**Business Proposal for Sainsmary’s**

***Smart Retail Operations and Customer Shopping Platform***

**Prepared by:** Aninda Roy  
**Date:** July 15, 2025

**1. Executive Summary**

Sainsmary’s is a full-featured smart retail platform designed to simulate the real-time operations of a modern supermarket, combining the digital convenience of online shopping with the operational complexities of physical retail. The system facilitates everything from item discovery based on precise aisle and shelf locations, to automated online ordering, delivery management, and role-based back-office operations.

The system is divided across five distinct user roles, Customer, Online Manager, Trading Manager, Store Manager, and Admin, each with specific responsibilities and dedicated dashboards. Sainsmary’s handles time-sensitive delivery scheduling, automated stock reductions based on physical in-store sales, age-restricted product compliance using local OCR, and scheduled as well as real-time notifications based on user role and shift.

Technologically, the platform uses Java Spring Boot for backend logic and API services, React.js with Tailwind CSS for an intuitive frontend experience, and MySQL for data persistence. Security is enforced using JWT for authentication, alongside optional social login (OAuth2 via Google and Facebook). Email receipts are sent to customers via Gmail SMTP integration, while in-app notifications keep managers informed throughout the day.

From multithreaded physical sales simulations to live inventory threshold alerts, Sainsmary’s is more than a simple supermarket system, it is an end-to-end operational platform that mirrors the real logistics, customer experience, and staffing requirements of a national retail chain.

**2. Project Objectives**

The development of Sainsmary’s began with a question: what if a retail system could handle not just e-commerce, but every in-store and behind-the-scenes operation as well? What if a single platform could simulate not only how customers buy, but how managers replenish, monitor, and operate a store in real-time?

The goal of this project is to realize that idea, by creating a comprehensive, modular, and intelligent system that models a real supermarket’s digital and physical workflows with functional accuracy. Sainsmary’s is not just a website where customers buy groceries. It’s a working replica of an entire retail operation.

At its core, Sainsmary’s is built to serve both **customers** and **staff**.

Customers are empowered with tools that enhance their shopping experience. For in-store customers, the system acts as a digital assistant. It helps locate products precisely by offering detailed location data like aisle number, row side (Left or Right), bay, shelf, and item position. For example, a customer searching for semi-skimmed milk might see a location like *31 R10 C3*, indicating Aisle 31, Right side, Bay 10, Shelf C, and the third product from the left. This functionality reflects the same granular organization used in major supermarkets.

For online customers, Sainsmary’s offers a streamlined checkout system and smart delivery slots. Orders placed before 1 PM are eligible for same-day delivery, while those after the cutoff are processed for next-day fulfillment. Customers are kept informed through real-time order tracking and email confirmation receipts.

To ensure compliance with the sale of age-restricted items like alcohol or cigarettes, customers are required to upload an image of a valid government-issued ID. The system uses local OCR (Tesseract) to automatically extract the date of birth, verify if the customer is 18+, and either approve or block the order accordingly, without requiring manual checks. This protects both the store and the customer from any legal violations, while reducing human workload.

The system goes a step further with its **physical sales simulation**. Using Java’s multithreading capabilities, Sainsmary’s includes a scheduled background process that mimics customer behavior inside the physical store. Every 3 minutes during operational hours (7 AM to 11 PM on weekdays, 11 AM to 5 PM on Sundays), the system simulates purchases across all product categories. This reduces stock levels in real-time, generates artificial footfall data, and affects the same inventory pool used by online orders. In doing so, it creates a more realistic view of store activity and supports automatic alerting when items go below a certain threshold.

This brings us to the staff.

The **Trading Manager** plays a critical role in inventory control. Whenever product counts drop below a predefined limit, they receive immediate in-app alerts and can mark products as unavailable or restock them as needed. They are also responsible for defining product locations and managing updates to aisle or shelf organization.

**Online Managers** focus exclusively on order fulfillment and customer validation. Their dashboards populate automatically twice per day, at 4 AM for next-day orders and 1 PM for same-day orders. They review each order, confirm payment success or failure, check age verification results, and mark deliveries as completed. Once marked, customers are notified instantly via email and dashboard status updates.

**Store Managers** oversee everything. They generate PDF and CSV reports, manage discount campaigns, and reassign shift roles. Their dashboard offers visibility into both Trading and Online operations, with full access to reporting metrics across all departments.

Finally, the **Admin** role exists as a failsafe. With full system-wide permissions, the Admin can override any part of the application, reset roles, manage permissions, or recover from failed processes. This ensures the system is always manageable, even if individual roles are compromised or unavailable.

In short, the objectives of Sainsmary’s are not limited to customer-facing improvements. They aim to replicate the entire lifecycle of a supermarket’s operations, from customer need to store supply, while making the system modular, scalable, and technically robust for long-term deployment and portfolio demonstration.

**3. System Users and Access Roles**

Sainsmary’s supports five distinct user types, each assigned specific responsibilities and permissions within the system.

Customers interact with the platform to shop online, find in-store item locations, upload identification for restricted items, and receive email confirmations of their orders. Their interface is clean, intuitive, and built for fast search and checkout.

Online Managers oversee all online activity. Twice daily, their dashboards populate with scheduled orders. They validate payments, confirm or cancel deliveries, and verify uploaded ID documents using automated OCR checks. Once orders are marked as delivered, they are archived and moved to reporting.

Trading Managers handle physical stock. They receive real-time in-app alerts when product quantities fall below threshold and are tasked with updating item availability, modifying aisle locations, and replenishing stock. They can also mark items temporarily unavailable.

Store Managers act as senior operators. They view all reports, sales, stock, delivery, discount, age-verification logs, and export them as CSV or PDF. They are responsible for managing discounts, promotions, and shift assignments for other managers.

Admins have superuser access. This role is used only when full system intervention is needed. Admins can manage user accounts, override permissions, reset passwords, perform backups, and control emergency-level operations.

**4. Key System Features**

**4.1 Customer Experience**

* Search product by name or category
* View exact in-store location using hierarchy:  
  **Aisle → Row → Bay → Shelf** (e.g., *31 R10 C3*)
* Place orders with time-based delivery logic:
  + Before 1 PM → same-day delivery
  + After 1 PM → next-day delivery
* Upload ID for 18+ products (alcohol, cigarettes)
* Track orders and receive receipts by email

**4.2 Manager Dashboards**

* **Online Manager**:
  + View all orders
  + Verify ID (OCR auto-check)
  + Confirm deliveries
  + View daily reports at 4 AM and 1 PM
  + Handle failed transactions
* **Trading Manager**:
  + Modify product locations and availability
  + Receive real-time alerts when stock drops below threshold
  + Update stock at midnight based on replenishment
  + Access trading-specific reports in CSV or PDF
* **Store Manager**:
  + Access and export all reports
  + Assign discount campaigns
  + Set or adjust manager shift schedules
  + View multithreaded simulation logs and analytics

**4.3 Physical Sales Simulation**

* Uses Java multithreading to mimic in-store purchases
* Runs every **3 minutes** between:
  + **7AM to 11PM** on weekdays
  + **11AM to 5PM** on Sundays
* Randomly reduces stock for all items
* Generates statistics: number of customers, quantity sold, revenue
* Combines with online orders to evaluate real-time stock status

**4.4 Age Verification with OCR**

* Customers upload one photo of an ID
* Tesseract OCR extracts DOB from the image
* System checks age >= 18 automatically
* Fails gracefully and blocks restricted items if criteria not met
* No manual verification needed by staff

**4.5 Notification System**

* **Scheduled Notifications:**
  + 4 AM: Online Manager receives all orders for next-day delivery
  + 1 PM: Online Manager receives orders for same-day dispatch
  + 12 AM: Trading Manager receives stock delivery alerts
* **Real-time Notification:**
  + Trading Manager receives in-app alerts when product count < threshold
* Managers receive only in-app notifications, **not emails**

**4.6 Reporting**

* **CSV** for numeric reports:
  + Sales summaries
  + Inventory levels
  + In-store simulation stats
* **PDF** for detailed reports:
  + Product history and audit logs
  + Age verification record
  + Discount impact analysis

**Reports by Role**

Reports are auto-routed to the appropriate format and downloadable via dashboard.  
Online and Trading Managers receive role-specific reports. Store Managers receive all report types, and formats (CSV or PDF) are auto-assigned depending on the content type.

**5. Technical Overview**

* **Backend:** Spring Boot, Spring Security, JWT, OAuth2
* **Frontend:** React.js, Tailwind CSS
* **Database:** MySQL (local)
* **OCR:** Tesseract (local, offline)
* **Authentication:** JWT + Google/Facebook login
* **Email:** Gmail SMTP for customer receipts
* **Scheduling:** Java multithreading for physical sale simulation
* **Notifications:** In-app only, based on user role and time logic
* **Storage:** Local filesystem for ID uploads
* **Reports:** CSV for numerical summaries, PDF for detailed logs

**6. Benefits**

Sainsmary’s provides a realistic simulation of modern supermarket operations, from physical shelf mapping to dynamic inventory management. Its use of multithreaded simulations allows automated tracking of in-store sales, while OCR ensures seamless age verification without manual checks.

Shift-based notifications improve operational coordination, delivering timely updates to relevant managers based on their assigned roles. The system’s inventory logic and threshold alerts reflect real retail practices, enhancing accuracy and responsiveness.

Designed with scalability and modularity in mind, Sainsmary’s is recruiter-friendly, production-ready, and ideal for demonstrating both technical expertise and real-world business logic in action.

**7. Future Enhancements**

Looking ahead, Sainsmary’s has strong potential for further expansion and deeper integration of modern technologies. One of the planned enhancements is the development of a real-time React dashboard for managers using WebSockets. This would allow shift supervisors and store managers to receive live updates on stock levels, orders, and alerts without needing to refresh their screens or rely on scheduled notifications.

Another promising enhancement is the integration of a supplier-side inventory synchronization API. This would allow the system to communicate directly with suppliers to track deliveries, manage lead times, and even automate reordering when product levels fall below a certain threshold.

The platform also has the potential to incorporate AI-based sales forecasting. By analyzing seasonal trends and historical data, the system could predict product demand, suggest stock adjustments, and assist managers in preparing for high-volume periods like holidays or promotions.

Customer engagement could be further improved by introducing a loyalty system. This would reward repeat purchases with points or discounts, encouraging retention and increasing user satisfaction.

Finally, the addition of barcode scanner integration for mobile devices would allow in-store customers to scan products using their phones for instant price checks, nutritional info, or location guidance, bridging the physical and digital experiences even more seamlessly.

These future plans ensure that Sainsmary’s is not only ready for today’s challenges, but well-prepared to evolve into a truly intelligent and scalable retail management platform.

**10. Conclusion**

Sainsmary’s is a complete and professionally structured system that mirrors the logistics, customer engagement, and operational workflows of a major retail chain. From stock monitoring and digital ordering to age compliance and managerial automation, it encapsulates every important aspect of running a supermarket at scale.

Technically, it demonstrates proficiency in backend system design, frontend UI/UX practices, asynchronous programming (multithreading), OCR integration, authentication systems, and data management. Functionally, it provides a full-scale simulation of how modern supermarkets run behind the scenes.

Whether presented as a portfolio project or deployed for internal use, Sainsmary’s is a model of operational intelligence and technical competence, built with the future of retail in mind.