

## **NATION FLEET: A WEB-BASED TRANSPORT MANAGEMENT SYSTEM FOR SMALL-SCALE LOGISTICS**

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### **ABSTRACT**

*Efficiency in the logistics sector directly impacts economic health, yet a stark digital divide persists. While large corporations optimize their operations with expensive software, small-scale transport operators are often left behind, managing their finances and fleets with outdated manual methods. This paper introduces Nation Fleet, a prototype for a web-based Transport Management System (TMS) built to address this very problem. We designed Nation Fleet to be an accessible, data-focused tool that helps small businesses streamline their operations. Built on a modern technology stack—React.js, Node.js with Express, and Mongo DB—the system delivers the essential features for logistics management: detailed trip and expense tracking, a central database for vehicles and drivers, a real-time financial dashboard, and simple data export tools. Our focus was on creating a scalable, secure, and user-friendly platform that gives small transport companies the digital tools they need to improve efficiency, boost profits, and make smarter, data-driven decisions.*

**KEYWORDS:** *Logistics Sector*

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### **INTRODUCTION**

While the logistics industry forms the backbone of the global supply chain, its reliance on technology is deeply uneven. Large corporations leverage powerful Enterprise Resource Planning (ERP) systems to gain a competitive edge. Meanwhile, a vast number of small and medium-sized enterprises (SMEs), the workhorses of the sector, remain stuck with pen-and-paper methods.

This manual approach is fraught with problems: it leads to inaccurate data, offers no real-time view of operations, creates a mountain of administrative work, and makes calculating profitability a guesswork-heavy task.

The Nation Fleet project was born from these observations. We set out to build a software prototype that would offer an intuitive, powerful, and low-cost TMS. Our main goal is to empower these smaller transport businesses by giving them a digital platform to manage their essential administrative and financial tracking, paving the way for a more organized and profitable future.

## LITERATURE REVIEW

To understand the landscape Nation Fleet operates in, we examined the history of Transport Management Systems and current market solutions. This review helped us pinpoint the specific gap our project is designed to fill.

### The Role and Evolution of the TMS

Transport Management Systems first appeared as a component of larger supply chain systems, focusing on the movement of freight (Coyle, Bardi, & Langley, 2003). These early systems were typically large, on-premise applications built for major corporations. Academics and industry experts agree that a complete TM should cover three main areas: planning, execution, and settlement. Core features usually include route optimization, freight tracking, and tools for auditing and paying invoices, with the planning and financial tools being the biggest drivers of cost savings.

### Recent Trends in Technology

The rise of cloud computing fundamentally changed the TMS market, giving way to Software-as-a-Service (SaaS) models. This shift dramatically lowered the cost of entry, as businesses no longer needed to invest heavily in their own IT infrastructure (Marchet, Melacini, & Perotti, 2014). More recently, the integration of IoT devices like GPS trackers has turned fleet management into a real-time discipline. Modern systems use this live data for dynamic routing and even predictive maintenance—areas we've marked as future goals for Nation Fleet.

### Why Small Businesses Get Left Behind

Despite the clear advantages of a TMS, smaller transport companies rarely use them. Research consistently points to a few key reasons:

- **High Costs:** Enterprise-grade solutions from major providers like Oracle or SAP come with licensing and maintenance fees that are simply too expensive for small operators.
- **Needless Complexity:** Most commercial systems are built for massive, intricate operations. They are packed with features that a small business would never use, making the software confusing and cumbersome.
- **No IT Staff:** SMEs typically don't have in-house IT teams to install, configure, and maintain complex software.

This situation has created a clear gap in the market for a TMS built from the ground up for the specific needs and budget of a small business. Such a tool needs to focus on the essential features and be easy to access and use.

### How Nation Fleet Fits In

We designed Nation Fleet specifically to fill this gap. By using a fully open-source technology stack (React, Node.js, Mongo DB), we eliminate software licensing costs. We intentionally focused the features on the core principles of an MVP— what a business truly needs to track its finances and operations—avoiding the bloat of enterprise systems. Finally, because it's a web application, anyone can access it from any computer or phone without needing to install anything, directly tackling the biggest hurdles that prevent small businesses from adopting modern technology.

## METHODOLOGY

We developed Nation Fleet using an agile approach. This allowed us to build the system in iterative cycles, starting with a Minimum Viable Product (MVP) and adding features based on clear priorities. This method gave us the flexibility to refine our goals as the project progressed. We used Git for version control to keep the development process organized.

## SYSTEM ARCHITECTURE AND DESIGN

Nation Fleet is built on a modern client-server architecture. We deliberately separated the user interface (frontend) from the server logic and database (backend). This separation is key, as it allows for easier updates, maintenance, and future scaling of the application.

### Our Technology Choices

- **Frontend (What the user sees):** We chose **React.js** to build our user interface. Its component-based philosophy was perfect for creating a modular and fast application. We paired it with the Vite build tool for a smooth development experience. For styling, we used **Bootstrap**, loading it from a CDN to ensure the design was fully responsive on all devices without complicating the installation process.
- **Backend (The engine):** We built the server using **Node.js** and the **Express.js** framework. This is a popular and powerful combination for creating the kind of RESTful APIs needed for our application to handle data requests efficiently.
- **Database (The memory):** We selected **Mongo DB**, a leading NoSQL database, because of its flexibility. A document-based database is ideal for a prototype where data structures might need to evolve. We used the **Mongoose** library on top of it to help define our data models and simplify interactions with the database.

### How We Structured the Data

We designed our database schema to be simple but effective, focusing on three main data models:

- **Trip:** This is the heart of the system. It captures everything about a trip, including the client's name, the revenue generated, and a detailed breakdown of expenses.
- **Vehicle:** A straightforward model to keep a record of each vehicle in the fleet.
- **Driver:** A dedicated model for managing driver information.

## FEATURES AND IMPLEMENTATION

The Nation Fleet prototype delivers a core set of features that directly address the daily challenges of a small transport business.

### The Dashboard

The first thing a user sees is the dashboard, which acts as a financial command center. It provides an at-a-glance view of key metrics like Total Revenue, Total Expenses, and Net Profit.

### Data Management (CRUD)

The system provides full Create, Read, Update, and Delete (CRUD) functionality. Users can easily add new trips, vehicles, and drivers, edit existing entries, or remove them, all through simple forms and lists.

### Financial Reporting

To give business owners more power over their data, we included an **Export to Excel** feature. On the backend, the exceljs library generates a detailed .xlsx spreadsheet of all trip data, which can be used for offline accounting or further analysis.

### Proposed Parivahan Sewa Link

A forward-thinking feature we designed is the proposed integration with the official Parivahan Sewa service. The interface already includes a "Verify" button. In a full production version, this would connect to the Parivahan API to automatically pull in official vehicle details, which would drastically reduce data entry errors.

## SECURITY CONSIDERATIONS

We understand that business data is sensitive, so we designed the application with security in mind. The current prototype doesn't have a login system, but the architecture is ready for it. In the future, we plan to implement a full security model, including user authentication, role-based permissions (e.g., admin vs. driver), and encryption of data.

## DISCUSSION AND FUTURE WORK

Nation Fleet successfully proves that a modern, web-based TMS can be a game-changer for small logistics companies. It serves as a strong foundation, but as a prototype, it has room to grow. Our plans for future development are clear:

- **Build a Secure Login System:** This is the most critical next step before the system could be used commercially.
- **Integrate Live GPS Tracking:** The next major phase will be to connect the system to GPS hardware for real-time vehicle tracking on a map.
- **Finish the Parivahan API Integration:** We want to make the "Verify" feature fully functional by connecting it to the official Parivahan API.
- **Add Advanced Analytics:** In the future, we plan to add charts and graphs to help users visualize their data and spot business trends.

## CONCLUSION

The Nation Fleet project demonstrates that a well-designed, web-based TMS can offer immense value to small transport businesses. By providing an intuitive platform for managing finances and operations, Nation Fleet gives business owners a powerful tool to move away from manual record-keeping and toward a more efficient, profitable, and data-driven way of working.

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