

# Merchant AI – Realtime E-Commerce Analytics Expert

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**ABSTRACT:** The increasing popularity of Ecommerce has happened at an incredible pace and it is still overwhelming many online merchants who are frequently attempting to stay current. Larger businesses are able to invest in large and very complex software as well as they have the ability to hire analysts to help them with day-to-day transaction tasks related to e-commerce; smaller retailers either use spreadsheets or write down notes or attempt to guess what there will

be left on their shelves to price according to the current market conditions; or they are relying on their instincts to make purchase decisions based on previous sales performance instead of using data. Merchant AI fills this gap with the concept that an organization's day-to-day operations are not supposed to be fragmented. Merchant AI uses a real-time analytical dashboard that gathers inventory analytics and other product management information and places everything into one usable location for convenience. On a practical level, the same problems found within other systems can be dealt with using more structured processes. Merchant AI utilizes contemporary web tech (react.js, tailwind CSS) to create responsive, & easy to use mobile/desktop UI. Also, it uses data-driven AI to assist merchants in analyzing & making informed decisions about their inventories. Merchant AI is a valuable tool that merges - on-line & off-line analytics, real-time performance reporting, & intelligent recommendations. This makes Merchant AI a real-world, scalable solution for eCommerce management in today's business marketplace.

## I. INTRODUCTION

The steady rise of eCommerce has changed how businesses operate, especially for merchants who can now sell far beyond their

local areas. A shop owner can list products online in the morning and take orders from different cities by night. However, this convenience comes with challenges. Managing inventory, tracking products, and interpreting sales data becomes tougher as operations grow. Many small and medium-sized merchants still rely on notebooks, Excel files, or basic billing software, partly due to habit and partly because of limited options. These methods can work, but errors can easily occur, and decisions often depend on guesswork instead of clear data. This issue has created a need for systems that can provide timely insights without adding more complexity.

Inventory management, in particular, often determines whether an eCommerce business operates smoothly or feels reactive. When stock levels aren't monitored closely, sellers either run out of popular items or hold on to unsold products that tie up capital. A delayed update can lead to accepting an order for an item that is no longer available, frustrating customers and eroding trust. Many traditional inventory tools work in isolation and update slowly, if at all. They rarely alert merchants at the right moment or clarify what the numbers actually mean. This lack of visibility makes it hard to respond when demand shifts unexpectedly.

At the same time, improvements in web development and artificial intelligence have created new possibilities. Interactive dashboards can now process large amounts of operational data and present it in a readable, intuitive way. Real-time analytics reduce the need for constant manual checks and help merchants spot patterns, such as a product that sells well on weekends or slows down during certain months. Automation manages repetitive tasks quietly in the background. Moreover,

mobile-friendly applications let merchants check stock levels or sales figures while commuting or managing a physical store, which fits better with how businesses really operate.

Dependence on the internet brings another layer of difficulty that is often overlooked. In many real-world settings, network connections can be unstable, especially for small shops in semi-urban or crowded commercial areas. When systems fail the moment connectivity drops, essential tasks like billing or stock updates come to a halt. That disruption may seem minor in theory but becomes costly in practice. Applications that don't allow for offline access often fail when they are needed most. This reality pushes developers to move beyond always-online assumptions and create systems that can work independently, at least for a while.

In this context, the Merchant AI project is suggested as a focused solution rather than a complete overhaul. It offers a real-time analytical dashboard that includes inventory tracking, barcode-based product identification, offline data access, and AI-driven insights in one platform. The aim is not to overwhelm merchants with features but to assist with everyday decisions using clearer information. By employing modern frontend technologies and smart automation, the system seeks to remain flexible and scalable as business needs grow. While no tool can fully replace experience or intuition, Merchant AI tries to make those instincts more informed and less hampered by avoidable mistakes.

## II. LITERATURE SURVEY

The evolution of eCommerce systems has progressively introduced several digital tools over time, which are meant to ease inventory management, sales tracking, and customer interactions. Early on, these platforms were simple—a means of product listing, order processing, and billing generation—sufficient for a time. Analytics, however, were mostly non-existent, and updates to stock would often depend on entering numbers manually at the end of the day. This approach sounds manageable until sales increase or product

variety expands. Errors begin to slip in, and decisions are delayed. Operational effort quietly increases, particularly since small and medium-scale businesses do not have dedicated technical support.

As web technologies matured, dashboard-based systems began to emerge and have received considerable attention. These dashboards replaced raw tables with charts and summaries easy to view and grasp at a glance regarding sales patterns and inventory levels. Near real-time visualization enabled merchants to understand which products were moving and which were not. With this visual clarity, day-to-day awareness improved. However, many of these systems are based on the assumption of always having stable internet access. In places where the internet can drop at any time, dashboards can be rendered utterly useless; instead of a helpful tool, they suddenly become a temporary hindrance rather than a solution.

Recent research has focused on integrating artificial intelligence and automation into eCommerce platforms. AI-powered tools can analyze historical sales data, react to current trends, and recommend restorative or discount actions on poor-selling items. Automated alerting minimizes the risk of losing essential stock levels, while predictive insights enhance planning. There is, however, a sticky point: most of these systems are built for large enterprises. They are costly, complex in configuration, and often overwhelming to a small merchant who needs clarity, not an extra layer of technical complexity.

Another recurrent theme regarding existing literature is usability, especially regarding the majority of merchants nowadays handle materials of their businesses using smartphones while serving customers or supervising staff. Responsive designs, mobile-first, are not even an option anymore. In parallel, offline data storage mechanisms have gained much interest recently, from browser-based local storage up to various other forms, considering maintaining system operability in case of a lost network. Several things are flagged here, indeed, yet there is a certain lack: a lightweight system based on intelligence, easiness of use, and

reliability while being offline. Right here is where the proposed Merchant AI solution fits in.

### III. SYSTEM ANALYSIS

#### 3.1 Existing System:

Most small and medium-sized businesses today work manually or with a high degree of automation in their operational workflow for running day-to-day business with retail and eCommerce. Inventory is tracked on Excel sheets, handwritten notebooks, or some basic billing software not designed for scaling. Quantities need to be updated, prices changed, and mistakes rectified; all this usually happens at the end of a long day. Under such a regime, small errors are virtually inevitable. A missed entry here or a duplicate record there slowly adds friction to daily operations, and over time, that friction turns into lost efficiency.

This creates another issue regarding the dependency on the Internet. Most cloud-based retail platforms simply cease functioning in the event of an outage. In regions of poor connectivity, even simple product-detail inquiries or making sales can become frustrating. The merchant standing at the counter with a customer waiting cannot afford any troubleshooting with the network. This breaks the rhythm of business, and at times, customers just walk away.

Then there is the other factor in existing systems—the lack of any intelligence. Most platforms collect data but do not call for low stock or flag up unusual sales patterns. Merchants are expected to review reports to identify issues—a time- and focus-drain from actually running the business. Without proactive alerts or any analytic support, the decision-making process remains retroactively proactive.

Then, of course, there is usability. Many retail solutions have been developed with the desktop user in mind and ported onto mobile screens. However, in the real world, small business owners use their smartphones as they dash between suppliers, counters, and customers. Cluttered interfaces and lack of offline access

diminish the practicality of these solutions. All of this adds up to a very real need for a better system. A platform like Merchant AI tries to combine simplicity, mobility, offline reliability, and smart insight into a single, usable solution.

#### 3.2 Proposed System:

Merchant AI is designed to address the everyday frustrations of traditional eCommerce and inventory tools. Instead of introducing another complicated system, it aims to create something practical and easy to use. The platform combines product management, stock tracking, and basic analytics into one dashboard that doesn't require constant attention. By using modern web technologies and simpler data handling, the system seeks to lessen the mental burden on merchants while they manage routine tasks.

A key feature of the system is real-time inventory monitoring. Stock levels update immediately after a product is scanned or modified. Though it seems simple, this makes a significant difference. Merchants don't have to wait until the end of the day to check numbers or guess what items might be missing. With up-to-date data available, decisions about restocking or promotions can be made faster and more confidently.

Barcode scanning offers another layer of convenience. Instead of manually typing product names or codes, merchants can scan an item and quickly see its details and available quantity. This helps minimize small but frequent mistakes that can occur during manual entry, especially during busy times. It also speeds up routine tasks, which becomes increasingly important as inventory lists grow.

Offline functionality is another useful feature of the system. By storing product and inventory data locally in the browser, Merchant AI can still operate when the internet connection fails. Merchants can search for products, update quantities, and continue with basic tasks. While it doesn't solve every connectivity issue, it prevents business operations from completely halting during network interruptions. The system also has smart alerts that inform merchants when stock levels drop too low.

These alerts prompt action before issues arise, rather than after shelves are empty. While the current emphasis is on inventory awareness, the design allows for future enhancements like advanced analytics or AI-driven support. In this way, Merchant AI is not positioned as a final solution, but as a flexible platform that can evolve to meet the needs of modern eCommerce businesses.

## IV. METHODOLOGY

### 4.1 Product Data Acquisition:

The methodology begins with collecting product information using a combination of manual entry and barcode scanning. Each item is logged with basic details like product name, category, price, quantity, and current stock status. Barcode scanning speeds up the process and feels more natural for daily operations, especially when handling multiple items. It also cuts down on minor mistakes that can happen with repeated typing. This stage is crucial for the whole system, as effective inventory management relies on having clean and reliable initial data.

**4.2 Local Storage-Based Data Handling:** Once the product data is captured, it is stored using browser-based local storage rather than relying entirely on remote servers. This choice supports system usage even when the internet connection is weak or temporarily unavailable. By keeping data locally, merchants can still search products, check quantities, and continue basic operations without disruption. While local storage has its limits in terms of capacity and security, it offers a practical balance between accessibility and reliability for small-scale business environments.

### 4.3 Inventory Management and Real-Time Updates:

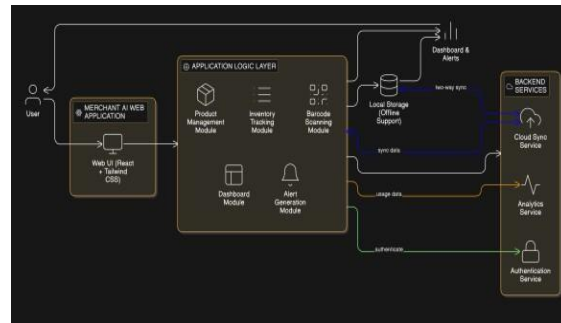
The system tracks inventory levels and updates stock information in real time as products are added, sold, or edited. Merchants can introduce new items, change existing product details, or remove products that are no longer needed. These updates happen instantly, which helps prevent confusion from delayed or incorrect records. Real-time inventory handling does not remove every error, but it greatly reduces the difference between actual stock and recorded data.

### 4.4 Alert System and Dashboard Visualization

The final stage focuses on turning raw inventory data into something easier to understand and act upon. When stock quantities drop below a set threshold, the system triggers alerts to warn merchants before shelves run empty. Alongside this, the dashboard presents inventory status and key indicators in a clear visual format rather than dense tables. This makes it easier to grasp the situation at a glance and respond quickly. While the dashboard does not replace business intuition, it supports more timely and informed decision-making based on visible patterns and alerts.

## V. IMPLEMENTATION

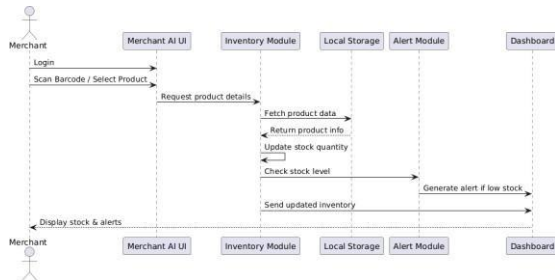
### 5.1 Architecture



- The Merchant AI system is accessed by the merchant through a web browser on a mobile device or desktop.
- The user interface is built using **React JS** and **Tailwind CSS**, which provides a responsive and interactive experience.
- User actions such as adding products, scanning barcodes, searching items, and viewing inventory are handled by the frontend components.
- These actions are passed to the **application logic layer**, where business rules such as data validation, stock updates, and alert checks are processed.
- Product and inventory data are stored in **browser local storage**, enabling offline access and fast data retrieval.
- The **inventory module** continuously tracks stock levels and updates quantities in real time.
- The **alert module** monitors inventory data and generates notifications when stock levels fall below the minimum threshold.
- The **dashboard module** aggregates inventory data and alerts, displaying insights and status information to the merchant.

- Optional backend services (such as Supabase and AI services) handle data synchronization and intelligent recommendations.
- The overall architecture follows a **modular and layered approach**, making the system scalable, reliable, and easy to maintain.

### 5.2 Sequence flow



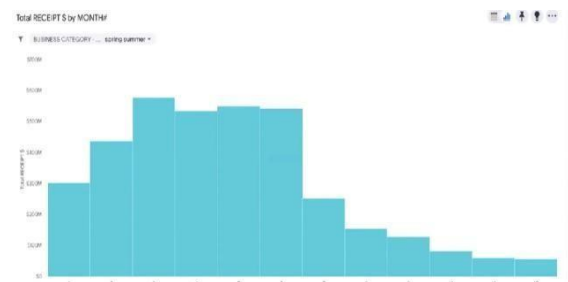
- The merchant opens the Merchant AI application through a web browser.
- The merchant logs into the system using valid credentials.
- After login, the merchant scans a product barcode or selects a product manually.
- The user request is sent from the user interface to the inventory module.
- The inventory module retrieves the corresponding product data from local storage.
- The system checks and updates the current stock quantity in real time.
- The updated stock value is compared with the predefined minimum stock limit.
- If the stock level is low, the alert module generates a low-stock notification.
- The dashboard module collects updated inventory data and alert information.
- Finally, the dashboard displays the updated stock status and alerts to the merchant.

## VI.RESULTS

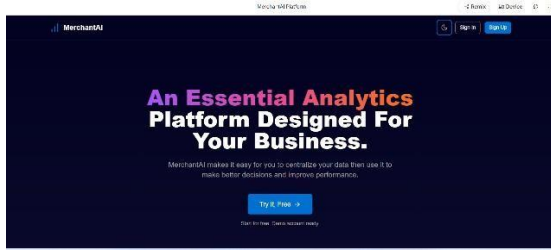
The implementation of Merchant AI works well in practice and feels genuinely useful for everyday inventory tasks. Stock levels update accurately, barcode scanning speeds things up,

and low-stock alerts arrive before problems grow. Offline access through local storage is a quiet but important feature, especially when the internet is unreliable. The dashboard stays clear and easy to read, which helps merchants decide quickly without overthinking. Overall, the system reduces manual mistakes and makes inventory management simpler for small and medium-scale businesses.

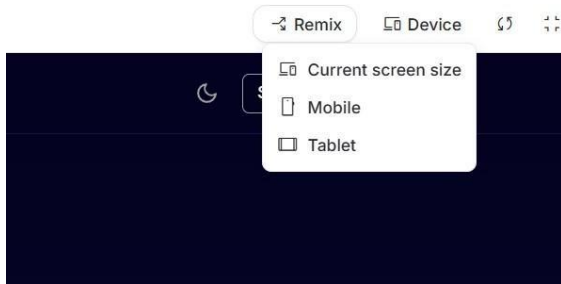
### BASIC EXPLORATORY ANALYSIS



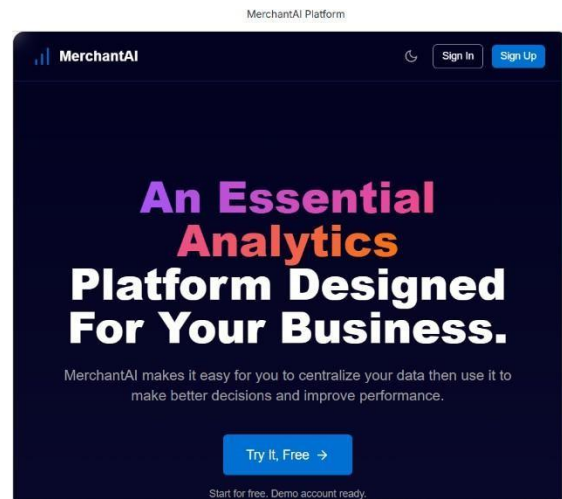
### 6.1OUTPUT SCREENS



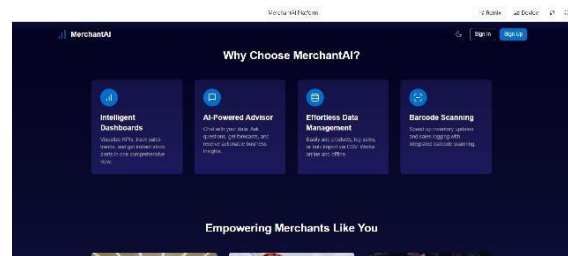
### 6.1.1 Landing Page



### 6.1.2 Device Types



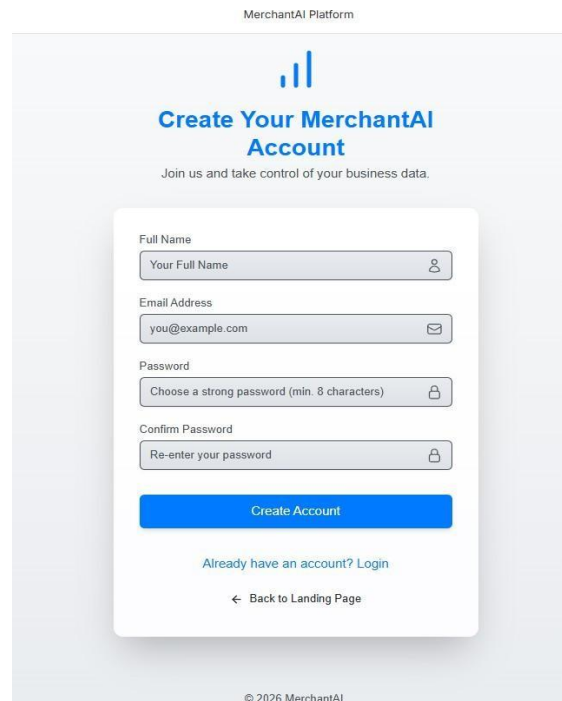
### 6.1.4 Tablet View



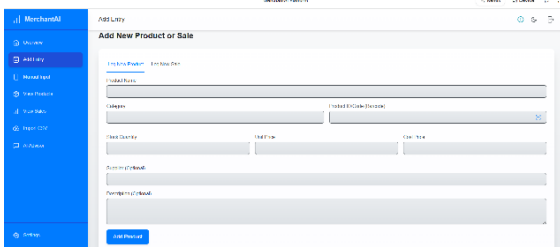
### 6.1.5 Website UI



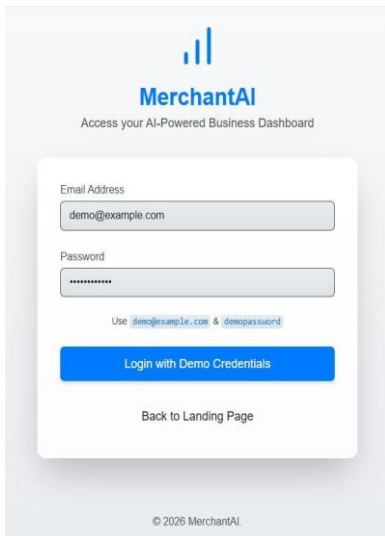
### 6.1.3 Mobile View



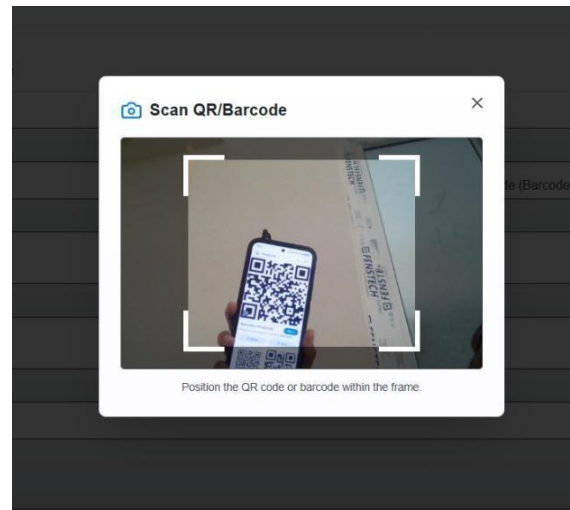
### 6.1.6 Sign up Page



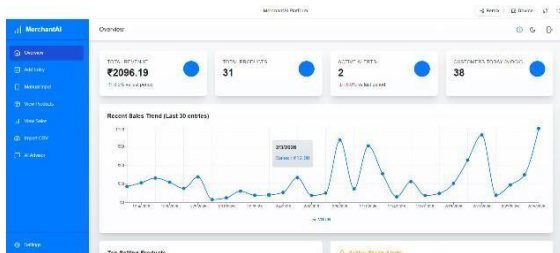
6.1.10 Add New Product or Sale



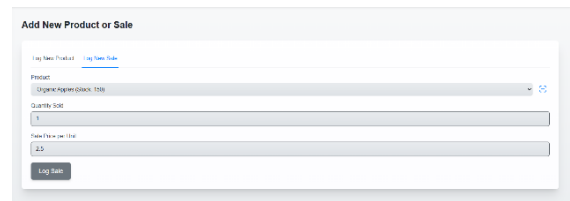
6.1.7 Sign in Page



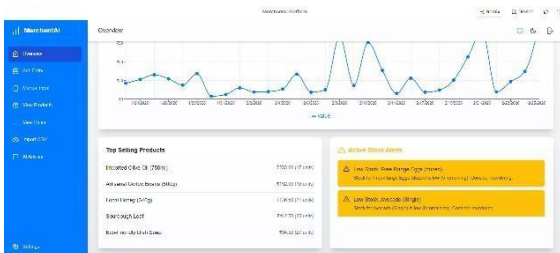
6.1.11 Barcode Scanning



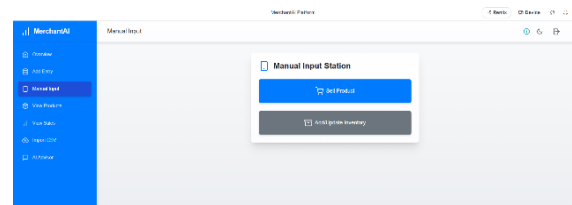
6.1.8 Dashboard



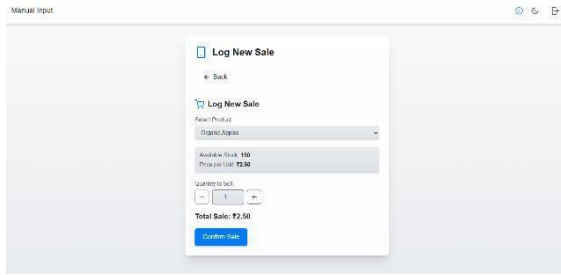
6.1.12 Log New Sales



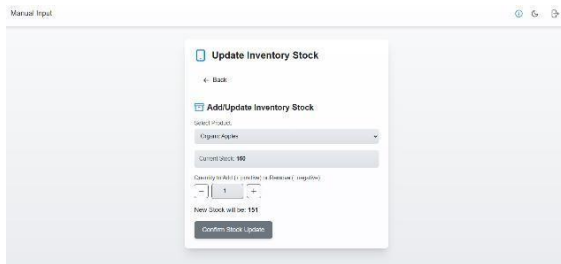
6.1.13 Manual Input



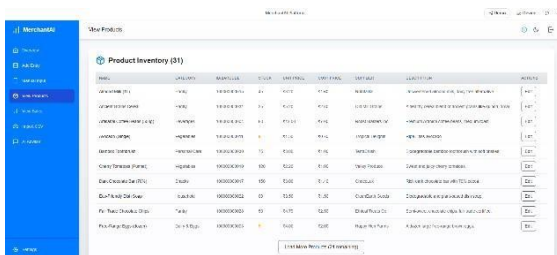
6.1.9 Dark Theme



6.1.14 Sell Product



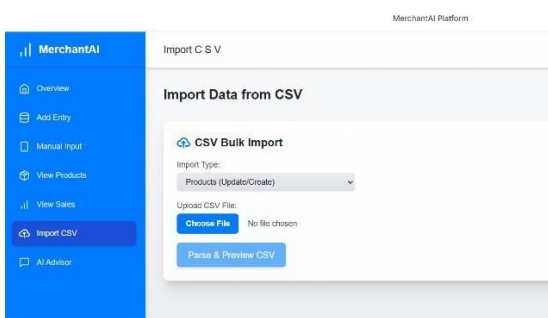
6.1.15 Update Inventory stock



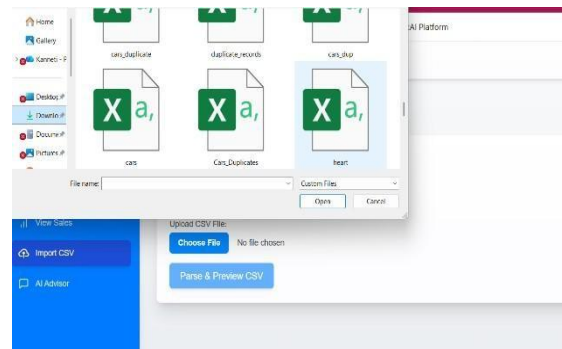
6.1.16 View Product Inventory



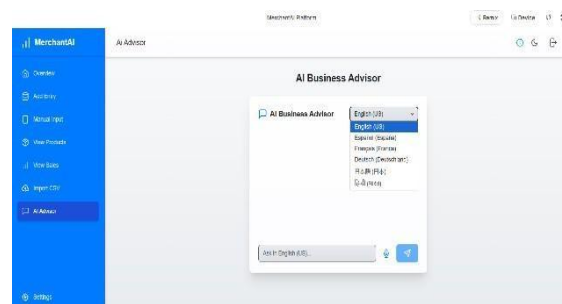
6.1.17 View Sales



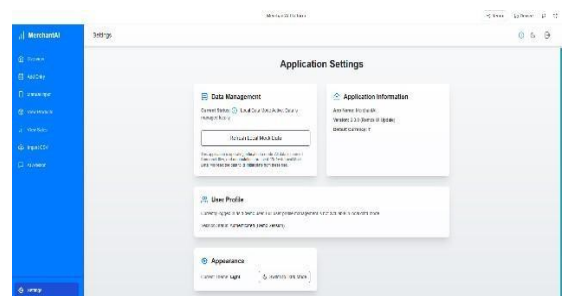
6.1.18 Import Data from CSV



6.1.19 Uploading CSV file



6.1.20 AI Advisor



6.1.21 Application Settings

## VII. Conclusion

Merchant AI turns everyday inventory work into something far more manageable. Barcode scanning, live stock updates, offline access, and simple alerts take away much of the manual effort that usually slows merchants down. The system feels responsive and flexible, making it suitable for small and medium businesses without adding complexity. In the end, it helps reduce stock issues, supports clearer decisions, and leaves room to grow with smarter features in the future.

## VIII. REFERENCES

1. Laudon, K. C., & Traver, C. G., *E- Commerce: Business, Technology, Society*, Pearson Education, 2019.
2. Turban, E., King, D., Lee, J., Liang, T. P., *Electronic Commerce: A Managerial and Social Networks Perspective*, Springer, 2018.
3. Chen, M., Mao, S., & Liu, Y., "Big Data: A Survey," *Mobile Networks and Applications*, Springer, 2014.
4. Han, J., Kamber, M., & Pei, J., *Data Mining: Concepts and Techniques*, Morgan Kaufmann, 2012.
5. Russell, S., & Norvig, P., *Artificial Intelligence: A Modern Approach*, Pearson, 2021.
6. Hevner, A. R., et al., "Design Science in Information Systems Research," *MIS Quarterly*, 2004.
7. Sommerville, I., *Software Engineering*, Pearson, 2016.
8. Pressman, R. S., *Software Engineering: A Practitioner's Approach*, McGraw-Hill, 2015.
9. Chen, Y., "Machine Learning Techniques for Inventory Management," *International Journal of Computer Applications*, 2017.
10. Kim, G., "Real-Time Data Analytics in Web Applications," *IEEE Transactions on Services Computing*, 2019
11. React Official Documentation (<https://react.dev/>)
12. Tailwind CSS Official Documentation (<https://tailwindcss.com/docs>)
13. JavaScript Guide (<https://developer.mozilla.org/en-US/docs/Web/JavaScript>)
14. Barcode Technology Overview (<https://www.barcode.com/>)
15. Supabase Documentation (<https://supabase.com/docs>)
16. <https://scholar.google.com/>
17. <https://www.researchgate.net/>
18. <https://www.sciencedirect.com/>
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