relative χ^2	SRMR	RMSEA	NNFI	CFI	NFI	GFI
Commitment to Sustainable SCM	2.657	0.623	0.082	0.91	0.91	0.923	0.878
Commitment to Sustainable Reverse Logistics	2.876	0.616	0.088	0.94	0.90	0.915	0.845
Sustainable Reverse Logistics Capability	2.976	0.678	0.089	0.92	0.87	0.956	0.899
Operational Performance	2.734	0.699	0.091	0.92	0.92	0.944	0.827

Table 3
Correlation Analysis.

Scale	Commitment to Sustainable SCM	Commitment to Sustainable Reverse Logistics	Sustainable Reverse Logistics Capability	Operational performance
Commitment to Sustainable SCM	1			
Commitment to Sustainable Reverse Logistics	0.534**	1		
Sustainable Reverse Logistics Capability	0.599**	0.459**	1	
Operational Performance	0.489**	0.488**	0.578**	1

Correlation is significant at.
*0.05 and.
** 0.01 levels (two-tailed).

Table 4
Reliability Assessment.

Scale	Cronbach's alpha	Construct reliability	Variance extracted
Commitment to Sustainable SCM	0.95	0.97	0.87
Commitment to Sustainable Reverse Logistics	0.92	0.93	0.89
Sustainable Reverse Logistics Capability	0.91	0.92	0.82
Operational Performance	0.93	0.91	0.84

Table 5
Confirmatory Analysis.

Construct/ measures	Standardized coefficients	*t*-value
Commitment to Sustainable SCM		
CSSCM1	0.90	12.97
CSSCM2	0.93	13.72
CSSCM3	0.96	12.87
CSSCM4	0.88	12.57
CSSCM5	0.90	13.48
CSSCM6	0.96	13.58
Commitment to Sustainable Reverse Logistics		
CSRL1	0.85	12.78
CSRL2	0.92	13.49
CSRL3	0.95	13.28
CSRL4	0.89	12.69
Sustainable Reverse Logistics Capability		
SRLC1	0.95	13.67
SRLC2	0.93	12.71
SRLC3	0.91	12.66
SRLC4	0.92	13.26
SRLC5	0.94	12.35
SRLC6	0.93	13.45
SRLC7	0.98	13.67
SRLC8	0.97	12.56
Operational performance		
OP1	0.86	12.86
OP2	0.89	13.56
OP3	0.90	12.49
OP4	0.95	12.79
OP5	0.97	12.57
OP6	0.88	13.78

chi-square=2.247; SRMR=0.67; RMSEA=0.087; NFI=0.94; NNFI=0.975; CFI=0.92; IFI=0. 945.

capabilities of both forward and reverse logistics have a direct and significant impact on the operational performance of the organization. The facts presented up until this point offer evidence in favor of accepting the hypotheses H1, H2, and H3.

Table 6
Linear Regression Analysis.

Variables	Sustainable Reverse Logistics Capability			Operational performance		
	B	R^2	ΔR^2	B	R^2	ΔR^2
Commitment to Sustainable SCM	0.415	0.457	0.045*			
Commitment to Sustainable Reverse Logistics	0.582	0.367	0.091**	–	–	–
Sustainable Reverse Logistics Capability	–	–	–	0.189	0.487	0.167*

4.4. Structural equation modeling results

The statistical method known as structural equation modeling (SEM) was developed to make it easier to conduct in-depth analyses and assessments of research hypotheses. Fig. 2 provides a graphical representation of the results that were obtained from the inquiry that utilized Structural Equation Modeling (SEM). According to Koufteros [81], the value of the Chi-square statistic for the model is 2.254, which indicates that there is support for accepting the study model. In addition, the values of the NNFI and CFI are, respectively, 0.989 and 0.95. According to Garver and Mentzer [80], the results of this investigation point to a high degree of validity for the model that was used in the research. Fig. 2 depicts a noteworthy and statistically significant link between the commitment to sustainable supply chain management (SCM) and the capability of sustainable reverse logistics. This association is illustrated by a positive relationship between the two variables. The estimated coefficient for this relationship is 0.56, and the corresponding t-value is 4.89.

In addition, the data shown in Fig. 2 illustrates a statistically significant relationship between a company's commitment to sustainable reverse logistics and its capability in this area. This relationship is estimated to have a coefficient of 0.54 and a t-value of 5.78, both of which point to a positive association between the two variables. In addition, there is a positive and significant relationship between sustainable reverse logistics capability and operational performance. The calculated coefficient for this correlation is 0.51, and its t-value comes in at 5.65. The findings presented above give evidence that supports the acceptance of all the hypotheses that were proposed in the study.

5. Discussion and conclusions

5.1. Theoretical and research implications

The findings indicate that dedicating resources to both sustainable supply chain management and reverse logistics is linked to improved effectiveness in sustainable reverse logistics practices. By allocating resources to secure employee support for sustainable supply chain activities and providing the necessary financial, technological,

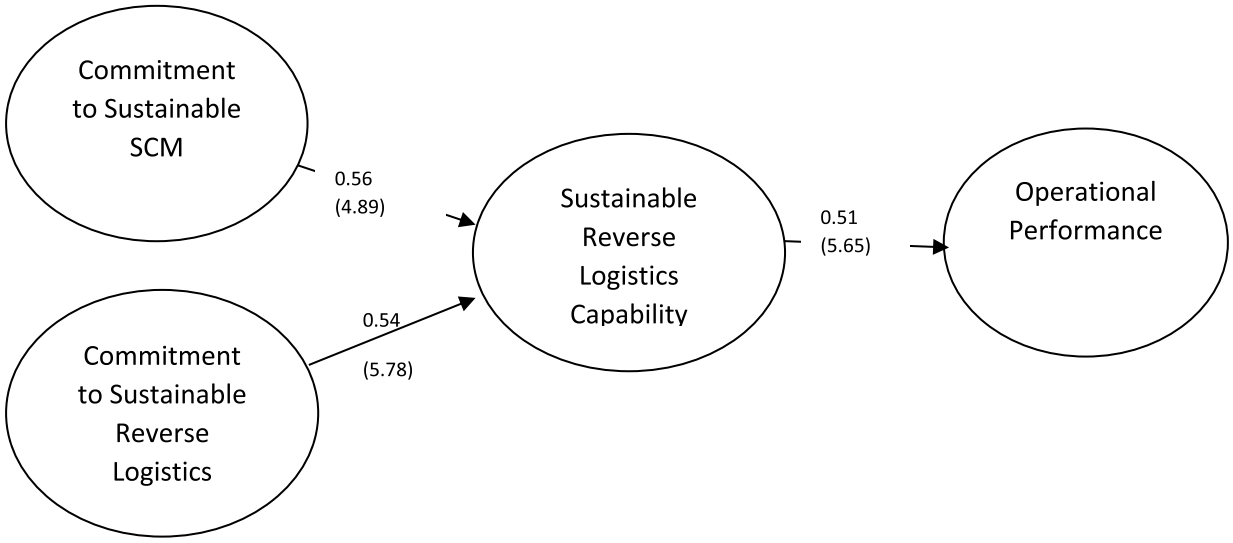

Fig. 2. The structural equation modeling with standardized coefficients and (t-value).
Chi-square=2.247; SRMR=0.67; RMSEA=0.087; NFI=0.94; NNFI=0.975; CFI=0.92; IFI=0. 945.

administrative, and physical resources for efficient reverse logistics operations, the likelihood of establishing a sustainable reverse logistics capability increases. The findings provide further support to prior study indicating that establishing a strategic framework through investment in interconnected resources promotes the desired behavior in associated strategic planning [82].

Furthermore, the findings of the research reveal that a proficient and enduring reverse logistics capability is linked to enhanced operational performance, as seen by improved delivery punctuality, superior production quality, and increased capacity utilization. Prior research has emphasized the necessity of conducting studies to assess the implementation of sustainability inside companies. Of particular significance is the understanding of how employee education and training influence operational performance [83]. The purpose of our study is to assess the extent to which companies are dedicated to implementing sustainable supply chain management practices. We examine how this commitment facilitates the involvement of human resources in achieving sustainability objectives. It is crucial to emphasize to the academic community that there is still a lack of study on human resources in the field of supply chain management.

Ultimately, the model's findings indicate that dedicating resources to sustainable supply chain management leads to enhanced operational performance indirectly by means of its connection to a sustainable reverse logistics capacity. Allocating resources to reverse logistics can be advantageous for a company if those resources are utilized to establish a sustainable reverse logistics capability, such as minimizing the adverse environmental effects of reverse logistics procedures. An effective and enduring reverse logistics capability can be achieved by allocating dedicated resources to reverse logistics and demonstrating a strong commitment to the sustainability of the supply chain. This indicates that the ability to strategically manage resources is crucial in order to achieve success in sustainable supply chain operations.

Resource allocations are often considered to be a crucial factor in attaining supply chain goals [84], while the literature has shown inconsistent findings on this matter [85]. This study concludes that allocating resources to sustainable reverse logistics projects is crucial for achieving success in building a sustainable supply chain as part of a comprehensive firm strategy. Resources play a crucial role in establishing a framework that enables businesses to operate effectively by having a sustainable reverse logistics capability, which in turn leads to enhanced performance. Our study enhances existing sustainable supply chain research by including a Structure-Conduct-Performance framework, so contributing to theory.

The observed good outcomes of the study may be attributed to the prior governmental initiatives aimed at enhancing and advancing the food business. The collaborative efforts of the Ministry of Climate Change and the Ministry of Industry are focused on enhancing the domestic food supply and positioning the United Arab Emirates as a globally recognized leader in food security. The present findings highlight the significance of the food industry managers' focus on the development and management of a sustainable supply chain. This is attributed to the positive impact it has on the establishment of a sustainable reverse logistics capability, ultimately resulting in enhanced operational performance for the company. It is imperative for managers to possess an understanding of the challenges and substantial financial commitment involved in establishing a sustainable supply chain, as well as the considerable duration required to cultivate a lasting partnership with the supplier. Additionally, the findings of this study assist in addressing the existing research vacuum in academia regarding the significance of establishing a sustainable supply chain to improve the performance of individual companies and the overall economic performance of a country.

Organizations may feel secure in their current market positions and certain that their expansion will continue in a linear fashion. Therefore, supply chain managers may feel secure in their position in the market and devote their attention to tactical matters such as reducing costs and running day-to-day operations. Knowing this fact about SCM, managers should take a step back and recognize that discussions and evaluations of sustainability are happening outside of the normal course of business. Managers in the supply chain must realize the connection between efficient reverse logistics management and overall supply chain performance is a sustainable reverse logistics capacity. Managers must pay close attention to the necessary shift in behavior when industries undergo quick and significant shifts. Companies like Scott Paper and Fleming Company Inc. have been severely harmed due to management's refusal to adapt to shifting market conditions.

The development of a long-term SCM capacity is influencing practices all throughout the supply chain. Managers, if they want to grow capabilities and get a leg up on the competition, need to investigate the advantages of sustainable SCM and arrange their reverse logistics operations accordingly. For continued success, businesses will need to invest in sustainable SCM and reverse logistics. They may fortify their position and boost their performance by creating a sustainable reverse logistics capacity. In a similar vein, our research suggests that a

sustainable approach may be necessary for a reverse logistics program to thrive in the modern day. The creation and implementation of a sustainable SCM capacity are predicted to aid in the reduction of costs and the acceleration of response times. Strategically, there are open problems concerning how to build a reliable reverse-logistics capacity from a standpoint of constant enhancement. Defee and Fugate [86] state that to prove their enterprise-wide value and applicability in the supply chain context, these skills need to span several companies. This degree of intricacy calls for intensive investigation. As a cost center, sustainability programs have a low chance of success. Cost savings and more responsiveness will be expected of supply chain managers throughout time. This research shows that enhancements to the environment and the economy are both feasible. Ideally, you'd like to achieve both, and that's OK. Long-term success of a sustainability program may depend on the efficiency with which reverse logistics and sustainable reverse logistics are implemented.

This study contributes to our field by incorporating a Structure-Conduct-Performance and Resource-Based View theoretical framework to investigate the junction of reverse logistics and sustainability. This field of research has received less attention thus far and, in our opinion, presents a significant possibility for further exploration. This work establishes a fundamental theoretical and empirical connection between reverse logistics and sustainability, demonstrating that they are inherently intertwined based on two distinct hypotheses. Integrating additional literature streams is necessary to enhance comprehension of effective reverse logistics and responsive sustainable logistics as a strategic approach. An analysis of this approach to supply chain management strategy could incorporate several supplementary theoretical viewpoints. Environmental challenges along the supply chain typically led to conflicting values [87]. Hence, the examination of competing values theory can be approached from a resource-based viewpoint, as elaborated in this work. Furthermore, recent research has indicated the necessity of incorporating ideas from other fields, as there are still pertinent theories from management and economics that have not been utilized in the context of logistics and supply chain management ([88], p. 349). Midrange theory [89] serves as a foundation for analyzing the contextual processes associated with mobility, recycling, remanufacturing, and several other operations. Currently, businesses and supply chains have not yet utilized knowledge-based theory [90] to develop a sustainable reverse logistics learning capability. However, this study adds significant value to the existing body of knowledge by establishing a connection between reverse logistics capabilities and sustainable reverse logistics capability. It is important for researchers to be aware that as sustainable reverse logistics programs expand, new structural solutions will arise in the market. We deliberately proposed a concise model that focuses on the crucial mediating factor - a sustainable reverse logistics capability. Many antecedents, moderators, settings, and outcomes have not been investigated. Specifically, we restricted the focus of the inquiry to the realm of reverse logistics. Exploring reverse logistics can enhance the conclusions of this work, as it is a component of the broader supply chain management process [91]. Building upon Espinosa's [92] research, future studies could examine particular resource allocations that enhance the speed of information systems in the returns management system. An examination of sustainable reverse logistics in this context might also explore its effects on preserving the quality of customer relationships and mitigating partner opportunism. To conclude, we highlight a proven connection between sustainable reverse logistics and exceptional performance, based on empirical evidence. The findings suggest that the integration of reverse logistics with performance is heavily dependent on sustainability, an in-depth analysis of a sustainable reverse logistics capability and performance is expected to yield useful insights for researchers and practitioners, enabling them to further enhance and refine reverse logistics practices.

5.2. Practical implications

Companies often perceive their industry positions as secure and their growth as linear. Consequently, supply chain managers may believe that their competitive position is safeguarded and prioritize cost reduction and daily operational tasks rather than strategic aspects of conducting business. Managers in supply chain management must recognize that sustainability is being debated and evaluated outside the firm's day-to-day activities. Supply chain managers must recognize that a sustainable reverse logistics capability is the key to efficient reverse logistics management and overall supply chain performance results. As industries undergo frequent and profound transformations, managers must be vigilant in adapting their behavior accordingly. Failure to acknowledge alterations in the competitive landscape has had a substantial detrimental impact on organizations. An ongoing transformation in supply chains involves the establishment of a sustainable supply chain management capability. Managers must analyze the advantages of sustainable supply chain management and organize their reverse logistics procedures to develop skills and outperform their rivals. In order to maintain effectiveness, firms must allocate resources to the advancement of sustainable supply chain management as well as reverse logistics. By doing this, they can cultivate a resilient reverse logistics capability that can safeguard their position and potentially result in enhanced performance. Developing and utilizing a sustainable supply chain management capability is anticipated to enhance both cost efficiency and responsiveness. From a strategic standpoint, there are still uncertainties regarding the establishment of a durable reverse logistics capability within the framework of continual improvement. These capabilities are anticipated to span several organizations, showcasing their worth and relevance to the entire company and supply chain environment [86]. Such a high level of intricacy requires thorough analysis. It is important to acknowledge that only a small number of sustainability efforts remain viable as a cost center. In the future, supply chain managers will need to demonstrate cost reductions and enhancements in responsiveness. This analysis elucidates the feasibility of enhancing both the environment and the market. Pursuing both results is a valid objective. Over time, the performance element of reverse logistics and sustainable reverse logistics could be crucial for sustaining a sustainability program.

The findings of this study are constrained to the food business in the United Arab Emirates (UAE) due to the exclusive selection of the sample from this sector. Additionally, the study exclusively examined the impact of commitment to sustainable supply chain management (SCM) and commitment to sustainable reverse logistics on sustainable reverse logistics capability and operational performance. This limitation should be acknowledged. It is imperative to replicate the study within the same industry to corroborate the findings, as well as across various industries and nations.

During the preparation of this work the author(s) used QuillBOT to eliminate the English Language mistakes. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

CRediT authorship contribution statement

Ahmed Attia: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.sftr.2025.100442.

Data availability

The data that has been used is confidential.

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