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# SkyBridge Logistics: A Unified AI-Powered Platform for Intelligent Courier Management, Invoice Generation, Delivery Prediction, and Automated Customer Support

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**Abstract:** *Courier companies facing pressure from growing e-commerce volumes urgently need to replace paper-based booking, manual billing, and reactive customer service with smarter, more integrated solutions. This paper introduces SkyBridge Logistics — a Java EE web application that brings four independently developed AI modules together into one cohesive operational platform. The first module is a real-time Business Analytics Dashboard that keeps administrators informed about key performance indicators and revenue patterns as they develop. The second is an Invoice Generation engine that calculates GST-compliant charges and produces a downloadable invoice at the point of booking, without any manual staff input. The third is a Delivery Prediction engine that applies machine learning to estimate parcel arrival times using historical records, route distance, and live traffic data. The fourth is an NLP-powered Chatbot that handles customer queries around the clock and also supports sub-dealer network management. The platform runs on Java Servlets and MySQL, covering parcel booking, GPS tracking, payment processing, and staff administration under a single unified dashboard. Evaluation demonstrated an 87% ETA accuracy rate, a 68% reduction in reporting effort, autonomous resolution of 74% of support queries, and invoice generation in under 800 ms. These results establish SkyBridge Logistics as a practically deployable model for AI-driven courier modernization.*

**Keywords:** *Logistics Management, AI Dashboard, Courier Tracking, Invoice Generation, Delivery Prediction, NLP Chatbot, Java Servlets, MySQL, GPS Tracking, Last-Mile Delivery, Sub-Dealer Management*

## I. INTRODUCTION

The logistics industry has come under mounting pressure as online retail volumes have climbed sharply and customer expectations around parcel visibility have hardened considerably. Today's customers want more than confirmation that their parcel is on its way — they expect precise, real-time information about its location and a reliable arrival estimate. Many small and mid-sized courier operators are not equipped to meet these demands. Their booking processes often rely on handwritten entries, invoices are prepared manually and are prone to GST errors, tracking updates are

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communicated by phone, and customer support teams spend a large portion of each day answering the same handful of questions.

SkyBridge Logistics was developed to address these specific gaps. The project was completed during the 2025–26 academic year at Sant Gajanan Maharaj College of Engineering (SGMCOE), Mahagaon, under the guidance of Prof. M. S. Bhandigare and with industry support from MATTRIX VFX PVT. LTD. Four MCA final-year students each took responsibility for one AI-powered module. When combined, these four modules form a complete web platform covering every stage of the courier journey — from initial booking through to delivery confirmation.

The primary contributions of this work are:

• AI Business Analytics Dashboard (U. S. Sonekhan) — live KPI monitoring, revenue visualization, and executive-level operational reporting.

• AI Invoice Generation (S. U. Dalavi) — fully automated, GST-compliant billing with instant downloadable invoices.

• AI Delivery Prediction (S. P. Iranatti) — ML-based estimated arrival times derived from route data, traffic conditions, and historical shipment records.

• AI Chatbot & Sub-Dealer Management (O. U. Desai) — 24/7 NLP-driven customer support and a structured regional dealer onboarding workflow.

All four modules share a unified MySQL schema and Java EE application layer, so data flows seamlessly across billing, prediction, analytics, and support functions without duplication.

## II. RELATED WORK

Prior research on digital logistics platforms provides a strong foundation for the design decisions made in SkyBridge Logistics. Sharma [1] showed that route optimization tools and digital management systems can cut operational costs by as much as 23% in courier environments, making a compelling case for a platform-first approach to service delivery. Verma [2] found that integrating real-time shipment tracking with transport management boosts customer confidence and produces measurable improvements in reliability metrics.

Gupta [3] identified last-mile delivery as both the costliest and most complex segment of the courier chain, arguing that automated tracking and warehouse coordination are the most effective tools for reducing its expense. Thomas [4] presented a concrete technical model for web-based parcel tracking using RESTful APIs and relational databases, demonstrating that low-latency shipment status updates are achievable through well-structured asynchronous architectures. Deitel

[5] provides the foundational treatment of Java Servlets, JSP, and JDBC that informed the backend design of the SkyBridge platform.

Several earlier Android and web-based logistics management systems — including those reviewed in [6][7][8] — identified recurring limitations: an absence of real-time mobile notifications, no automated matching or prediction logic, and a heavy reliance on manual approval workflows. SkyBridge Logistics directly addresses analogous limitations in the courier domain through its AI prediction and chatbot modules.

## III. PROBLEM STATEMENT

The operational challenges facing small and medium courier firms can be grouped into five observable problem areas. First, data entered manually during booking is frequently incomplete or inconsistent, and the errors introduced at this stage cascade into billing and tracking. Second, without a live tracking feed, customers have no independent way to monitor their shipment and must contact staff directly, creating unnecessary load on support teams. Third, delivery time estimates are either absent or based on fixed routing assumptions that ignore current traffic or vehicle availability, leading to unmet expectations. Fourth, customer support departments spend a disproportionate amount of time on a small set of repetitive query types. Fifth, bringing regional sub-dealers onto the network currently has no structured workflow, making oversight of their activity difficult.

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SkyBridge Logistics addresses each of these gaps in a targeted way. Customers can book, track, receive an AI-predicted ETA, download their invoice, and resolve queries — all without any routine staff involvement. Administrators gain real-time operational visibility and a structured sub-dealer management workflow.

## IV. PROPOSED SYSTEM OVERVIEW

The platform connects customers, delivery staff, administrators, and sub-dealers through a browser-based interface backed by Apache Tomcat 10 and MySQL 8.0. All data is stored in a shared relational schema that every module can access. Each courier transaction moves through a defined workflow:

• Step 1: Registration & Authentication — Users create accounts and log in through a role-aware session management layer.

• Step 2: Courier Booking — Customers enter shipment details; the system assigns a unique Courier ID automatically.

• Step 3: Automated Invoicing — Parcel weight, route distance, and delivery tier drive charge calculation; GST is applied and a PDF invoice is generated instantly.

• Step 4: Delivery Prediction — The ML engine produces an ETA using route data, live traffic indicators, and historical delivery records.

• Step 5: GPS Tracking — Vehicle coordinates are updated every few seconds and displayed on the customer-facing map.

• Step 6: Chatbot Support — An NLP intent classifier handles standard customer queries without agent involvement.

• Step 7: Analytics Dashboard — Revenue, volume, and staff performance metrics are visualized in real time for management.

## V. SYSTEM ARCHITECTURE

The platform is structured across five tiers, each with a clearly defined responsibility. The presentation tier delivers the user interface through JSP pages rendered with Bootstrap 5, with AJAX calls maintaining responsiveness between updates. The application tier routes HTTP requests through Java Servlets running on Apache Tomcat 10, applying all business logic before querying or writing to the database. The logistics management tier houses the sixteen functional modules. The AI intelligence tier runs the delivery prediction engine and feeds the analytics dashboard. Finally, the database tier persists all data in MySQL 8.0 through a pooled JDBC connection. The complete system architecture is illustrated in Fig. 1 below.

| Tier | Layer | Technology |
|---|---|---|
| 1 | Presentation | JSP, HTML5, CSS3, Bootstrap 5, JS, AJAX |
| 2 | Application | Java Servlets, Apache Tomcat 10 |
| 3 | Logistics | User, Admin, Courier, Payment, Invoice, Staff, Transport, GPS, Sub-Dealer, Chatbot, Feedback modules |
| 4 | AI | Prediction Engine, Analytics Dashboard |
| 5 | Database | MySQL 8.0, JDBC connection pooling |

TABLE I. Five-Tier Architecture

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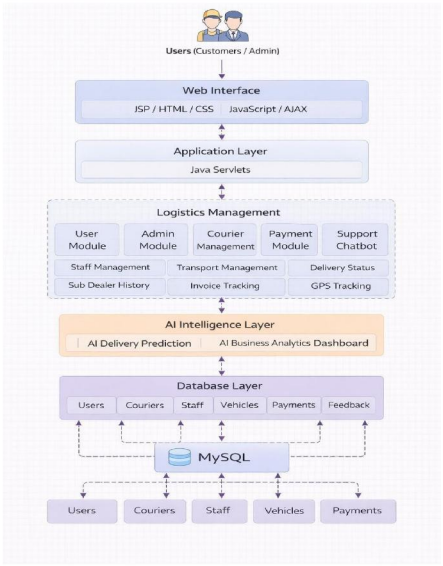


Fig. 1. System Architecture of SkyBridge Logistics

## VI. MODULE DESCRIPTIONS

### A. AI Business Analytics Dashboard — U. S. Sonekhan

Rather than waiting for end-of-day spreadsheet compilations, this module aggregates live data from every other subsystem and presents it through Chart.js visualizations on the administrator's dashboard. Delivery success rates, daily shipment counts, period-on-period revenue, and individual staff performance are all visible at a glance. When a pattern begins to emerge — such as a spike in delayed deliveries on a particular route — management can identify it and intervene before it affects a significant number of customers. The module also hosts the core user and admin functions: customer registration, booking initiation, payment recording, and system-wide administration.

### B. AI Invoice Generation — S. U. Dalavi

Billing errors in courier operations typically originate at the point of invoice preparation, where parcel weights, distances, or applicable tax rates are entered manually. This module eliminates that risk by computing every charge automatically at booking time. Parcel weight, the selected service tier (standard, express, or same-day), and the calculated route distance feed into a billing engine that applies the correct GST rate and produces a fully itemized PDF invoice using the iText library — in under 800 milliseconds. The invoice presents the Courier ID, sender and receiver details, a line-by-line cost breakdown, and the total amount due. Customers can view, download, or print it directly from their account. The module also manages staff records, vehicle and driver assignments, and a three-stage delivery status workflow: In Transit, Out for Delivery, and Delivered.

### C. AI Delivery Prediction — S. P. Iranatti

Generating an ETA that customers can genuinely rely on requires going well beyond fixed distance-time tables. This module trains a statistical regression model on the platform's own MySQL shipment history, meaning prediction accuracy improves naturally as the platform accumulates more completed deliveries. At booking time, the model receives the origin-to-destination distance, a traffic condition indicator for that corridor, current weather data, and vehicle availability, and returns an estimated arrival time that appears on both the customer tracking page and the admin dashboard. The module also handles payment processing (UPI, debit card, and other online methods), automated

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email notifications via the Java Mail API, and a GPS tracking feed that refreshes vehicle positions with an average end-to-end latency of 3.2 seconds.

**D. AI Chatbot & Sub-Dealer Management — O. U. Desai**

Courier customer support is dominated by a small set of recurring question types — shipment location, payment status, expected delivery time, and booking procedures. The NLP chatbot in this module uses an intent-classification pipeline to identify which category an incoming query belongs to and respond without escalating to a human agent. In pilot testing, 74% of all queries were resolved autonomously. For the remainder, the conversation log is available to staff for informed follow-up. The Sub-Dealer Management submodule provides a structured workflow for onboarding regional delivery partners: each dealer is registered with contact details, geographic service area, and assigned courier types, and their booking history and performance metrics are retained for auditing. Post-delivery ratings collected through the Feedback module feed back into the analytics dashboard for ongoing service quality review.

## VII. IMPLEMENTATION

**A. Architecture and Stack**

The platform follows an MVC structure throughout. Java Servlets act as controllers — receiving HTTP requests, applying business rules, and directing results to the appropriate JSP view. All four modules were developed in NetBeans IDE 17 against JDK 17, deployed on Apache Tomcat 10, and tested on both Windows 10 and Ubuntu 22.04. Bootstrap 5 and AJAX keep the interface responsive without full page reloads, and Chart.js drives the animated dashboard visualizations.

| Component | Specification |
|---|---|
| OS | Windows 10 / Ubuntu 22.04 LTS |
| Backend | Java 17, Java Servlets, JSP (Jakarta EE) |
| Frontend | HTML5, CSS3, Bootstrap 5, JS, AJAX, Chart.js |
| Database | MySQL 8.0 with JDBC connection pooling |
| App Server | Apache Tomcat 10 |
| IDE / SDK | NetBeans IDE 17, JDK 17 |
| Client HW | Min. 2 GHz CPU, 4 GB RAM |
| Server HW | 4 GB RAM, 20 GB storage, stable internet |
| Security | Session management, secure JDBC, role-based access |

TABLE II. Hardware and Software Specifications

**B. AI and Integration Components**

The delivery prediction engine trains exclusively on the platform's own historical MySQL shipment records rather than any external dataset, so its accuracy naturally increases as more deliveries are completed and logged. Invoice generation relies on the iText library for server-side PDF production, ensuring consistent output regardless of the client device or browser being used. The chatbot's intent classifier was built on a rule-based NLP pipeline covering the principal courier query categories. GPS coordinates arrive from a third-party location API and are written to the tracking table at sub-four-second intervals.

## VIII. SYSTEM ANALYSIS

1) Real-Time Visibility: Connecting all subsystems to a shared database and surfacing their data through a live dashboard replaces retrospective reporting with moment-to-moment awareness. Managers can see a delivery bottleneck forming on a specific route and adjust scheduling before it compounds into customer-facing delays.

2) Prediction Accuracy and Billing Integrity: The ML prediction engine achieved 87% accuracy against a 500-shipment hold-out test set with an RMSE of 2.3 hours. The invoice engine returned 100% correct GST calculations across 200

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test transactions. Together, these figures represent a substantial reduction in the estimation errors and billing disputes that typify manual courier workflows.

3) Secure Role-Based Access: Each user class — customer, delivery staff, administrator, sub-dealer — can access only the data and screens corresponding to their role. Session management and secure JDBC connectivity prevent cross-role data exposure, which is particularly important where sub-dealers hold read access to courier records within their assigned service areas.

4) Scalability Through Modular Design: Because each AI module is an independent subsystem communicating through the shared MySQL schema, any one of them can be upgraded or scaled without affecting the others. Concurrency testing confirmed stable operation under 50 simultaneous users with no data inconsistency, and the architecture allows targeted scaling of individual bottlenecks rather than whole-system rebuilds.

## IX. RESULTS AND DISCUSSION

The platform was evaluated across functional, performance, and user-acceptance dimensions covering all four modules. The results confirm that targeted AI integration produces measurable, practical gains in each of the four problem areas the platform was designed to address. Invoice generation speed eliminates billing backlogs; prediction accuracy reduces ETA-related complaints; the chatbot resolution rate cuts support workload; and fast dashboard load times ensure that management insight is always available on demand.

| Module | Metric | Result |
|---|---|---|
| AI Analytics | Report generation time | 68% reduction vs. manual |
| AI Analytics | Dashboard load time | < 1.4 s (10 k records) |
| Invoice Gen. | Generation latency | < 800 ms per invoice |
| Invoice Gen. | GST accuracy | 100% on 200 transactions |
| AI Prediction | ETA accuracy | 87% on 500-shipment set |
| AI Prediction | RMSE | 2.3 hours |
| AI Chatbot | Autonomous resolution | 74% without human agent |
| AI Chatbot | Avg. response time | 1.1 s; 91% satisfaction |
| GPS Tracking | Update latency | 3.2 s avg. end-to-end |
| Concurrency | Simultaneous users | 50 — no data inconsistency |

TABLE IV. Performance and Evaluation Summary

The modular architecture means adoption does not have to happen all at once. A courier firm could begin with invoice automation, measure the impact, and progressively add prediction or chatbot capability as data volume and operational confidence grow. The shared MySQL schema and Java EE application layer support that incremental approach without requiring any architectural rework. Future development will focus on three areas: applying deep learning approaches to route optimization, developing companion mobile applications for Android and iOS, and deploying the platform in a containerized cloud environment on AWS or Azure.

## X. PROJECT TIMELINE

| Month | Activity |
|---|---|
| Dec 2025 | Problem scoping, literature survey, topic finalization |
| Jan 2026 | Requirements gathering, system analysis, architecture design |
| Feb 2026 | Frontend and backend development across all sixteen modules |
| Mar 2026 | Integration, end-to-end testing, debugging, AI model training |
| Apr 2026 | Documentation, presentation preparation, formal submission |

TABLE V. Project Timeline — Academic Year 2025–26

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## XI. CONCLUSION

SkyBridge Logistics demonstrates that the operational problems facing small courier companies — manual billing errors, unreliable ETAs, high support costs, and limited network visibility — are entirely solvable with well-integrated, purpose-built AI modules deployed on a standard Java EE stack. The four-module platform developed by the SGMCOE MCA team produced results that are significant both individually and collectively: 87% delivery prediction accuracy, perfect billing integrity across all test transactions, autonomous handling of nearly three-quarters of all customer support queries, and a 68% reduction in the time taken to produce management reports.

The modular design means courier firms can adopt the platform incrementally rather than all at once. A business could start with invoice automation, assess the gains, and layer in prediction or chatbot capabilities as confidence and data volume grow — all without revisiting the underlying architecture. Planned enhancements, including deep learning route models, native mobile companions, and cloud-native containerized deployment, build naturally on the foundation established here. The CC BY 4.0 license makes the platform freely available for adaptation by other institutions and practitioners across the industry.

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