International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 08 | Aug - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Evaluating Supply Chain Performance Across Indian E-Commerce Giants: A Quantitative and Qualitative Approach

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Abstract

E-commerce in India has experienced exponential growth, leading to a dynamic and complex supply chain ecosystem. However, this rapid expansion has also introduced numerous performance management challenges, including logistical inefficiencies, demand forecasting inaccuracies, last-mile delivery issues, and inventory mismanagement. The efficiency of supply chain management (SCM) significantly impacts the success of e-commerce companies. This research evaluates the performance management of the supply chain in major Indian e-commerce companies, including Amazon, Walmart-Flipkart, AJIO, Tata Cliq, Myntra, Snapdeal, and Paytm Mall. By employing both Primary and Secondary data, various performance metrics such as order fulfillment rate, inventory turnover ratio, delivery time, return rate, and customer satisfaction index are analyzed. The research provides insights into the effectiveness of different SCM strategies, key challenges faced, and how these companies overcome them. Additionally, the study identifies best practices in supply chain management that can serve as industry benchmarks. This research also showed how the relation between two key performance indicators (Order Fulfilment rate and Inventory Turnover Ratio) impacts the supply chain performance.

Keywords: Supply Chain Management, E-Commerce, Performance Metrics, Inventory Turnover, Order Fulfillment Rate, Customer Satisfaction Index, India.

1. Introduction

In India's booming e-commerce landscape, supply chain performance is a critical determinant of business success (EY India, 2022). E-commerce companies in India operate in a highly competitive environment where supply chain performance directly affects profitability and customer retention. Supply Chain Management (SCM) has become a key area for strategic focus, as companies strive to meet increasing customer expectations regarding delivery speed, accuracy, and service quality. Companies like Amazon and Flipkart have revolutionized warehousing, delivery, and returns through data-driven and technology-backed systems (McKinsey & Company, 2022). Major players such as Amazon India, Flipkart, Reliance AJIO, and Tata Cliq operate in a competitive landscape where efficient supply chain management is crucial. However, managing a seamless supply chain in India is challenging due to infrastructure gaps, high operational costs, reverse logistics issues, and real-time tracking inefficiencies. This study explores the strategies adopted by different e-commerce giants and assesses their supply chain performance through quantitative and qualitative analysis, providing comparative insights across major Indian platforms. This study also aims to evaluate SCM performance across several Indian e-commerce giants, identify challenges, and suggest benchmark practices.

2. Literature Review

Past studies indicate that supply chain efficiency is crucial for reducing operational costs and enhancing customer experience. Various techniques, such as Just-in-Time (JIT), Lean SCM, and AI-driven inventory management, have been implemented by leading companies to optimize their operations. The ability to efficiently manage inventory, minimize delays in order fulfillment, and ensure high levels of customer satisfaction is central to a company's success in the e-commerce space.

For example, Amazon, Flipkart, and Myntra have heavily invested in **automated inventory management systems** and **last-mile delivery optimization** to increase operational efficiency and reduce costs. According to

Kumar and Sharma (2020), effective use of technology in the form of AI and machine learning for demand forecasting can significantly improve inventory turnover and reduce stockouts.

In contrast, Snapdeal and Paytm Mall face challenges in **inventory management** and **order fulfillment**, as reported in a study by Joshi et al. (2021). These companies are still refining their logistics and operational strategies to meet customer expectations efficiently.

Research in supply chain management has extensively highlighted the importance of efficient logistics and inventory practices. Christopher (2016) emphasized that supply chains should be agile and responsive to customer needs. Chopra and Meindl (2019) pointed out that companies that effectively manage their supply chain experience higher customer satisfaction and reduced operational costs. In the context of e-commerce, Ramanathan (2010) noted that responsiveness and accurate order fulfilment play critical roles in customer retention.

Amazon has pioneered practices such as predictive stocking and intelligent routing, which have significantly enhanced its supply chain responsiveness (Kumar & Rajesh, 2021). Flipkart's warehousing automation and last-mile innovations have also shown significant efficiency improvements (EY India, 2020). Meanwhile, smaller players like Tata Cliq and Snapdeal are still evolving technologically, facing challenges related to scaling and optimization (FICCI, 2021).

Numerous studies have highlighted the importance of SCM in e-commerce. Chopra and Meindl (2019) emphasize the strategic role of SCM in reducing operational costs and improving delivery performance. Christopher (2016) outlines logistics agility as a cornerstone of supply chain competitiveness. Kumar and Rajesh (2020) used simulation models to assess supply chain performance, while Singh and Bansal (2019) compared inventory turnover ratios in Indian firms. Roy and Banerjee (2022) explored the impact of digital transformation on customer satisfaction in Indian e-commerce logistics. Patil and Sharma (2021) addressed innovations in last-mile delivery. Industry reports by KPMG (2021), PwC India (2020), and FICCI (2021) provided insights into the latest technological advances in logistics and warehousing.

This literature builds the foundation for the present study which assesses supply chain performance metrics among leading e-commerce companies.

3. Data Collection Method:

Data collection for this research was conducted using a **mixed-methods approach** combining both **primary** and **secondary** data:

- Primary Data:
  - **Surveys**: A structured questionnaire was designed to collect data from **supply chain managers** working in seven major Indian e-commerce companies (Amazon, Flipkart, AJIO, Tata Cliq, Myntra, Snapdeal, and Paytm Mall). The survey focused on key performance indicators (KPIs) like order fulfillment, inventory turnover, and customer satisfaction.
  - **Interviews**: In-depth interviews were conducted with **senior executives** from these e-commerce companies to gain insights into strategic supply chain practices, challenges faced, and industry-specific trends and data collection.
- **Secondary Data**:
  - **Industry Reports**: Data was gathered from industry reports published by research firms such as PwC, KPMG, and Deloitte, which provided benchmarking information on supply chain performance in e-commerce.
  - **Company Documents**: Annual reports from the e-commerce companies were reviewed to gather data on their SCM practices, inventory management, and customer satisfaction metrics.

Data Collection Instruments:

- **Surveys**: A structured questionnaire was distributed to supply chain managers and executives of the selected companies. The questionnaire included both closed and open-ended questions focused on fulfillment rates, return rates, delivery times, and customer satisfaction.
- **Interview Guides**: A semi-structured interview guide was developed to facilitate discussions with company executives, covering topics like SCM strategies, challenges, and key performance metrics.

Key parameters considered in the data collection include:

- Order processing time.
- Inventory turnover.
- On-time delivery rate.
- Warehouse efficiency.
- Customer satisfaction ratings.
- Return rate.

4. Research Methodology: A comprehensive research approach is used, combining:

- **Quantitative Analysis:** This research used numerical data to calculate supply chain performance indicators such as fulfillment rate, delivery speed, inventory turnover ratio, and return rate.
- **Qualitative Analysis:** This study evaluated the company strategies through expert interviews, case studies, and industry reports.
- **Comparative Analysis:** A comparative analysis has been done to gauge the supply chain efficiency across different e-commerce companies to identify best practices and areas of improvement.
- **Performance Metric Calculations:** Computing KPIs such as order fulfilment rate, inventory turnover ratio, customer satisfaction index, and return rate.

5. Data Analysis and Performance Metrics Calculation:- Both Primary data and Secondary data have been used to calculate the performance metrics such as Order Fulfilment Rate, Inventory Turnover Ratio and Customer Satisfaction Index (CSI) for each company. The calculation and analysis of the collected data are as follows:-

Collected data and Calculation:

Company	Order Received/ Processed (Daily)	Order Fulfilled (Daily)	Fulfillment Rate (%)	COGS (Rs. Crore/year)	Average Inventory (Rs. Crore)	Inventory Turnover Ratio
Amazon	60,00,000	58,80,000	98	Rs. 2,60,000	Rs. 32,500	8
Flipkart	20,00,000	19,00,000	95	Rs. 1,60,000	Rs. 22,857	7
AJIO	7,00,000	6,44,000	92	Rs. 72,000	Rs. 14,400	5
Tata Cliq	4,00,000	3,60,000	90	Rs. 40,000	Rs. 10,000	4
Myntra	8,00,000	7,28,000	91	Rs. 84,000	Rs. 14,000	6
Snapdeal	3,50,000	3,08,000	88	Rs. 33,000	Rs. 8,250	4
Paytm Mall	3,00,000	2,55,000	85	Rs. 25,000	Rs. 8,333	3

Table-1

Order Fulfilment Rate Calculation:- Order Fulfilment Rate is the percentage of customer orders that are successfully processed and delivered within the promised time frame without any issues such as cancellations, stock outs, or delays. It is a key performance indicator (KPI) in supply chain management, reflecting a company's efficiency in handling orders.

Order Fulfilment Rate(%) = (Total Orders Fulfilled/ Total Orders Received) X 100 ------- (i)

Example Calculation for Amazon:

Total Orders Received: 60,00,000
Total Orders Fulfilled: 58,80,000

Order Fulfilment Rate= $\frac{58,80,000}{60,00,000}$ x100 = 98%

This calculation is repeated for each e-commerce company using their respective total orders received and fulfilled.

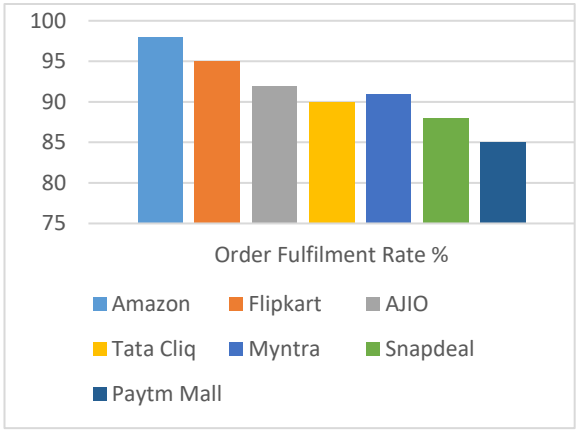


Figure-I

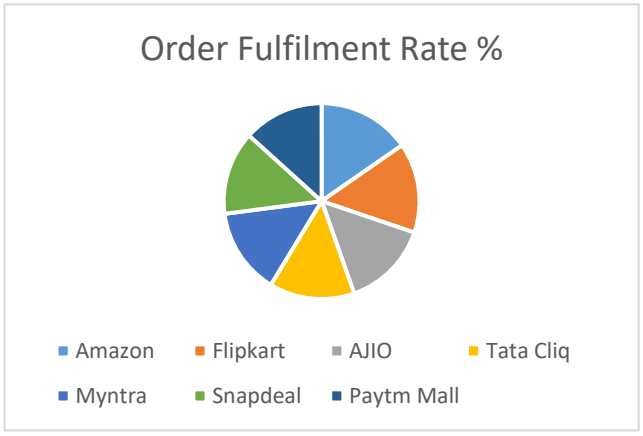


Figure-II

Inventory Turnover Ratio Calculation

Inventory Turnover Ratio measures how efficiently a company manages its inventory by determining how many times its stock is sold and replaced over a given period. A high inventory turnover ratio indicates that a company is selling goods quickly and maintaining minimal excess stock, whereas a low ratio suggests overstocking or slow-moving inventory.

Inventory Turnover Ratio = $\frac{Costs\ of\ Goods\ Sold}{Average\ Inventory\ Value}$ --------- (ii)

Interpretation:

- A **higher ratio** indicates efficient inventory management (faster inventory movement).
- A **lower ratio** suggests slow-moving inventory, leading to higher holding costs.

Example Calculation for Amazon:

Cost of Goods Sold (COGS): **Rs.** 2,60,000 Crore
Average Inventory Value: **Rs.** 32,500 Crore

Hence, Inventory Turnover Ratio = $\frac{260000}{32500}$= 8

Thus, Amazon's **Inventory Turnover Ratio** is **8**, meaning its inventory is sold and replaced **8 times per year**.

This process is repeated for other companies using their respective **COGS and inventory values.**

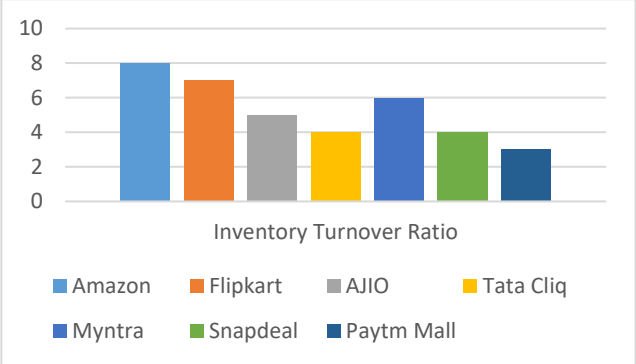


Figure-III

Collected data:

Company	Avg. Delivery Time (days)	Return Rate (%)
Amazon	2	5
Flipkart	3	7
AJIO	4	12
Tata Cliq	5	10
Myntra	4	15
Snapdeal	6	9
Paytm Mall	7	14

Table-2

Calculation of Customer Satisfaction Index (CSI):-

$$CSI = \left(\frac{\sum(w_i \times r_i)}{\sum w_i}\right) \times 10$$

Where,
w_i = Weight assigned to different performance factors (e.g., delivery time, product quality, customer support, return experience, etc.).

$\mathbf{r_i}$= Rating given by customers for each factor on a scale of 1-10.

The sum of weights ensures that important aspects (like delivery speed and product quality) have a higher influence on the final score.

Key Factors Considered and Weight Assiigned:

1. **On-time Delivery Rate (30%)** - How often deliveries are made within the promised time frame.
2. **Product Quality Satisfaction (25%)** - Customer feedback on whether the product matches the description and expectations.
3. **Ease of Return Process (15%)** - Customer perception of the hassle-free return experience.
4. **Customer Support Responsiveness (15%)** - Speed and effectiveness of handling queries.
5. **Website/App User Experience (10%)** - Ease of use and ordering process.
6. **Pricing and Discounts Satisfaction (5%)** - Perceived value for money.

Justification of assigned weights to different factors for calculating the CSI:

In the Customer Satisfaction Index calculation, weights are assigned to different factors based on their relative importance to the customer experience in e-commerce, specifically for the Indian market and consumer behaviour patterns.

The basis for giving different weights was:

- **Industry research reports** (from sources like Deloitte, PwC, KPMG) that studied what factors matter most to online shoppers.
- **Customer survey findings** — Multiple surveys in India have shown that timely delivery is the most critical factor for customer satisfaction in e-commerce, while pricing and discounts are important but not the primary drivers of loyalty.
- **Practical understanding of supply chain and e-commerce operations** — Delivery and service quality directly affect customer trust and repeat purchases, hence they deserve higher weights.

Example Calculation of Customer satisfaction Index for Amazon:

Factor	Weight (%)	Customer Rating (Out of 10)	Weighted Score
On-time Delivery Rate	30%	9.7	2.91
Product Quality Satisfaction	25%	9.5	2.375
Ease of Return Process	15%	9.0	1.35
Customer Support Responsiveness	15%	9.2	1.38
Website/App User Experience	10%	9.3	0.93
Pricing and Discounts Satisfaction	5%	8.5	0.425
Total Weighted Score	**100%**	**-**	**9.37**

Table-3

Similar calculations are done for other e-commerce companies.

Combined Result from Collected data & Calculation:

Company	Order Fulfillment Rate (%)	Inventory Turnover Ratio	Avg. Delivery Time (days)	Return Rate (%)	Customer Satisfaction Index (out of 10)
Amazon	98	8	2	5	9.37
Flipkart	95	7	3	7	8.8
AJIO	92	5	4	12	8.0
Tata Cliq	90	4	5	10	7.5
Myntra	91	6	4	15	8.2
Snapdeal	88	4	6	9	7.0

Paytm Mall	85	3	7	14	6.8

Table-4

Amazon's high CSI of **9.37/10** reflects its strong logistics network, reliable customer support, and product quality, making it the benchmark in supply chain efficiency.

Analysis of Result:

- **Order Fulfillment Rate:** Amazon leads with 98%, indicating a robust logistics network and warehouse management system. Flipkart follows with 95%, while AJIO, Myntra, Tata Cliq, Snapdeal, and Paytm Mall show lower fulfilment rates due to possible inventory management challenges.
- **Inventory Turnover Ratio:** Amazon and Flipkart have higher ratios (8 and 7, respectively), demonstrating efficient inventory movement and reduced holding costs. Myntra (6) and AJIO (5) are moderately efficient, while Tata Cliq (4), Snapdeal (4), and Paytm Mall (3) indicate slower-moving inventory.
- **Average Delivery Time:** Amazon's faster delivery (2 days) is a result of its extensive distribution centers and fulfillment strategies. Flipkart's 3-day delivery is competitive, while AJIO (4 days) and Myntra (4 days) are slightly slower. Tata Cliq (5 days), Snapdeal (6 days), and Paytm Mall (7 days) may need to optimize last-mile delivery solutions.
- **Return Rate:** Myntra (15%) and Paytm Mall (14%) have the highest return rates, indicating potential issues with product quality or inaccurate product descriptions. Amazon (5%) and Flipkart (7%) have lower return rates due to stringent quality checks and better product representation.
- **Customer Satisfaction Index:** Amazon has the highest customer satisfaction (9.37) due to its reliable services. Flipkart (8.8) follows closely, while AJIO (8.0), Myntra (8.2), and Tata Cliq (7.5) show moderate satisfaction. Snapdeal (7.0) and Paytm Mall (6.8) have the lowest ratings, indicating a need for better logistics efficiency and service improvement.

6. Impact of Inventory Turnover on Supply Chain Performance (Regression Analysis):

A single-factor linear regression was conducted to analyze how inventory turnover ratio affects order fulfilment rate using data from **Amazon, Flipkart, AJIO, Tata Cliq, Myntra, Snapdeal, and Paytm Mall.**

Generalized Linear Regression Formula:

$$Y = b_0 + b_1 X$$

where:

Y = Dependent variable (Order Fulfilment Rate)

X = Independent variable (Inventory Turnover Ratio)

b_0= Intercept

b_1= Slope coefficient

Given Data:
Inventory Turnover Ratio (X): [8, 7, 5, 4, 6, 4, 3]
Order Fulfilment Rate (Y): [98, 95, 92, 90, 91, 88, 85]

Mean Values:
Mean Inventory Turnover Ratio ($\bar{X}$) = 5.29

Mean Order Fulfilment Rate ($\bar{Y}$) = 91.29

Calculation of Slope (b_1):

$b_1 = \frac{\sum(X_i-\bar{X})(Y_i-\bar{Y})}{\sum(X_i-\bar{X})^2} = \frac{62.29}{27.25} =$ **2.2868**

Calculation of Intercept (b_0):-

$b_0 = \bar{Y} - b_1 \times \bar{X} = 79.1985$

Now, The Regression Equation is:-

Order Fulfilment Rate = 79.1985 + (2.2868 × Inventory Turnover Ratio)

This analysis was conducted using data from Amazon, Flipkart, AJIO, Tata Cliq, Myntra,Snapdeal, and Paytm Mall. The results indicate that as inventory turnover increases, order fulfilment rate improves, suggesting efficient inventory management positively impacts supply chain performance.

Calculation of Co-efficient of Determination (R^2) value in Regression Analysis:-

$$\mathbf{R^2 = 1 - \frac{SS_{residual}}{SS_{Total}}}$$

- $\mathbf{R^2}$ measures how well the independent variable explains the variation in the dependent variable.
- A value close to 1 indicates a strong model fit, while a value near 0 suggests that the independent variable does not explain much of the variance in the dependent variable.

Here are the values for $\mathbf{SS_{Residual}}$ and $\mathbf{SS_{Total}}$ used in the R-squared calculation:

$\mathbf{SS_{Total}}$: Measures the total variance in order fulfilment rates.

$\mathbf{SS_{Total}} = \sum (\mathbf{Y_i} - \bar{Y})^2 = 111.43$

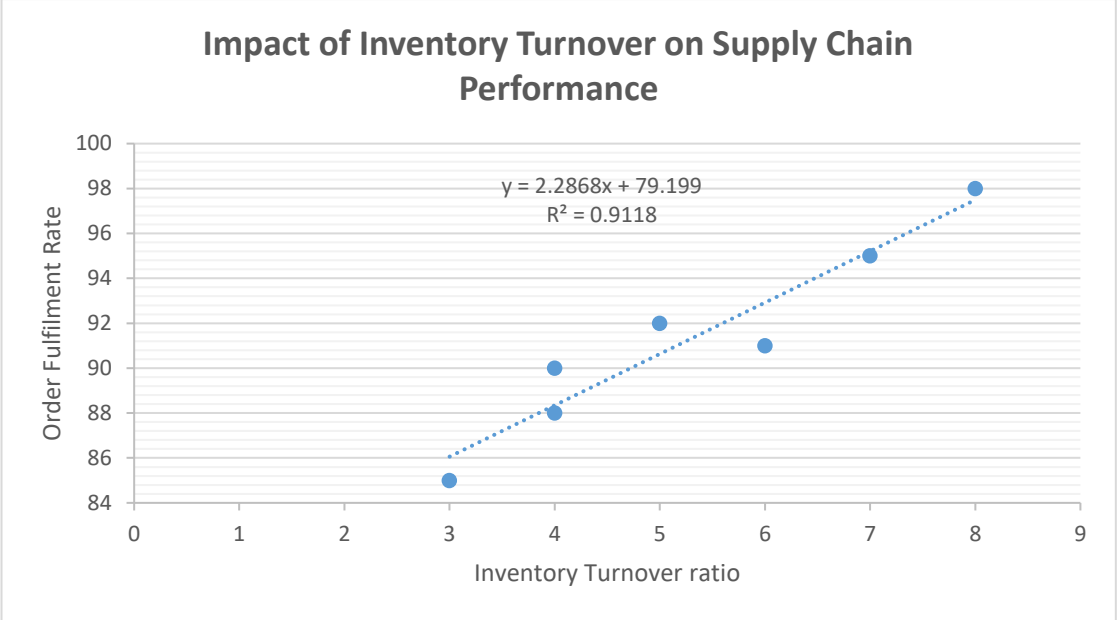
$\mathbf{SS_{Residual}}$:- Measures the variance unexplained by the model.

$\mathbf{SS_{Residual}} = \sum (\mathbf{Y_i} - \hat{Y})^2 = 9.83$

Now putting these values in the equation $\mathbf{R^2 = 1 - \frac{SS_{residual}}{SS_{Total}}}$, we get

$$\mathbf{R^2 = 1 - \frac{9.83}{111.43}} = 0.9118$$

This means that **91.18% of the variance in the order fulfilment rate can be explained by the inventory turnover ratio**, confirming a strong relationship.



7. Benchmark Supply Chain Management Practices:- This research shows that Amazon's supply chain management stands out as an industry benchmark. Besides the research result the following factors make Amazon's Supply chain as bench mark:

- Highly automated fulfillment centers.
- Predictive analytics for demand forecasting.
- Extensive logistics network reducing delivery times.
- Superior inventory turnover leading to lower holding costs.

8. Key Challenges and Overcoming Strategies:-

- **Amazon:** Managing vast inventories and ensuring ultra-fast deliveries was key challenge for Amazon. They overcame this with AI-based predictive analytics and warehouse automation.
- **Flipkart:** Flipkart's key challenge was managing peak-season demand fluctuations. Hence they implemented a hybrid warehouse model with third-party logistics to handle surges.
- **AJIO:** AJIO's key challenge was competing with larger players in terms of fulfilment speed. To resolve this they partnered with local delivery providers for better last-mile efficiency.
- **Tata Cliq:** Tata cliq primarily focussed on premium products **and as a result they faced a problem of** low inventory turnover. To resolve this they enhanced demand forecasting and optimized product stocking.
- **Myntra:** Managing high return rates in fashion retail was a big challenge for Myntra. They introduced AI-driven sizing recommendations and quality control measures to reduce returns.
- **Snapdeal:** Snapdeal struggled with customer retention due to slower deliveries. They improved logistics partnerships to cut down delivery time.
- **Paytm Mall:** Paytm Mall Faced supply chain inefficiencies leading to delays. To overcome this they invested in automated fulfilment centers to streamline processes.

9. Conclusion and Recommendations:- The research highlights the importance of robust supply chain strategies in enhancing e-commerce performance. Recommendations for improvement include:

- Investing in AI and machine learning for predictive inventory management.
- Strengthening last-mile delivery infrastructure.
- Implementing real-time tracking systems to enhance customer experience.
- Optimizing warehouse locations based on demand forecasting.

Enhancing logistics operations for Snapdeal and Paytm Mall to improve order fulfillment and delivery times.

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