

Evaluating Anticipated Inventory Return Rates: Analysis of Circular Economy Metrics

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Abstract

This research explores the role of inventory management in the circular economy, focusing on how return inventory rates affect the sustainability and profitability of supply chain management. The present study proposes an Economic Production Quantity (EPQ) model with dual-market demand, recoverable items, external procurement, and circular economy indicators. A mixed-methods approach including quantitative surveys and qualitative interviews was employed to collect insights from 90 industry experts across the fashion and technology sectors. The results indicate that a majority of the respondents have high return rates of 91-95%, prefer a low percentage of inventory floats, and expect fast processing of returns with most respondents expecting a velocity rate to be above 90%. Furthermore, respondents had an overwhelming desire to limit the write-offs to 2% of dispatched inventory value, maintaining the order-to-deliver cycles as short as possible, and making cost avoidance in the range of Rs. 9 crores per annum. Such a study highlights the effectiveness of good supply chain management practices for achieving circular economy goals such as reducing waste and improving economic value. The findings are beneficial for firms looking to align their inventory policies with circular economy objectives to ensure sustainable and profitable business operations.

Keywords: Circular economy, inventory management, return inventory rates, supply chain practices, Economic Production Quantity (EPQ), sustainability, cost control, fashion industry, technology industry.

1. Introduction

The circular economy concept aims to enhance sustainability by encouraging producers to minimize waste through material cycling and product recovery, while consumers bolster these efforts by purchasing from these manufacturers. An eco-friendly inventory system aims to optimize production revenues while reducing environmental effect (Yeo, 2024). This research presents an Economic Production Quantity (EPQ) model that integrates dual-market demand, recoverable items, external procurement, variable item return rates, and a circular economy indicator. Due to an inadequate supply of high-quality return products, new manufacturing items are expected to satisfy the remaining demand in the primary market (Lei et al., 2024).

This has led to increased popularity for the circular economy in recent times, where businesses look towards more sustainable and efficient ways of resource management. Management of returns from the inventory is a critical element within this model, since returns management contributes significantly towards reduction of waste, increased profitability, and efficient resource use (Lee et al., 2024). The ability and consideration of the return inventory rate for businesses to align themselves with circular economy elements in their operations is critically important. This paper addresses this analysis of return inventory rates based on circular economy metrics with a focus area that incorporates industries which rapidly implement circular economy principles along their supply chains. It is within this backdrop that this study will critically assess return expectations, inventory float, and disposition turnaround times as avenues through which the circular economy practice is to enhance effective inventory management, cost reductions, and sustainable business practice (Tashkeel et al., 2021). As a result, the findings will be helpful in advancing existing literature about how companies' inventory policies can be directed towards aligning with the objectives of circular economies, creating environmental and economic value at the same time.

2. Review of Literature

The circular economy has gained prominence as one of the main strategies to promote sustainability, and the study of return rates of inventory forms a vital part of how to optimize resource efficiency. Several metrics have been advanced to assess circularity, while **Corona et al. (2019)** critically examines the existing circularity metrics and discusses the challenges in measuring circularity, including those related to inventory returns. **Di Maio et al. (2017)** suggest a market value approach to measure resource efficiency, focusing on the retention of value in returned products, which is central to understanding anticipated inventory return rates. **Kazancoglu et al. (2018)** present a holistic framework for “green supply chain management”, integrating circular economy principles and underlining the role of inventory management in performance evaluation. **Tashkeel et al. (2021)** proposed a cost-normalized circular economy indicator for post-consumer waste, providing insight into how financial and environmental metrics can be merged to assess inventory returns. **Geng et al. (2012)** developed a national circular economy indicator system, stressing the need for comprehensive

metrics to evaluate resource recovery and waste reduction. Collectively, these studies highlight the need for the execution of circular economy metrics in business operations and provide a solid foundation for the analysis of inventory return rates as an vital element of sustainable supply chain management.

3. Research Methodology

- In order to thoroughly examine the connection between supply chain practices and the circular economy, the study employed a mixed-methods strategy. The use of both quantitative and qualitative techniques provided an integrated understanding of the research issue.
- The study focused on experts working in the field of supply chain management for fashion and technology industries; thus, the sample obtained is relevant to the research purposes. The method of purposive sampling was utilized to select 90 respondents with specialized expertise and experience in supply chain management to strengthen the reliability and validity of the findings.
- Quantitative data was obtained through standardized questionnaires with the respondent's demographic details and an elaborate response in relation to the methods of the supply chain, return rates, inventory management, and its perceived impact on the circular economy. Qualitative data was also collected through comprehensive interviews and focus group discussions conducted with industry experts.

4. Results

A. Demographic Profile of Respondents

Table 1: Demographic Profile of Respondents

Variable	Sub Construct	Frequency
Age	25-34 years	26
	35-44 years	24
	45-54 years	32
	55 and over	8
Gender	Male	77
	Female	13
Experience	Less than 2 years	4
	2-5 years	15
	6-10 years	26
	More than 10 years	45
Income Level	Rs 5-10 lakhs per annum	29
	Rs 10-20 lakhs per annum	45
	More than Rs 20 lakhs per annum	16
Marital Status	Single	19
	Married	60
	Prefer Not to Say	11
Industry	Fashion	45
	Technology	45

B. Descriptive Analysis

It is concluded that, among the total of 45 respondents in the analyzed data, 28.9% expect a return rate of 81-90% on their inventory, 42.2% expect a return rate of 91-95%, and 28.9% expect a 100% return rate. This indicates that the majority of respondents anticipate a return rate between 91% and 95%.

Table 2: What's the average return rate of inventory they expect in their business?

What's the average return rate of inventory they expect in their business?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	81 - 90%	13	28.9	28.9	28.9
	91 -95 %	19	42.2	42.2	71.1
	100 %	13	28.9	28.9	100.0
	Total	45	100.0	100.0	

It is concluded that, among the total of 45 respondents in the analyzed data, 51.1% want to achieve a Float% of 0-10% for inventory in the field by value, while 48.9% aim for a Float% of 11-20%. This indicates a near-equal distribution of respondents, with a slight majority preferring a lower float percentage.

Table 3: What's the Float% > 10 days (inventory in field by value) they want to achieve?

What's the Float% > 10 days (inventory in field by value) they want to achieve?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 – 10%	23	51.1	51.1	51.1
	11% - 20%	22	48.9	48.9	100.0
	Total	45	100.0	100.0	

It is concluded that, among the total of 45 respondents in the analyzed data, 48.9% expect their business to achieve a velocity% of 81-90% within 10 days for returns management, while 51.1% expect a velocity% of more than 90%. This indicates that the majority of respondents aim for a high velocity, delivering more than 90% of returns within 10 days.

Table 4: What's the velocity% (by unit) within 10 days they expect their business (returns management) to deliver?

What's the velocity% (by unit) within 10 days they expect their business (returns management) to deliver?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	81% - 90%	22	48.9	48.9	48.9
	More than 90%	23	51.1	51.1	100.0
	Total	45	100.0	100.0	

It is concluded that, among the total of 45 respondents in the analyzed data, 84.4% expect the maximum limit of write-off to be up to 2% of the dispatched (WIP) inventory value, while 15.6% expect it to be between 3% and 5% of the dispatched (WIP) inventory value. This indicates that the majority of respondents aim to keep write-offs to a minimal level, not exceeding 2%.

Table 5: What's the maximum limit of write-off they expect on account of non-return value of inventory?

What's the maximum limit of write-off they expect on account of non-return value of inventory?					
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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Up to 2% of despatched (WIP) inventory value	38	84.4	84.4	84.4
	3% - 5% of despatched (WIP)inventory value	7	15.6	15.6	100.0
	Total	45	100.0	100.0	

It is concluded that, among the total of 45 respondents in the analyzed data, 53.3% wish to maintain an order-to-deliver cycle of 1-3 days, while 46.7% prefer a cycle of 4-7 days. This indicates a slight preference for a quicker delivery cycle, with more than half of respondents aiming for delivery within 3 days.

Table 6: What's the max order-to-deliver cycle they wish to maintain in their business?

What's the max order-to-deliver cycle they wish to maintain in their business?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 - 3 days	24	53.3	53.3	53.3
	4 - 7 days	21	46.7	46.7	100.0
	Total	45	100.0	100.0	

It is concluded that, among the total of 45 respondents in the analyzed data, 60% wish the supply chain to deliver a maximum disposition turnaround time of 1-3 days, while 40% prefer a turnaround time of 4-7 days. This indicates that the majority of respondents prioritize a quicker disposition process, with a preference for turnaround times within 3 days.

Table 7: What's the maximum disposition Turn Around time they wish the supply chain to deliver?

What's the maximum disposition Turn Around time they wish the supply chain to deliver?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 - 3 days	27	60.0	60.0	60.0
	4 - 7 days	18	40.0	40.0	100.0
	Total	45	100.0	100.0	

It is concluded that, among the total of 45 respondents in the analyzed data, 66.7% expect the annual new parts cost avoidance to be up to 9 crores, while 33.3% expect it to be greater than 9 crores. This indicates that the majority of respondents anticipate cost avoidance within the range of up to 9 crores.

Table 8: What's the annual new parts cost avoidance in terms of value?

What's the annual new parts cost avoidance in terms of value?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Up to 9 Cr	30	66.7	66.7	66.7
	> 9 Cr	15	33.3	33.3	100.0

	Total	45	100.0	100.0	
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It is concluded that, among the total of 45 respondents in the analyzed data, 100% believe that an effective supply chain can significantly reduce scrap disposition.

Table 9: Do you believe an effective supply chain can bring down the scrap disposition?

Do you believe an effective supply chain can bring down the scrap disposition?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, significantly	45	100.0	100.0	100.0

5. Discussion

The results indicate the major trends in supply chain practices within the fashion and technology industries, with high expectations for inventory turnover and efficiency. More than 42% of respondents believe that a return rate of 91%-95% is attainable, while preferences for inventory float are divided, with most preferring a range of 0-10%. A major 51.1% aim for a return velocity rate over 90%, underlining the significance of fast returns processing. In addition, 84.4% of the respondents want to limit write-offs to 2% of dispatched inventory value, which shows a great emphasis on cost control. Speed is also a priority, with 53.3% wanting to achieve an order-to-delivery cycle of less than 3 days and 60% wanting to achieve a disposition turnaround of 1-3 days. Respondents also emphasize saving costs, with 66.7% expecting annual savings of Rs. 9 crores from new parts. All respondents finally agreed that effective supply chain management plays a crucial role in reducing waste and increasing profitability. In the conclusion, the findings underscore the importance of inventory efficiency, cost control, and rapid turnover in the success of a supply chain.

6. Conclusion

This study addresses the integration of circular economy principles into inventory management to enhance return inventory rates, float percentages, and disposition turnaround times for more sustainability and profitability. It reveals that companies in these fashion and tech sectors seek high return rates, speedy processing, and low float percentages and strive for write-off minimization as well as the elimination of scrap disposal. The study highlights the need for an efficient supply chain in decreasing waste and increasing resource utilization toward better environmental sustainability and cost efficiency. In the end, this research shows that embracing the circular economy in managing an inventory can help support long-term sustainability goals while enhancing the performance of operations.

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