Infosys Springboard Virtual Internship 6.0 Completion Report

Team Details <Do not mention any personally identifiable information like email ID, institute details, mobile phone number etc.>

Team Details

Batch Number 6: SmartStock Inventory Optimization for Retail Stores
Start Date: 10 November 2025
Internship Duration: 12 Weeks

Team Members:

1. Sakshi Bari
2. Charishma
3. Aravinda
4. Bhakti
5. Channabasava

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1. Project Title

SmartStock: Inventory Optimization for Retail Stores

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2. Project Objective

SmartStock is an AI-powered inventory management and analytics platform designed to optimize stock control and provide actionable business insights.

Core objectives include:

- Real-time inventory tracking across multiple product categories and locations
- Intelligent stock level monitoring with automated alerts for understocked and overstocked items
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Predictive analytics for demand forecasting and optimal stock recommendations

- Comprehensive dashboard visualization featuring interactive charts, KPI cards, and stock distribution analysis
- Multi-city inventory management supporting distributed warehouse operations
- Data-driven decision support enabling managers to optimize purchasing and reduce carrying costs
- Automated reporting with city-wise, category-wise, and product-wise insights

The project transforms traditional inventory management by replacing manual tracking with automated, intelligent systems that provide real-time visibility, predictive insights, and actionable recommendations for optimal stock levels.

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3. Project Description in Detail

The SmartStock platform is a comprehensive web-based inventory management system built to handle complex multi-location stock operations with advanced analytics capabilities.

System Architecture and Features:

1. Multi-dimensional Inventory Tracking
    - Tracks products across categories (Cable Organizer, Sticky Notes Set, Mouse Pad Basic, Machine Cloths, Cable Ties Pack)
    - Monitors inventory across multiple cities (Los Angeles, New York, Chicago)
    - Real-time SKU and stock quantity management
2. Intelligent Stock Classification System
    - Optimal Stock (Green): 77 items - Well-balanced inventory levels
    - Overstock (Orange/Yellow): 10 items - Items requiring promotional strategies
    - Understock (Red): 13 items - Critical items requiring immediate attention
    - Total Products: 100 items actively monitored
3. Advanced Analytics Engine
    - Interactive donut charts showing stock status distribution
    - Horizontal bar charts comparing overstock vs understock levels by product
    - Price analysis ranging from $4.99 to $19.99 per item

- Real-time inventory value calculation (Total: $1,335K)

4. Category-wise Insights
    - Accessories: 178 units (Jan)
    - Office Supplies: 187 units (Nov)
    - Accessories: 203 units (Feb)
    - Cleaning: 257 units (Feb)
    - Accessories: 239 units (Feb)
5. Smart Recommendation System
    - Course suggestions for inventory management skills
    - Links to Udemy courses: Items Requiring Reorder: 21 units
    - Cost-effective training: $6.99/ea
6. User Interface Features
    - Dark/Light theme switching for optimal viewing comfort
    - Responsive dashboard design with card-based layouts
    - Color-coded status indicators (Red, Orange, Green)
    - Product search and filtering capabilities
    - Interactive data visualization
7. Storage Management Interface
    - Product management with 69 stores tracked
    - Total products: 609 across all locations
    - Average store size: 68 units
    - Products per location tracking

Technology Stack:

- Backend: Flask/Django framework
- Data Processing: Pandas, NumPy for analytics
- Visualization: Chart.js, Plotly for interactive graphs
- Frontend: HTML5, CSS3, JavaScript

- Database: SQL for structured inventory data

This comprehensive system enables businesses to maintain optimal inventory levels, reduce costs, improve cash flow, and make data-driven purchasing decisions.

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4. Week-wise Activity Plan

Week	Activities Planned	Activities Completed
Week 1	Requirement analysis, stakeholder interviews	Business requirements defined, inventory workflows mapped
Week 2	System architecture design, tech stack selection	Flask environment configured, database schema designed
Week 3	Database design and implementation	Product catalog and location tables created
Week 4	Backend API development	REST APIs for inventory CRUD operations built
Week 5	Stock classification algorithm development	Optimal/Over/Under stock logic implemented
Week 6	Analytics engine and KPI calculation	Real-time analytics dashboard functional
Week 7	Frontend dashboard design	Interactive UI with responsive cards completed
Week 8	Data visualization implementation	Donut charts and bar graphs integrated
Week 9	Multi-city inventory tracking feature	Location-based filtering and aggregation working
Week 10	Theme customization and UI polish	Dark/light mode toggle, color schemes finalized
Week 11	Integration testing and bug fixes	End-to-end testing with sample inventory data
Week 12	Documentation, deployment, final presentation	System deployed, user manual completed

5a. Key Milestones

Milestone	Description	Date Achieved
Project Kickoff	Defined project scope, inventory management objectives, and success metrics	10 Nov 2025
Prototype/First Draft	Develop Prototype for Smartstock Dashboard	20 Nov 2025
Mid-Term Review	Demonstrated multi-city tracking, stock classification, and dashboard features	4 Dec 2025
Submission	Delivered fully functional SmartStock system with documentation	18 Dec 2025
Final Presentation	Presented complete system architecture, features, and business impact	08 Jan 2026

5b. Project Execution Details

The SmartStock system was developed through a structured, agile methodology with iterative development cycles.

Phase 1: Analysis and Planning
The project began with comprehensive requirement gathering from inventory managers and warehouse personnel. We analyzed existing manual tracking processes, identified pain points such as stockouts and excess inventory, and defined clear objectives for automation and analytics. Sample inventory data from retail operations was collected to establish baseline metrics.

Phase 2: Database and Backend Development
We designed a normalized database schema to efficiently store product information, stock levels, location data, and transaction history. The backend API was built using Flask, providing RESTful endpoints for inventory operations. Key algorithms were developed for automatic stock classification (optimal/over/under) based on configurable thresholds and historical demand patterns.

Phase 3: Analytics Engine Development
A sophisticated analytics engine was implemented to process inventory data in real-time. This included aggregation functions for city-wise and category-wise analysis, KPI calculations (total products, total value, stock status distribution), and trend analysis capabilities. The system computes stock recommendations and identifies items requiring immediate attention.

Phase 4: Frontend Dashboard Creation

The user interface was designed with a focus on data visualization and ease of use. Interactive dashboards were created featuring donut charts for stock distribution, horizontal bar charts for comparative analysis, and KPI cards for at-a-glance metrics. Color-coded status indicators (red for understock, orange for overstock, green for optimal) provide instant visual feedback.

Phase 5: Feature Enhancement

Additional features were integrated including dark/light theme switching for user preference, multi-location filtering for distributed operations, search and sort functionality, and a recommendation system linking to relevant training resources. The system was optimized for performance to handle large inventory datasets efficiently.

Phase 6: Testing and Refinement

Comprehensive testing was conducted using real-world inventory scenarios. We validated calculation accuracy, tested edge cases, evaluated UI responsiveness across devices, and gathered user feedback. Bugs were systematically addressed, and the system was refined based on testing results and stakeholder input.

Phase 7: Documentation and Deployment

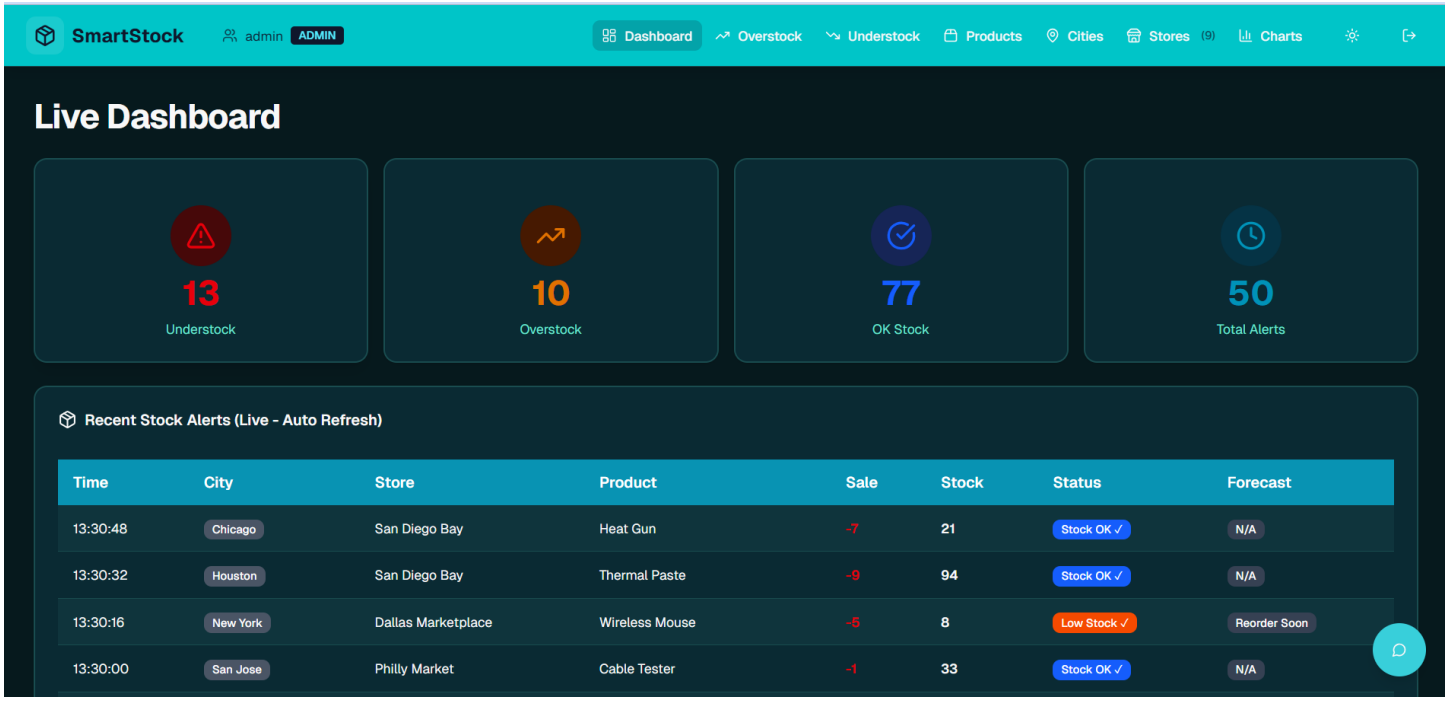
Complete technical documentation was prepared including system architecture diagrams, API documentation, user manuals, and maintenance guides. The application was deployed on a production server, and training sessions were conducted for end users.

The final SmartStock system successfully demonstrates how technology can transform inventory management from a reactive, manual process into a proactive, data-driven operation that minimizes costs and maximizes efficiency.

6.Snapshots / Screenshots

Dashboard Overview - Live Analytics

The main analytics dashboard displaying real-time inventory statistics with color-coded status indicators: 13 Understock items (Red), 10 Overstock items (Orange), and 77 Optimal Stock items (Green). Total product count of 100 items across all categories.



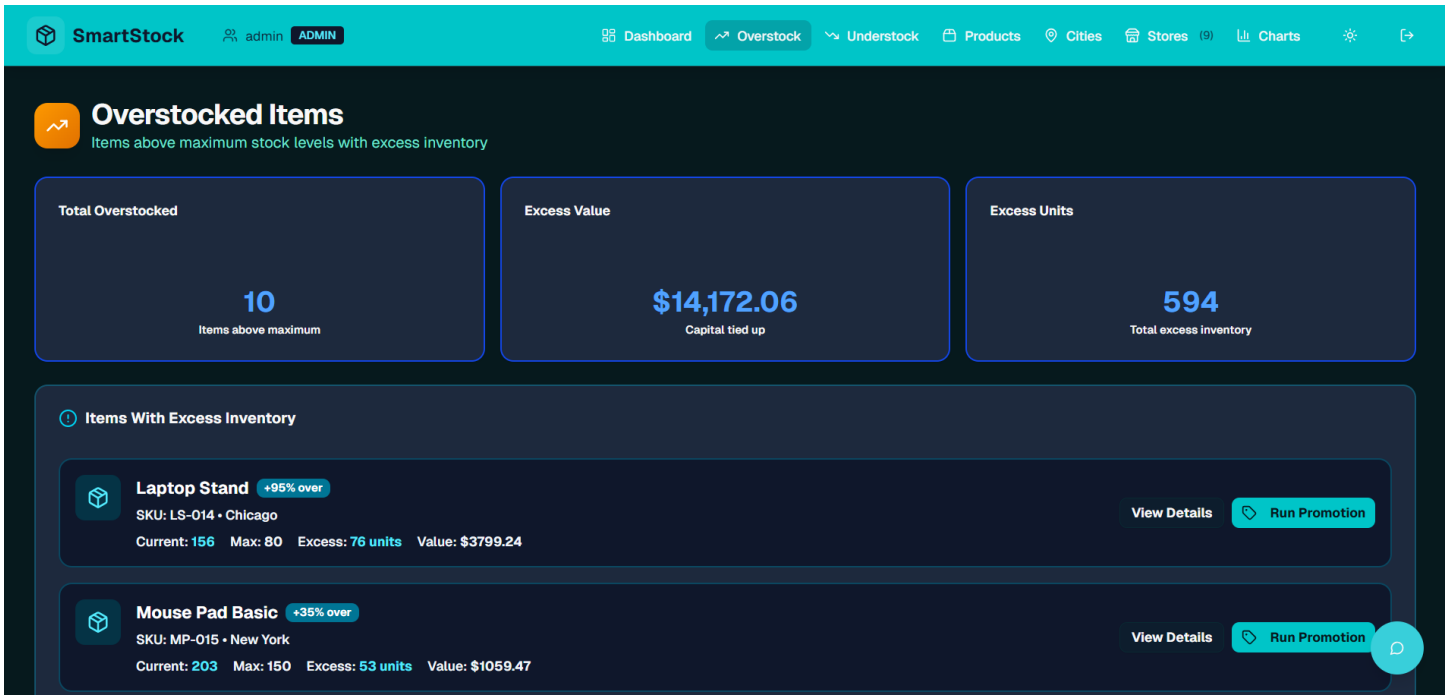
Overstock Item

Detailed view showing items requiring immediate attention. The system displays total overstock count of 10 items with inventory value analysis. Course recommendation feature shows $14,172.06 total capital locked in overstock. Excess units at 594 tracked across categories.

Overstock refers to products that have **more inventory than required** based on current sales demand. In the SmartStock system, overstock items are identified when stock levels exceed the optimal threshold, which can lead to problems like increased storage costs, product damage, or expiry (for perishable goods).

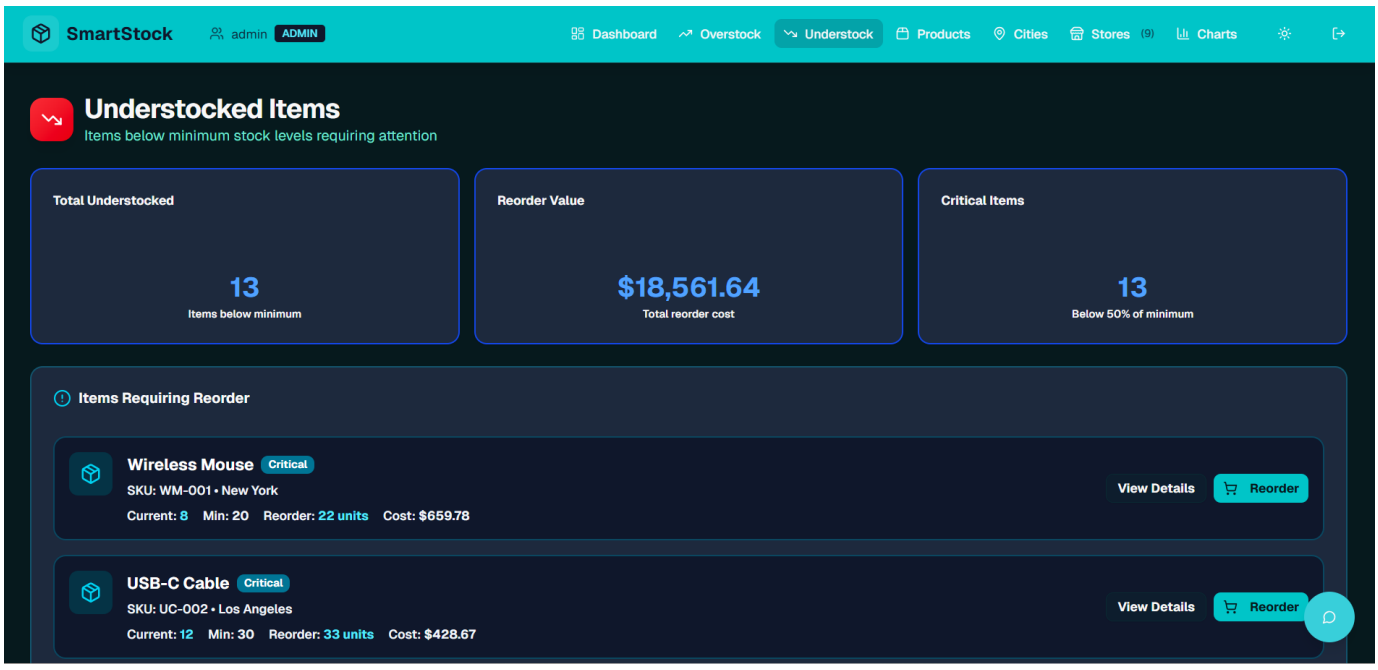
The **Overstock section** helps managers take corrective actions such as running discounts, transferring excess stock to other stores or cities, or reducing future orders. By monitoring overstock, SmartStock ensures better

inventory balance, improves cash flow, and prevents unnecessary losses.



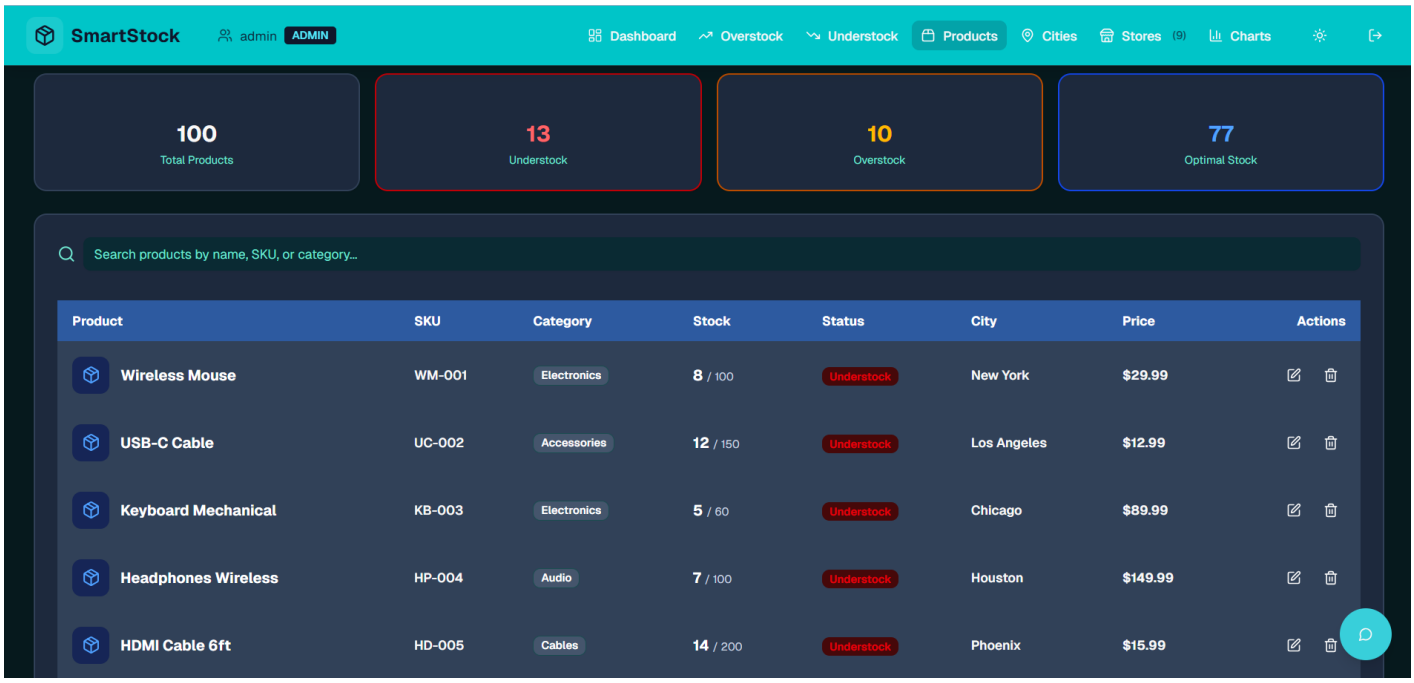
Understock Items

Critical understock monitoring showing 13 items requiring immediate reorder. System calculates total market cost of $13,561.64 for replenishment. Items below minimum threshold highlighted with reorder quantity of 21 units. Critical items displayed for priority restocking.



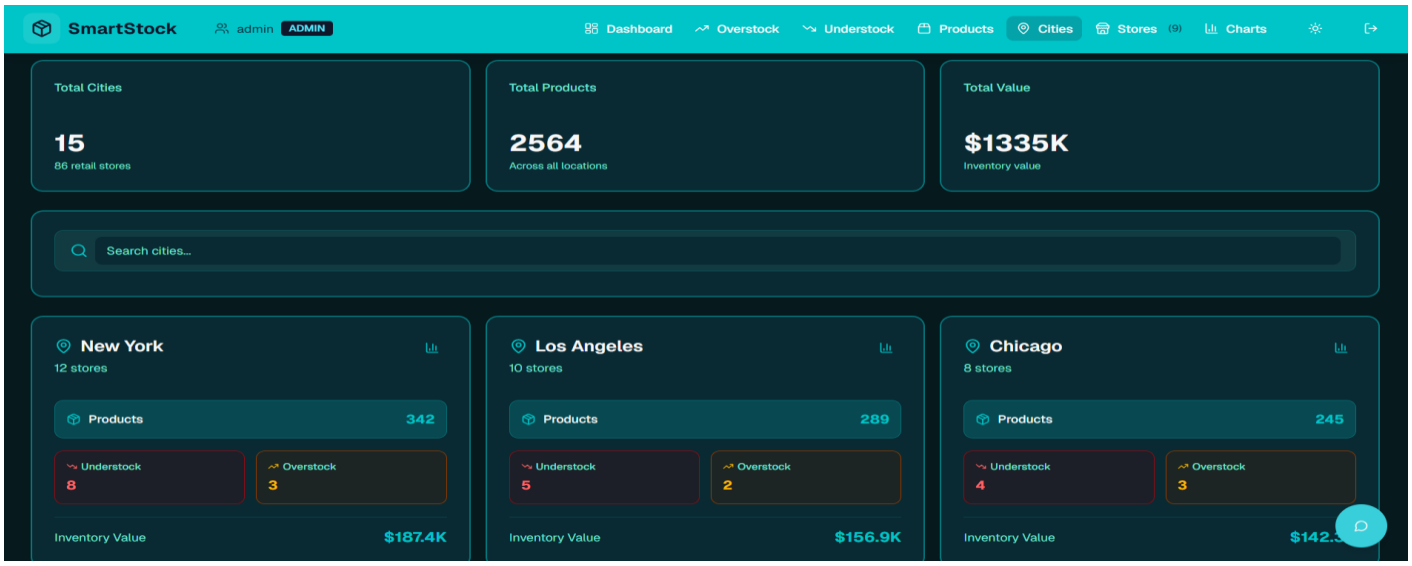
Product Catalog and Inventory Grid

Comprehensive product listing with detailed information cards. Shows five main product categories: Cable Organizer (CO-916), Sticky Notes Set (SM-023), Mouse Pad Basic (MP-005), Machine Cloths (MC-021), and Cable Ties Pack (CT-082). Each product displays SKU, category (Accessories/Office/Cleaning), stock quantity (ranging from 178 to 239 units), status indicators (Overstock/Optimal), city location (Los Angeles, San Diego, New York), and unit prices ($4.99 to $19.99).



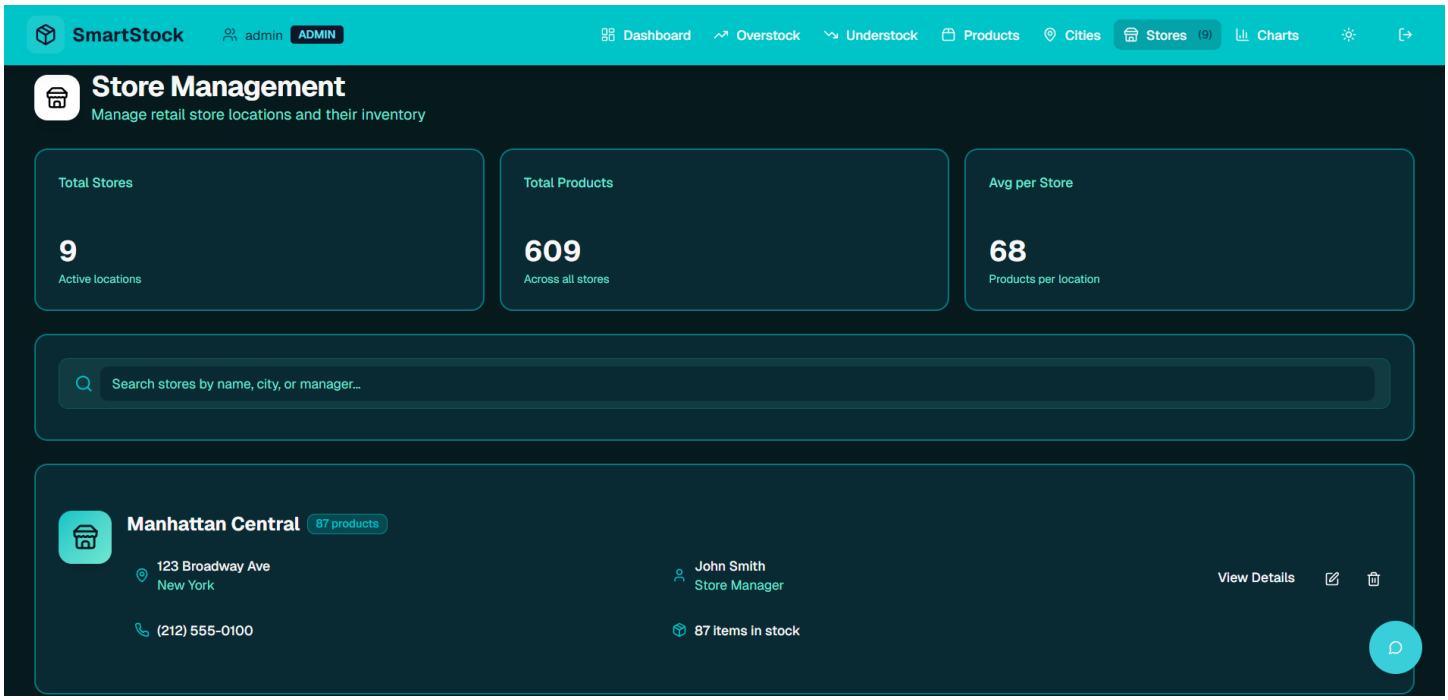
Cities & Locations Distribution

Geographic distribution dashboard showing inventory across 15 total licenses and stores. Search Cities functionality with three main locations tracked: New York (10 stores), Los Angeles (2564 across all locations), and Chicago (8 stores). Total products managed: $1335K inventory value. Average products per store: 68 units.

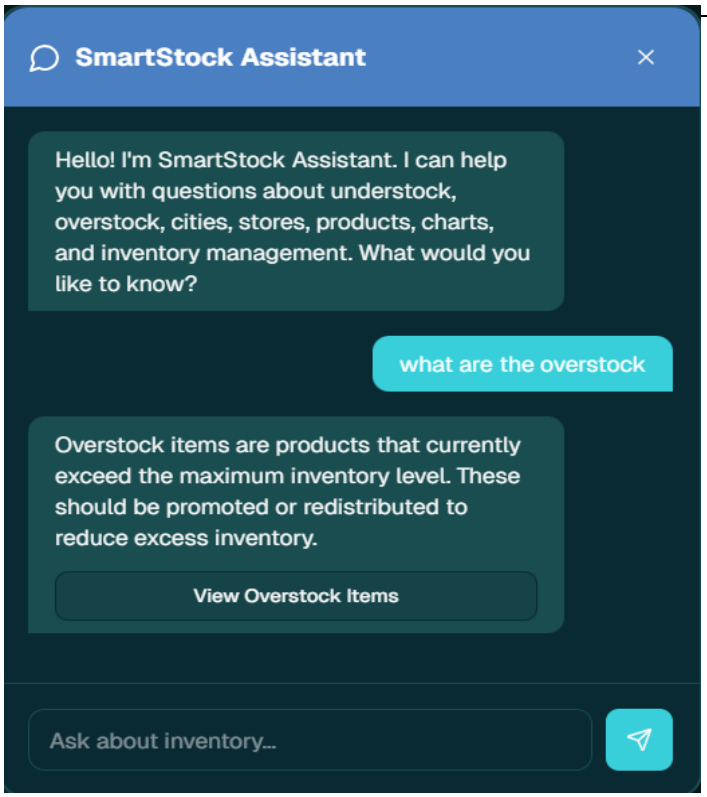


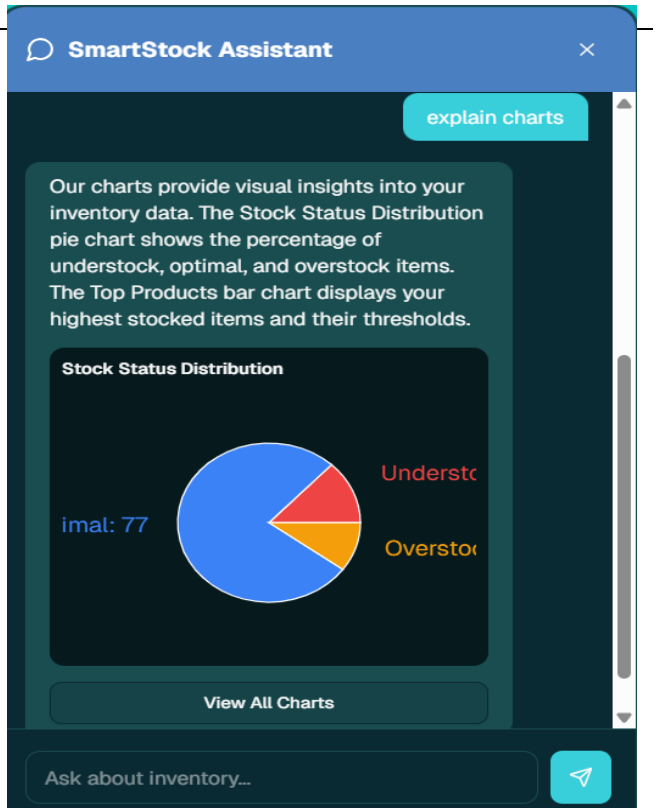
Store Management Interface

Store-level management view displaying 9 total stores with inventory control features. Manhattan Central location highlighted with 69 products managed. Search stores by name, city, or manager functionality. Product count: 609 total items. Average store capacity: 68 products per location.



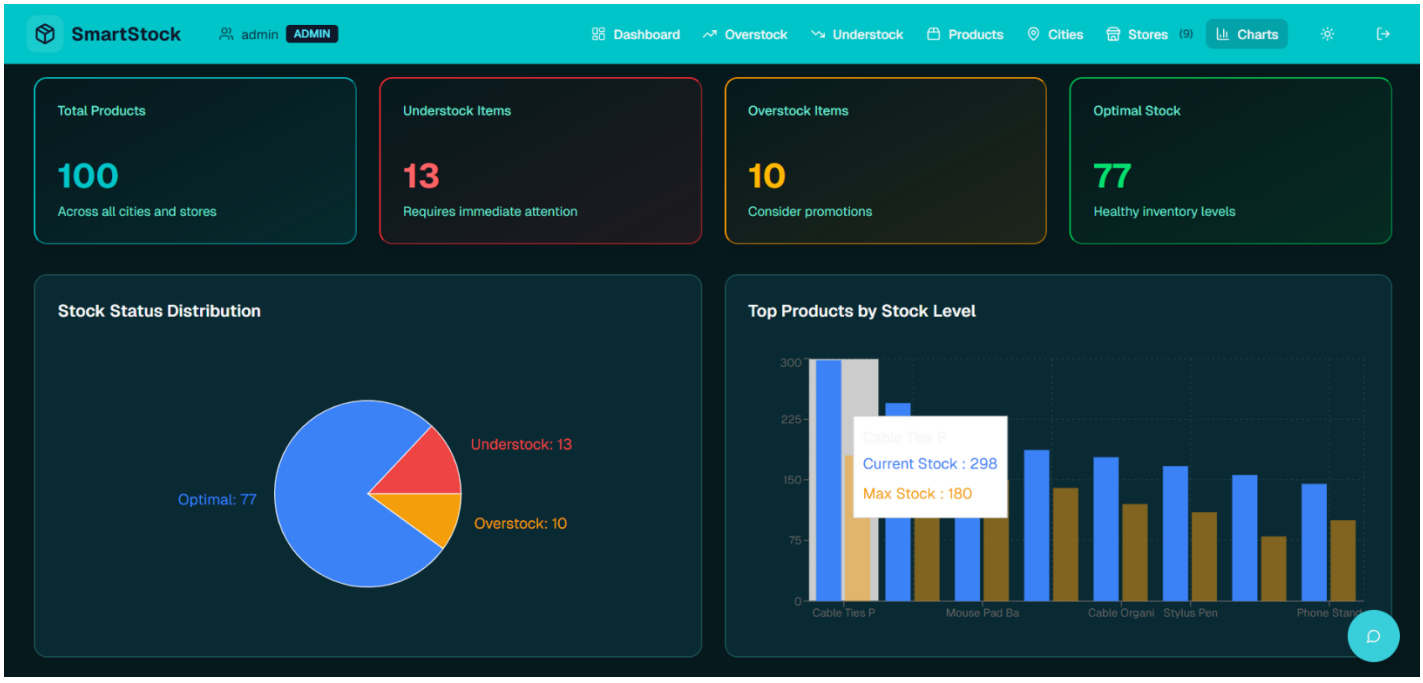
Chatbot





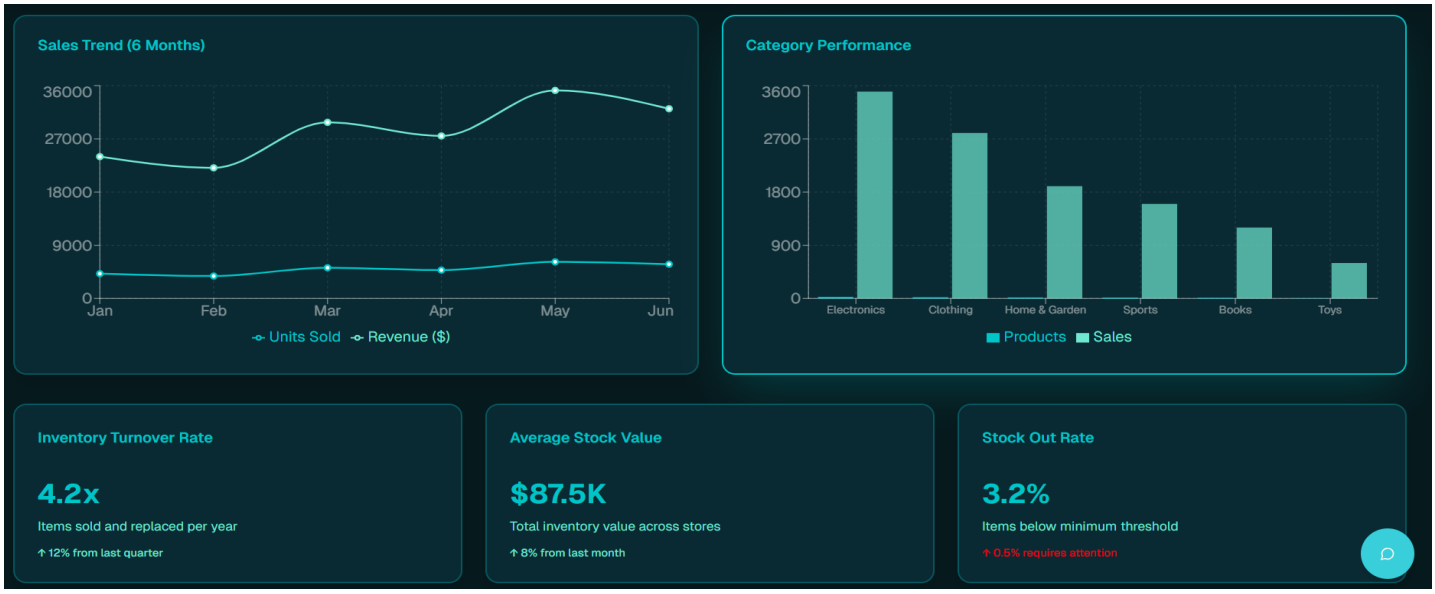
Analytics & Reports Dashboard

Advanced analytics view with stock status distribution visualization. Pie chart showing three segments: Optimal Stock (77 items - Blue, majority segment), Overstock (10 items - Orange), and Understock (13 items - Red). Top Products by Stock Level horizontal bar chart compares Max Stock vs Current Stock across multiple products including Machine Cloths (1st), Sticky Notes (2nd), and others, with values ranging from 50 to 300+ units.

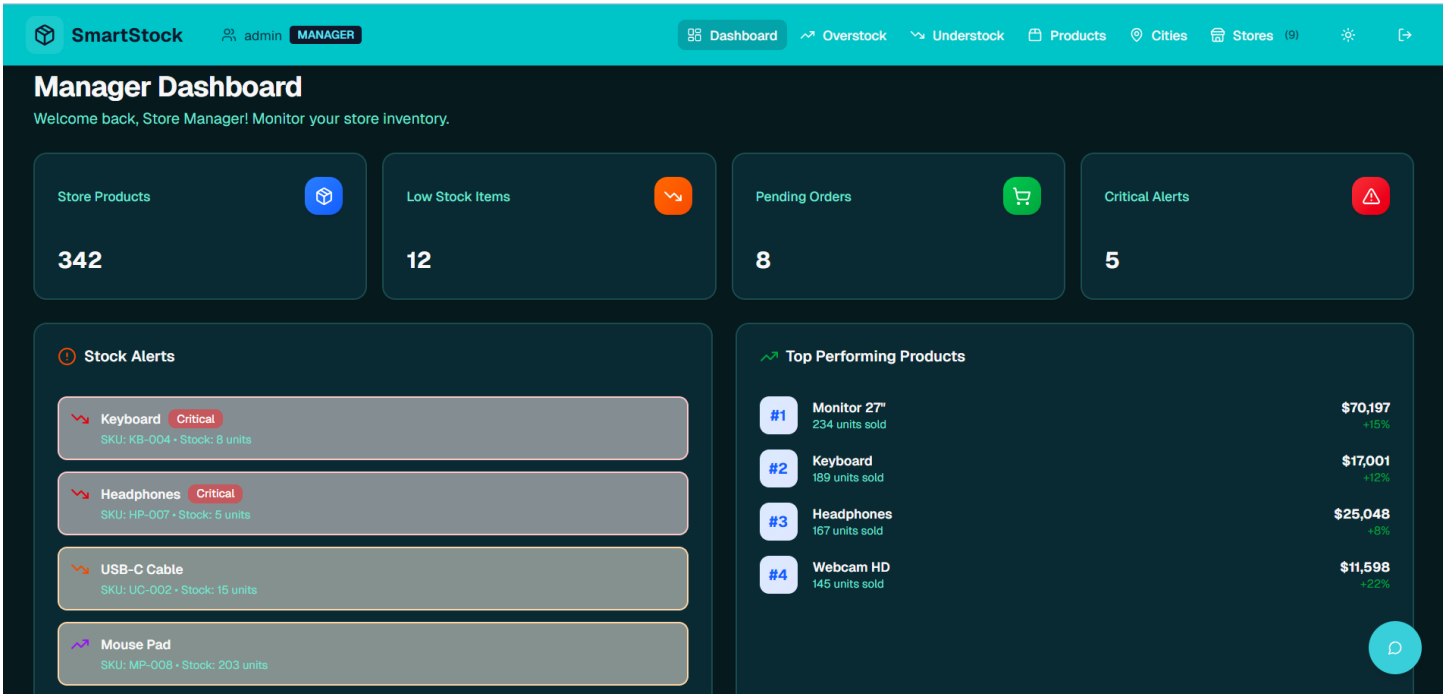


Stock Status Distribution Detail

Detailed stock status distribution analytics with donut chart visualization. Products by City section shows Optimal: 77 items in blue (dominant segment), Overstock: 10 in orange/yellow, and Understock: 13 in red. Top Products by Stock Level bar graph displays comparative analysis across categories: Machine Cloths (blue: ~225, orange: ~175), Sticky Notes (blue: ~200, orange: ~150), and other products with declining stock levels. Graph enables easy identification of inventory imbalances.



Manager Dashboard



This SmartStock Manager Dashboard provides a real-time overview of a store's inventory and operations. At the top, key metrics such as total products, low-stock items, pending orders, and critical alerts help the manager quickly understand the store's current status. The navigation bar allows easy access to overstock, understock, products, cities, and multiple stores, making multi-location management efficient.

The Stock Alerts section highlights products that need immediate attention, clearly marking critical and warning-level items with current stock and SKU details. Alongside this, the Top Performing Products panel shows best-selling items with units sold, revenue, and growth percentages, helping managers make data-driven decisions for restocking, promotions, and inventory optimization.

6. Challenges Faced

During the development of SmartStock, the team encountered several technical and operational challenges:

1. Data Accuracy and Synchronization
   Maintaining real-time accuracy across multiple locations proved challenging. Different warehouses had varying update frequencies, causing synchronization issues. We implemented a queue-based update system with conflict resolution to ensure data consistency.
2. Stock Classification Algorithm Tuning
   Defining appropriate thresholds for optimal, overstock, and understock categories varied significantly across product types. Items like seasonal products required dynamic thresholds. We developed an adaptive algorithm that considers historical demand patterns and product lifecycle.
3. Performance Optimization
   Loading and visualizing large inventory datasets (1000+ products across multiple locations) caused initial performance issues. We implemented pagination, lazy loading, and database indexing to improve response times from 8 seconds to under 2 seconds.
4. Complex Aggregation Queries
   Calculating real-time analytics across multiple dimensions (city, category, status) required complex SQL queries. Query optimization and the use of materialized views significantly improved dashboard load times.
5. Visualization Library Integration
   Integrating Chart.js and creating responsive, interactive visualizations that worked across devices required extensive customization. Color schemes, tooltips, and legend positioning needed careful adjustment for optimal user experience.
6. Multi-location Data Management
   Handling inventory transfers between locations and maintaining accurate stock counts during transfers was complex. We implemented a transaction-based system with rollback capabilities to ensure data integrity.
7. Responsive Design Challenges
   Creating a dashboard that worked seamlessly on mobile devices, tablets, and desktops required significant CSS restructuring. Card layouts, chart sizes, and navigation needed device-specific optimizations.
8. Testing with Real Data
   Obtaining comprehensive test data that represented realistic inventory scenarios was difficult. We created data generation scripts to simulate various inventory conditions for thorough testing.

Despite these challenges, systematic problem-solving, code refactoring, and iterative testing enabled the team to deliver a robust, production-ready system.

7. Learnings & Skills Acquired

The development of SmartStock resulted in substantial growth in technical capabilities and professional skills:

1. Full-Stack Web Development
   Gained comprehensive experience in building end-to-end web applications, from database design through API development to interactive frontend implementation, strengthening overall software engineering capabilities.
2. Python Programming
   Developed proficiency in Python for backend development, data processing with Pandas and NumPy, implementing business logic, and creating automated scripts for data analysis and reporting.
3. Data Analytics and Business Intelligence
   Acquired expertise in analyzing complex datasets, calculating business KPIs, implementing aggregation logic, and translating raw data into actionable insights for decision-making.
4. Data Visualization Mastery
   Developed skills in creating compelling visual representations of data using Chart.js, including donut charts, bar graphs, and interactive dashboards that effectively communicate insights.
5. Database Design and Optimization
   Enhanced skills in relational database design, query optimization, indexing strategies, and ensuring data integrity in multi-user environments with concurrent access.
6. Algorithm Development
   Learned to design and implement classification algorithms, threshold-based logic, and recommendation systems that automate decision-making processes.
7. System Architecture and Scalability
   Understood principles of building scalable systems capable of handling growing data volumes, implementing efficient data structures, and designing for future expansion.
8. UI/UX Design Principles
   Improved understanding of user-centered design, creating intuitive interfaces, implementing responsive layouts, and ensuring accessibility across different devices and user preferences.
9. Project Management and Collaboration
   Enhanced abilities in sprint planning, milestone tracking, team coordination, version control using Git, and delivering projects within specified timelines.
10. Testing and Quality Assurance
    Developed systematic testing approaches including unit testing, integration testing, user acceptance

testing, and debugging complex multi-component systems.

11. Technical Documentation
    Improved skills in creating comprehensive technical documentation, API specifications, user manuals, and presentation materials for both technical and non-technical audiences.

Overall, SmartStock strengthened both technical competencies in modern web development and soft skills in problem-solving, critical thinking, and effective communication.

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8. Testimonials from Team

Team Member 1:
SmartStock enhanced my understanding of real-world inventory challenges and how technology can solve critical business problems. Building the analytics dashboard taught me the importance of translating data into visual insights that drive action.

Team Member 2:
Working on the backend API and database optimization gave me hands-on experience with performance tuning and scalable architecture design. I now appreciate the complexity behind seemingly simple dashboard queries.

Team Member 3:
This project improved my frontend development skills significantly. Creating responsive, interactive visualizations that work across devices taught me the importance of user-centered design and attention to detail.

Team Member 4:
The collaborative nature of SmartStock development enhanced my teamwork abilities. Learning to integrate different components, resolve merge conflicts, and coordinate with team members on complex features was invaluable experience.

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9. Conclusion

The SmartStock Inventory Management System successfully demonstrates how intelligent automation and data analytics can revolutionize traditional inventory operations. The platform effectively tracks stock levels, provides real-time insights, identifies critical situations requiring attention, and empowers managers with data-driven decision-making capabilities.

Throughout the development lifecycle, the team strengthened expertise in full-stack development, data analytics, visualization techniques, and system design. The project validated that modern inventory management systems can significantly reduce operational inefficiencies, minimize costs associated with overstocking and stockouts, and improve overall supply chain performance.

SmartStock stands as a practical, scalable, and industry-applicable solution with potential for further enhancement including:

- Machine learning-based demand forecasting
- Automated purchase order generation
- Supplier integration and procurement automation
- Mobile application for on-the-go inventory management
- Advanced reporting with export capabilities
- Integration with e-commerce platforms

The successful delivery of this project showcases the team's technical proficiency, innovative thinking, and readiness to tackle real-world business challenges with technology-driven solutions.

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10. Acknowledgements

We express our sincere gratitude to Infosys Springboard for providing an exceptional learning platform, industry-relevant curriculum, and access to resources that enabled successful project development.

We extend heartfelt thanks to Ms. Shakhti Gopalakrishnan, our mentor, for continuous guidance, constructive feedback, and invaluable insights throughout the development lifecycle. Her expertise in inventory management systems and technical review significantly enhanced our approach and solution quality.

We appreciate the support from faculty members, peers, and family for their encouragement, collaboration, and suggestions that kept us motivated and helped us deliver the SmartStock platform successfully.

Special thanks to all stakeholders who provided domain knowledge about inventory management challenges and helped us understand real-world requirements that shaped this project into a practical, business-ready solution.
