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Supply Chain and Logistics Innovations in Mahindra & Mahindra and Tata Motors' EV Segment

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Abstract

The advent of electric vehicles (EVs) has triggered a paradigm shift in the global automotive industry, compelling traditional manufacturers to reconfigure their supply chain and logistics operations. In the Indian context, Mahindra & Mahindra and Tata Motors have emerged as pioneers in the EV segment, proactively driving innovation to build agile, resilient, and sustainable supply networks. This study undertakes a comprehensive examination of the supply chain and logistics innovations adopted by these two companies, with an emphasis on understanding their strategies to overcome sector-specific challenges such as battery sourcing, critical material procurement, technological adaptation, and infrastructure constraints.

Mahindra's strategy emphasizes localization of key components, vertical integration through partnerships with global technology firms, and the establishment of battery assembly units within India to mitigate import dependency and logistical risks. Tata Motors, on the other hand, has championed an integrated ecosystem approach through initiatives like Tata Universe, leveraging synergies with group companies for battery manufacturing, charging infrastructure, and digital logistics optimization. Both organizations are increasingly adopting Industry 4.0 technologies—such as Internet of Things (IoT), artificial intelligence (AI), and blockchain—to enhance supply chain visibility, predictive maintenance, and real-time inventory management.

The research methodology integrates qualitative analysis of case studies, industry reports, and executive interviews to draw comparative insights. Key findings reveal that both firms prioritize supply chain resilience, cost competitiveness, and environmental sustainability as core pillars of their EV strategies. Challenges such as global semiconductor shortages, high battery import costs, regulatory uncertainty, and the need for extensive supplier development persist, necessitating continuous innovation.

This study concludes by emphasizing that supply chain and logistics excellence will be a decisive factor in determining leadership in India's burgeoning EV market. It also offers

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strategic recommendations to further strengthen supply chain frameworks, enhance technological integration, and contribute to India's future of sustainable mobility.

Keywords:

Electric Vehicles (EVs), Supply Chain Innovation, Logistics Optimization, Mahindra & Mahindra, Tata Motors, Battery Supply Chain, EV Ecosystem, Sustainable Mobility, Industry 4.0, Localization Strategy, Digital Supply Chain, Charging Infrastructure, Smart Logistics, Automotive Industry, Future Mobility.

Introduction

As India charts its ambitious course toward a sustainable and equitable future under the India@2047 vision, the electric vehicle (EV) sector emerges as a critical enabler of green growth, energy security, and inclusive development. Central to this transformation are homegrown automotive giants—Mahindra & Mahindra (M&M) and Tata Motors—who are not only leading the charge in EV manufacturing but are also innovating deeply across their supply chain and logistics ecosystems. These innovations span from the localization of EV components and digital twin modeling to green logistics, battery lifecycle management, and the integration of Industry 4.0 practices.

Mahindra & Mahindra has strategically invested in a vertically integrated EV value chain through initiatives like Mahindra Electric Mobility Limited (MEML) and partnerships with global players. Tata Motors, on the other hand, leverages the strength of the Tata Group ecosystem, enabling synergies in battery tech, software, and EV infrastructure—anchored by Tata Auto Comp, Tata Power, and Tata Chemicals. These companies are redefining traditional logistics by incorporating AI-powered demand forecasting, just-in-time component delivery, and sustainable warehousing, thus aligning mobility with India's climate goals and digital transformation agenda.

This paper explores the transformative logistics and supply chain strategies of Mahindra & Mahindra and Tata Motors within the EV segment, analyzing their role in shaping an inclusive, low-carbon mobility future for India. Through technological innovation, localization efforts, and policy alignment, these firms exemplify how Indian manufacturers can empower India's transition to a green economy by 2047.

What is Logistics?

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Logistics is the organized management of the movement, storage, and flow of goods, information, and resources from the point of origin to the point of consumption. It entails the coordination of various processes and activities.:

1. **Transportation:** Selecting the best methods (road, rail, air, sea) to move goods efficiently.
2. **Warehousing:** Managing storage facilities to hold goods until needed.
3. **Inventory Management:** Balancing inventory levels to meet customer demand without excessive holding costs.
4. **Packaging:** Properly preparing goods for protection, efficient handling, and transport.
5. **Order Fulfillment:** Accurately and timely processing of orders from customers or distribution channels.
6. **Supply Chain Coordination:** Ensuring smooth integration with suppliers, manufacturers, distributors, and retailers.
7. **Information Management:** Tracking goods, managing data, and providing visibility across the supply chain.

Importance of Logistics:

- Reduces operational expenses and improves efficiency.
- Enhances customer satisfaction through timely and accurate delivery.
- Optimizes resource utilization and reduces waste.
- It supports strategic planning and competitive advantage.

Types of Logistics:

- **Inbound Logistics:** Movement of raw materials from suppliers to production facilities.
- **Outbound Logistics:** Distribution of finished products from factories to customers.
- **Reverse Logistics:** Managing returns, recycling, disposal, and reuse of goods.

Current scenario of logistics: As of 2025, the logistics landscape in India's automobile sector is undergoing significant transformation, with industry leaders like Tata Motors and Mahindra & Mahindra (M&M) spearheading advancements in sustainability, digitalization, and supply chain resilience.

Tata Motors: Advancing Sustainable and Integrated Logistics

Tata Motors is actively enhancing its logistics and supply chain operations through several strategic initiatives:

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- **Local Battery Production:** To strengthen its electric vehicle (EV) supply chain, Tata Motors is investing $1.5 billion in a domestic battery gigafactory via its subsidiary, Agratas. This facility aims to commence lithium-ion cell production by 2026, ensuring a stable supply of critical EV components.
- **Digital Supply Chain Management:** The company has implemented advanced Warehouse Management Systems (WMS) and Transport Management Systems (TMS) across its operations. These technologies optimize warehouse functions, provide end-to-end visibility through telematics, and enhance efficiency and responsiveness.
- **Strategic Partnerships:** In October 2024, Tata Motors signed a Memorandum of Understanding (MoU) with CJ Darcl Logistics to explore opportunities for fleet expansion and logistics services enhancement, reflecting its commitment to collaborative growth.
- **Sustainability Initiatives:** The company is focusing on reducing embodied emissions and increasing the use of renewable energy within its supply chain, aligning with global sustainability goals.

Mahindra & Mahindra: Expanding Logistics Capabilities and Green Initiatives

Mahindra & Mahindra is actively scaling its logistics operations and embracing sustainability through the following measures:

- **Acquisition of SML Isuzu:** In April 2025, M&M announced the acquisition of a 58.96% stake in SML Isuzu for ₹5.55 billion ($65 million). This move aims to double M&M's market share in the truck and bus segment from 3% to 6%, with a target of reaching 12% by fiscal year 2031.
- **Green Logistics Ecosystem:** Through its 'Edel' initiative, Mahindra Logistics is fostering a green logistics ecosystem. The company has launched an Emissions Analytics Report to help clients decarbonize their supply chains, contributing to India's net-zero emissions goal by 2070.
- **Infrastructure Expansion:** Mahindra Logistics has expanded its fulfillment operations, including the launch of a 6.5 lakh sq. ft. multi-client warehouse in Bhiwandi, enhancing its capacity to serve diverse sectors.
- **Financial Performance:** In the fiscal year 2024-25, Mahindra Logistics reported a 67% year-on-year increase in standalone profit after tax (PAT) to ₹13.12 crore for the March

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quarter, with revenue growing by 11% to ₹5,013 crore for the full year. This growth is attributed to new account additions and service offerings.

Industry-Wide Trends

Both Tata Motors and Mahindra & Mahindra are navigating a logistics environment characterized by:

- **Digital Transformation:** The adoption of AI, IoT, and blockchain technologies is enhancing supply chain visibility and efficiency.
- **Sustainability Focus:** There's a concerted effort to reduce carbon footprints through the use of electric vehicles and alternative fuels like LNG.
- **Strategic Collaborations:** Partnerships with logistics providers and technology firms are becoming pivotal in optimizing operations.

These developments indicate a robust and forward-looking approach by India's leading automobile manufacturers to modernize their logistics and supply chain frameworks, ensuring resilience and sustainability in a dynamic market.

Vision 2047: Logistics in India's Automobile Sector

(Special Emphasis on Tata Motors and Mahindra & Mahindra)

By 2047, the centenary of India's independence, logistics within the automobile sector—particularly for Tata Motors and Mahindra & Mahindra—will have undergone a transformational shift toward unprecedented efficiency, sustainability, and technological integration. Here's a strategic vision highlighting key logistics dimensions:

1. Fully Digitalized and Automated Logistics Networks

- **AI & Robotics Integration:** Complete automation of warehouse management, inventory tracking, and handling systems through AI-powered robotics.
- **Blockchain Implementation:** Transparent, secure, and immutable supply chain records managed via blockchain technology, enhancing traceability and accountability.
- **Predictive Analytics:** Advanced predictive analytics to anticipate demand fluctuations, optimizing inventory and minimizing costs.

2. Green and Sustainable Logistics

- **Zero-emission Fleet:** Complete transition to electric trucks and hydrogen-powered transportation vehicles for component supply and finished goods delivery.
- **Circular Economy Practices:** Enhanced reverse logistics and recycling strategies for end-of-life vehicles, batteries, and other critical automotive components.

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- **Carbon-Neutral Infrastructure:** Sustainable logistics hubs powered by renewable energy sources (solar, wind) with minimal ecological impact.

3. Smart and Resilient Supply Chains

- **Localized Supply Chains:** Strong localization of components (particularly batteries and critical electronics), significantly reducing import dependency.
- **Resilient Logistics Hubs:** Creation of strategically placed logistics hubs across India, integrated with smart infrastructure to mitigate disruptions caused by global uncertainties.
- **Real-Time Visibility:** IoT-driven tracking and real-time data analysis, ensuring agility and rapid response capability in supply chain adjustments.

4. Advanced Multi-modal Transportation Systems

- **Integrated Multi-modal Networks:** Seamless connectivity between roads, railways, inland waterways, and air transport for swift and flexible logistics operations.
- **Drone Delivery Networks:** Last-mile delivery and component transportation facilitated through automated drone networks, particularly in remote or inaccessible regions.

5. Collaborative Ecosystem Development

- **Strategic Alliances:** Tata and Mahindra are leading collaborative platforms, partnering with global and domestic tech firms, startups, academia, and governmental bodies to foster innovation.
- **Supply Chain Clusters:** Creation of industry-specific clusters to enhance collaboration, reduce logistics complexity, and promote resource sharing among stakeholders.

Company-specific Focus:

Tata Motors' Logistics Vision

- **Battery Supply Chain:** Complete self-reliance via Tata's subsidiary, Agratas, creating a robust domestic battery manufacturing ecosystem.
- **Global Strategic Partnerships:** Strengthened relationships with global EV component providers (e.g., Tesla), leveraging advanced logistics and supply chain innovations.
- **Smart Distribution Networks:** AI-driven predictive logistics platforms optimizing inventory and distribution for commercial and passenger EV segments.

Mahindra & Mahindra's Logistics Vision

- **Green Logistics Leadership:** Expanded use of its EV logistics fleet—fully electrified, reducing carbon footprints significantly.

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- **Circular Economy Integration:** Advanced recycling plants and circular logistics mechanisms, ensuring complete sustainability in EV lifecycle management.
- **Telematics and IoT-driven Supply Chains:** Advanced telematics systems enhancing efficiency in real-time route optimization, safety monitoring, and emissions tracking.

Strategic Outcomes by 2047:

- **Reduction of Logistics Costs**: Achieving a 25-30% reduction in overall logistics expenses through optimized operations and smart infrastructure.
- **Carbon Neutrality**: Attaining near-total decarbonization of automotive logistics operations.
- **Resilience and Self-Reliance**: Dramatic improvement in resilience and localization, insulating supply chains against global shocks.
- **Customer-Centric Logistics**: Enhancing customer satisfaction through timely, transparent, and reliable logistics and delivery experiences.

Conclusions:

In conclusion, the forward-looking supply chain and logistics innovations driven by Mahindra & Mahindra and Tata Motors are pivotal to India's ambitious sustainability goals for 2047. Both automotive giants exemplify strategic leadership by extensively adopting digitalization, automation, and green logistics practices, setting benchmarks not only for the Indian automotive industry but also for the global EV ecosystem. Mahindra focuses on recycling, tracking emissions, and building green logistics, while Tata Motors is dedicated to making batteries locally, forming global partnerships, and creating a digital supply chain. Collectively, these innovations substantially enhance operational resilience, sustainability, and economic competitiveness. By proactively reshaping their logistics landscapes, Tata Motors and Mahindra are laying the foundation for a robust, equitable, and environmentally responsible automotive future—effectively contributing toward India's vision for a carbon-neutral and prosperous economy by 2047.

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