EVALUATING THE ROLE OF GREEN SUPPLY CHAIN PRACTICES IN IMPROVING OPERATIONAL PERFORMANCE OF INDIAN MANUFACTURING FIRMS

Background and Objectives:

With growing environmental concerns and increasing regulatory pressures, manufacturing firms in India are under rising scrutiny to implement sustainable practices. Green Supply Chain Management (GSCM) has emerged as a strategic approach integrating environmental thinking into supply chain activities such as procurement, production, and distribution. However, the impact of such initiatives on operational performance in the Indian context remains understudied.

Objectives:

- To identify the extent of adoption of green supply chain practices among Indian manufacturing firms.
- To assess the relationship between green practices and key operational performance indicators (e.g., cost efficiency, delivery speed, inventory turnover).
- To recommend practical steps for firms to balance sustainability and operational excellence.

Research Questions:

1. What types of green supply chain practices are most commonly implemented in Indian manufacturing firms?
2. Is there a statistically significant relationship between the level of GSCM implementation and operational performance?
3. What are the primary barriers and enablers in adopting green practices?

Hypotheses:

- **H1:** Adoption of green procurement practices is positively associated with operational efficiency.
- **H2:** Internal environmental training and awareness lead to better resource utilization.

- **H3:** Firms with higher levels of GSCM integration experience better inventory turnover and delivery reliability.

Methodology:

- **Research Design:** Quantitative, cross-sectional survey-based analysis
- **Sampling:** 85 mid-sized manufacturing firms across Maharashtra, Tamil Nadu, and Gujarat
- **Data Collection:** Structured questionnaire distributed to operations/supply chain managers
- **Variables:**
    - Independent: Green procurement, eco-friendly packaging, reverse logistics, energy-efficient production
    - Dependent: Cost reduction, delivery speed, inventory turnover, defect rate
- **Data Analysis Tool:** SPSS
- **Tests Conducted:**
    - Descriptive statistics for profiling
    - Pearson correlation for relationship testing
    - Multiple regression analysis for hypothesis validation

Results and Interpretations (Simulated):

- **Descriptive Findings:**
    - 72% of firms reported adopting at least two green practices.
    - Reverse logistics adoption remained low (34%).
- **Correlational Findings:**
    - Strong positive correlation between green procurement and cost efficiency ($r = 0.62$, $p < 0.01$).
    - Moderate correlation between energy-efficient processes and delivery speed ($r = 0.49$, $p < 0.05$).
- **Regression Findings:**

- Green procurement significantly predicted operational performance ($\beta = 0.51$, $p < 0.01$).
- Lack of top management support and cost concerns were cited as key barriers.

Conclusion and Managerial Implications:

The study confirms a positive impact of green supply chain practices on operational performance. Particularly, firms that invest in green procurement and energy-efficient processes achieve better cost control and delivery reliability. Managers should integrate sustainability KPIs into vendor selection, employee training, and process design. Moreover, firms can view GSCM not just as a compliance measure but as a strategic tool for competitive advantage.

Future Research Scope:

- Comparative studies across sectors (e.g., textiles vs automotive).
- Longitudinal tracking of green KPIs and firm performance over 5–10 years.
- Case studies on successful GSCM implementations to develop best practice frameworks.
- Exploring digital enablers such as IoT and blockchain for sustainable supply chains.

Academic and Corporate Relevance:

- **Academic:** Suitable for coursework in Operations Management, Sustainability in Business, and Industrial Strategy.
- **Corporate:** Useful for supply chain managers, sustainability officers, and consultants focused on ESG (Environmental, Social, Governance) compliance and performance improvement.