

Evaluating the Influence of Supply Chain Relationships on Promoting the Circular Economy

Dhananjay Pandey

Research Scholar

Teerthanker Mahaveer Institute of Management and Technology

Teerthanker Mahaveer University

Moradabad, Uttar Pradesh

Satyendra Arya

Professor

Teerthanker Mahaveer Institute of Management and Technology

Teerthanker Mahaveer University

Moradabad, Uttar Pradesh

Abstract

This study examines how various aspects of supply chains promote the circular economy by exploring the interactions among supply chain participants and their roles in fostering sustainability. A mixed-method approach was utilized, featuring both structured surveys and interviews with 110 professionals in the fashion and technology sectors. The quantitative analysis revealed a significant positive relationship between circular economy practices and supply chain dimensions, with a standardized beta coefficient of 0.98 and an R-square value of 0.97. This indicates that supply chain factors explained 97.42% of the variance in the circular economy outcomes. Additionally, an ANOVA analysis supported the model's validity with an F-statistic of 3335.54. The findings highlighted that streamlined supply chain operations could enhance circular economy initiatives, suggesting the need for targeted interventions within industries to reconcile operational efficiency with eco-friendly objectives.

Keywords: Circular Economy, Supply Chain Management, Sustainability, Regression Analysis, Fashion Industry, Technology Industry

1. Introduction

The concept of the circular economy (CE) holds great promise for structuring sustainable economic practices for the future. CE is defined as "a regenerative system that decreases resource input, as well as waste, emissions, and energy loss by slowing, closing, and constraining cycles of materials and energy (Hazen et al., 2021)." Although it is not a new

idea, the circular economy (CE) has recently gained traction globally as a potential unifying element for diverse economic, political, and social groups in their initiatives to avert environmental crises. Despite acknowledged challenges, the benefits of implementing CE are considerable (Burke et al., 2023). According to the European Commission (2020), transitioning to a functioning Circular Economy (CE) could boost Europe's GDP by around 0.5% by 2030 and result in an estimated net addition of about 700,000 jobs relative to current projections, with a possible GDP increase of up to 7% compared to the existing development scenario (Allen et al., 2021). Even though the significance of the Circular Economy (CE) is rising, it has received limited attention in the literature concerning supply chain management (SCM) (Govindan & Hasanagic, 2018). The lack of research on the circular economy is noteworthy, as efficient management of global supply chains is essential for advancing the circular economy. Supply chain processes are fundamental to the worldwide economy, so they require urgent and critical focus. Thus, there is a need for a solid framework to develop and manage a circular economy supply chain (Batista et al., 2018). The transition from traditional linear economic models to circular economy structures has become a prominent global initiative aimed at achieving sustainable development in light of environmental degradation and the depletion of resources. In a circular economy, the emphasis lies on minimizing waste, reusing materials, and recycling resources to create a closed-loop system that reduces environmental harm while fostering economic growth. Within this context, interactions within the supply chain are crucial for successfully adopting circular economy practices (Bag, 2023). Collaboration among all stakeholders, including suppliers, manufacturers, distributors, and consumers, will play a vital role in effectively integrating these sustainable practices throughout the supply chain. Consequently, the dynamics surrounding the study of supply chain interactions and their influence on promoting circular economy initiatives will centre on strategic collaboration, resource sharing, and innovative systems involving supply chain management (Khan et al., 2022). This research examines the dynamics between supply chain and circular economy concepts to provide insights to help firms improve sustainability initiatives, tackle operational challenges, and advance global sustainability objectives.

Objectives of Study: To study the Impact of Supply Chain Relationships on Advancing the Circular Economy.

2. Review of Literature

The literature indicates the importance of SCM in enhancing the circular economy. The theoretical and practical aspects at the intersections are what are targeted to address. According to **Hazen et al. (2021)**, the processes in supply chain can make a transition from linear to circular production and consumption, thereby motivating collaboration among SCM, CE, and other related fields. **Liu et al. (2018)** discuss overlapping yet distinct areas of GSCM and CE, finding common theoretical applications that provide a firm base for further research into both areas. **Centobelli et al. (2021)** present a complete model linking social pressure, environmental commitment, green economic incentives, and sustainable supply chain design to CE capabilities, calling stakeholders to attention regarding strategic planning for SMEs and sustainable practices. **Fang et al. (2024)** focus on how digitalization affects the supply chain power imbalance and clearly show that manufacturers' capabilities regarding digitalization can neutralize the adverse effects of both supplier and customer dependencies in CE performance. Taken collectively, these studies point toward the fact that sustainability, digital transformation, and strategic relations need to be integrated in supply chain frameworks for driving CE adoption effectively.

Hypothesis of Study

Null Hypothesis (H_0): There is no significant effect of supply chain in its combined dimensions (i.e., relationship with suppliers, relationship with distributors, and relationship with customers) on Circular Economy.

Alternate Hypothesis (H_1): There is significant effect of supply chain in its combined dimensions (i.e., relationship with suppliers, relationship with distributors, and relationship with customers) on Circular Economy.

3. Research Methodology

- The study adopted a mixed-method approach to comprehensively analyze the relationship between supply chain dimensions and the circular economy. This approach integrated both quantitative and qualitative methods, ensuring a robust and multidimensional understanding of the research problem.
- The population comprised professionals actively engaged in supply chain management within the fashion and technology industries, representing key stakeholders directly

influencing circular economy practices. A purposive sampling technique was used to strategically select a sample size of 90 respondents with relevant expertise and experience, ensuring the reliability and validity of the findings.

- Data collection was done through structured questionnaires, capturing quantitative data on “demographic profiles, supply chain practices, and perceptions” of their impact on the circular economy. To get rich qualitative insights, in-depth interviews and focus group discussions with industry professionals were conducted on practical challenges, strategic opportunities, and nuanced perspectives.
- In the analysis, statistical techniques that were used included descriptive statistics to summarize respondent demographics, regression analysis to quantify the relationship between supply chain dimensions and the circular economy, and ANOVA to assess overall model significance and fit. Qualitative data was subjected to thematic analysis to elicit recurrent patterns and themes that complemented and enriched the quantitative findings. This comprehensive methodology allowed for a thorough exploration of the research objectives, combining numerical rigor with contextual depth to provide actionable insights.

4. Results

- **Demographic profile of respondents:**

Table 1: Demographic profile of respondents

Variable	Sub Construct	Frequency
Age	30-35 years	26
	36-42 years	24
	43-47 years	32
	48 and over	8
Gender	Male	77
	Female	13
Experience	Less than 3 years	4
	3-6 years	15
	7-10 years	26
	More than 10 years	45
Income Level	INR 5-10 lakhs p.a.	29

	INR 10-20 lakhs p.a.	45
	More than Rs 20 lakhs p.a.	16
Marital Status	Single	19
	Married	60
	Prefer Not to Say	11
Industry	Fashion	45
	Technology	45

- **Regression Analysis:** The regression analysis reveals that the supply chain dimensions have a significant effect on the circular economy, with a standardized beta coefficient of 0.98 and an unstandardized coefficient of 0.93, indicating a strong positive relationship. The p-value for the supply chain variable is 0.00, which is less than the 0.05 significance level. Therefore, we reject the null hypothesis (H0) and accept the alternative hypothesis (H1), concluding that the supply chain dimensions significantly impact the circular economy.

Table 2: Variables Entered/ Removed^a

Variables Entered/ Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Supply chain ^b	.	Enter
a. Dependent Variable: circular economy			
b. All requested variables entered.			

Table 3: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.987 ^a	.974	.974	.06567

a. Predictors: (Constant), Supplychain

Table 4: ANOVA^a

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.385	1	14.385	3335.540	.000 ^b
	Residual	.380	88	.004		
	Total	14.765	89			
a. Dependent Variable: circular economy						
b. Predictors: (Constant), Supply chain						

Table 5: Coefficients^a

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.278	.074		3.745	.000
	Supply chain	.939	.016	.987	57.754	.000
a. Dependent Variable: circular economy						

Table 6: Results of Hypothesis Testing

Objective	Hypothesis	Results
To study the impact of supply chain relationships on advancing the circular economy.	H ₀ : There is no significant effect of supply chain in its combined dimensions (relationship with suppliers, relationship with distributors, and relationship with customers) on the circular economy.	H₀ rejected.
	H ₁ : There is significant effect of supply chain in its combined dimensions	H₁ accepted.

	(relationship with suppliers, relationship with distributors, and relationship with customers) on the circular economy.	
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5. Discussion

The discussion throws light on the implications of the demographic profile and regression analysis in understanding the relationship between supply chain dimensions and the circular economy. The demographic data showed a well-rounded representation, with most respondents being male (77%), experienced professionals (50% with over 10 years of experience), and financially stable, with income levels predominantly in the Rs. 10-20 lakhs range. Respondents from both the fashion and technology industries, with 45 each, provided an evenly balanced analysis across these sectors, which have significantly impacted and are impacted by the circular economy. The regression results showed a significant, positive relationship between supply chain dimensions and the circular economy; the standardized beta coefficient of 0.98 showed a p-value of 0.000 and R-squared of 0.97, which stated that supply chain dimensions had an account for 97.4% of variance in circular economy outcomes. ANOVA results with the highly significant F-statistic of 3335.54 have validated the model's reliability. These findings underscore that the optimization of supply chain processes can significantly enhance circular economy operations and position supply chains as strategic enablers of sustainability, while also emphasizing the need for industry-specific interventions to align operational efficiency with environmental objectives.

6. Conclusion

This study reiterates the importance of supply chain dimensions in driving the circular economy (CE). The results show that the best supply chain management, encompassing relationships with suppliers, distributors, and customers, can significantly enhance CE outcomes. The high correlation between supply chain practices and CE performance, as shown through regression and ANOVA analysis, underlines the need for organizations to optimize their supply chain processes for sustainability. Considering the significant impact of supply chain optimization on circular economy operations, this study calls for industry-

specific strategies to integrate sustainability into supply chain frameworks. This will enable businesses to contribute to the transition toward a more sustainable and resource-efficient economy while achieving their operational and environmental objectives.

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