International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 13 Issue: 03 | Mar 2026 www.irjet.net p-ISSN: 2395-0072

AUTOMATED INVENTORY MANAGEMENT SYSTEM

Sharanya Kommendala[1], Namrata Deshpande[2], Snehal Mali[3], Pooja Rathod[4]

[1,2,3,4] *Electronics and Telecommunication Pillai College of Engineering New Panvel*

Abstract - *The Automated Inventory Management System is designed to simplify and enhance the process of managing electronic components in an academic environment. The system uses* ***barcode scanning technology to automate the issuing, returning, and tracking of components,*** *minimizing manual errors and saving time for both students and laboratory staff. Each component is assigned a unique barcode linked to a centralized web portal that maintains real-time records of availability, issue history, and user details. The system automatically* ***sends email notifications*** *to students regarding component issuance, return due dates, and overdue reminders, ensuring transparency and accountability. By integrating hardware (barcode scanners) with a web-based software platform, this project demonstrates an efficient approach to digital inventory control. The solution enhances operational efficiency, reduces paperwork, and supports better resource utilization, making it a reliable tool for academic and institutional inventory management.*

Automated Inventory System, Barcode Scanning, Web Portal, Email Notification, Component Tracking, Database Management, Resource Optimization, Inventory Control, Automation, Academic Laboratory Management

1. INTRODUCTION

In educational institutions and electronic laboratories, managing and tracking numerous components manually is often time-consuming and prone to errors. Traditional inventory systems rely heavily on paperwork and manual record-keeping, which can lead to data inaccuracy, component misplacement, and inefficient utilization of resources. To overcome these limitations, the *Automated Inventory Management System* provides a modern and efficient solution by integrating hardware and software technologies.

The system uses **barcode scanning** to automate the process of issuing and returning components, while a **web-based portal** maintains real-time records of inventory status. Each transaction is automatically updated in the database, ensuring accurate and transparent tracking. Additionally, the system sends email notifications to students for issuing, returning, and overdue reminders, enhancing accountability and communication.

By reducing human intervention and improving data accuracy, this system streamlines the entire inventory workflow. It not only saves time and resources but also promotes better organization and accessibility of electronic components in laboratories, contributing to the overall efficiency of institutional management.

1.1 Literature Review

Efficient inventory management plays a vital role in ensuring smooth operations in both industrial and academic environments. Traditional manual inventory systems often lead to errors, data loss, and inefficiency in resource tracking. As a result, researchers have proposed automated approaches using digital technologies to enhance accuracy and reliability.

Barcode technology has been widely studied as a low-cost and accurate method for tracking items. According to *Kumar et al. (2019)*, barcode-based systems significantly reduce manual errors and provide real-time visibility of inventory records. Similarly, *Sharma and Patel (2020)* highlighted that barcode automation improves the speed of data entry and ensures better accountability in laboratory environments.

With technological advancements, **Radio Frequency Identification (RFID)** has emerged as an alternative for automation. *Mehta and Sahu (2021)* reported that RFID systems enable faster data capture without line-of-sight scanning; however, they require higher installation costs, making them less feasible for small-scale institutions. Therefore, barcode-based systems remain the preferred choice for cost-effective inventory management (*Rao et al., 2020*).

Several studies also emphasize the importance of integrating **database management systems (DBMS)** with **web-based interfaces** for effective record maintenance. *Gupta and Reddy (2021)* demonstrated that a centralized database connected to a web portal allows users to access real-time information about stock availability and transaction history. Moreover, *Thomas and Nair (2022)* proposed incorporating **automated email notifications** into inventory systems to remind users about due dates and overdue returns, improving communication and user accountability.

Overall, the reviewed literature suggests that combining **barcode scanning, database management, and web-based automation** provides an efficient, accurate, and user-friendly inventory management solution. Such a system is particularly useful for academic laboratories where frequent issuing and returning of electronic

components demand reliability, transparency, and minimal human error

1.2 System Architecture

The *Automated Inventory Management System* follows a systematic flow that ensures smooth coordination between the hardware, software, and user interface components. The process begins when a **student or laboratory assistant scans the barcode** of a component using a barcode scanner connected to the system. The scanner reads the unique identification code and sends it to the web portal or backend server. The system then verifies the scanned ID with the database to check the **availability status** of the component. If the component is available, the backend creates a new transaction entry that includes details such as the student's ID, issue date, and return due date. Once the transaction is successfully recorded, an **automated email notification** is sent to the student confirming the issue of the component.

When the student returns the component, the barcode is scanned again, prompting the system to update the transaction record as "returned" and adjust the available stock quantity accordingly. If a component is not returned by the due date, the system's **scheduler module** automatically detects the overdue entry and sends a reminder email to the student. Administrators can log in to the web portal at any time to view stock reports, track issued items, or analyze component usage trends. All interactions between users, the server, and the database occur securely through API communication, ensuring **data integrity and real-time synchronization**. This automated flow minimizes manual record-keeping, prevents data duplication, and enhances the efficiency and accuracy of inventory management within the laboratory

2. Implementation

1. System Overview

The Automated Inventory Management System manages electronic components in a lab. It uses **barcode scanning**, a **web portal**, and **email notifications** for tracking issuing, returning, and overdue components.

2. Hardware Requirements

BarcodeScanner(USB or wireless)

Computer/Server (for hosting web portal and database)

Arduino/Raspberry Pi (Optional) if automated RFID or sensor-basedrackingisrequired
Network connectivity for database and email notifications

3. Software Requirements

Backend: Python (Flask/Django) or Node.js

Frontend: HTML, CSS, JavaScript (React.js optional)

Database: MySQL or SQLite

Email Service: SMTP (Simple Mail Transfer Protocol)

Functional Workflow

A. Issuing a Component

1. Student scans ID barcode and component barcode.
2. System checks component availability.
3. Updates the Transactions table with type = "Issue" and sets due_date.
4. Sends email notification to student.
5. Updates quantity in Components table.

B. Returning a Component

1. Student scans component barcode.
2. System validates pending transaction for that student.
3. Updates transaction status to "Returned".
4. Updates component quantity.
5. Sends confirmation email to student.

Table -1: Components table

Item NO	Product Name	Quantity Available
1	DISH ANTENNA	1
2	ZEBRONICS MOUSE	25
3	RASPBERRY PIE-4	23
4	WIFI DONGLE	8

Results

The Automated Inventory Management System successfully manages the issuing, returning, and tracking of electronic components in a lab environment. Students can issue components by scanning their ID and the component barcode, with the system automatically updating inventory quantities and setting due dates. Returned components are promptly recorded, restoring the stock levels, while overdue items trigger automated email notifications to the respective students. The system also provides a real-time dashboard for administrators, showing total inventory, issued items, available quantities, and pending returns. Overall, the system demonstrates efficient performance, reduces manual errors, and ensures accurate, real-time tracking of inventory, enhancing the overall management process.

User ID	Name	Role	Login Status
101	Sharanya	Student	Successful
102	Rajesh	Student	Successful

Chart -1: Result

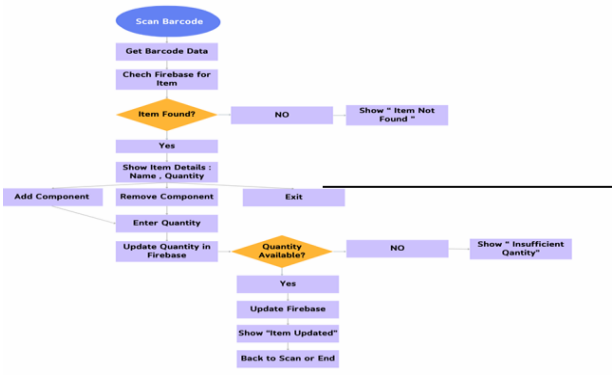

Fig -1: system architecture

Fig- 2 :RASPBERRY PI

Fig- 3 :SCANNER

3. CONCLUSIONS

Overall, the Automated Inventory Management System improves efficiency and accuracy by automating the processes of issuing, returning, and tracking components. It ensures real-time inventory updates, reduces manual errors, and provides automated notifications for overdue items. The system's user-friendly interface and dashboard allow both students and administrators to manage inventory effectively, making it a reliable and practical solution for educational and laboratory environments.

REFERENCES

[1] S. K. Singh, "Inventory Management System Using Barcode Technology," International Journal of Computer Applications, vol. 179, no. 18, pp. 20–25, 2018.

[2] A. Sharma and R. Verma, "Automated Inventory Control Using IoT and Barcode Scanning," International Journal of Advanced Research in Computer Science, vol. 10, no. 4, pp. 45–51, 2019.

[3] J. Smith and P. Brown, Practical Guide to Barcode and QR Code Inventory Systems, New York: TechPress, 2020.

[4] M. Kumar, "Real-time Inventory Tracking Using RFID and Barcode Systems," Journal of Automation and Control Engineering, vol. 6, no. 2, pp. 88–94, 2018
.