**IUBAT Smart Library Automation System**

**1. Project Overview**

This proposal presents a comprehensive solution to modernize the entry and PC assignment processes within IUBAT University’s library and computer section. The current manual system—dependent on paper logs—results in inefficiency, poor traceability, and limited data utility. Leveraging barcode-based student IDs, React-powered user interfaces, and a Django backend, the proposed system digitizes entry tracking and introduces a real-time computer allocation framework. Students will scan their IDs to log entry, select available PCs through an interactive layout, and initiate auto-deactivation upon session completion. The system is designed for scalability, security, and minimal disruption, offering offline redundancy and future integration with mobile devices and central databases. By streamlining workflows and enhancing monitoring capabilities, this solution promises improved user experience, administrative control, and data-driven decision-making across library operations.

**2. Background**

IUBAT University's library and computer section currently rely on manual processes for student entry and tracking. Students must write their ID, name, and entry time into physical logs for both areas. This causes delays, data inconsistency, and difficulty in tracing activity during incidents. Students have ID cards with barcodes, which present an opportunity for digital automation.

**3. Problem Statement**

Despite operating in a rapidly digitizing academic environment, IUBAT University's library and computer section continue to rely on legacy manual processes for entry logging and resource allocation. These methods, while historically serviceable, pose serious limitations in terms of efficiency, traceability, and overall user experience.

* **Slow manual entry process creates long queues:** Students must physically write their information into a notebook, which leads to long queues and frustration during peak hours.
* **Library data stored in hardcopy format:** Data retrieval is cumbersome, making it difficult to search, filter, or analyze information for audits or administrative tasks.
* **Computer section lacks per-user PC assignment and tracking:** There is no formal record of which student used which PC, for how long, or during what time, creating a major gap during investigations.
* **Security and incident resolution risks:** In the case of accidents or rule violations, the current system offers no immediate way to identify responsible users. Manual records are unreliable and weaken the ability to enforce fair policy.
* **Operational burden on staff:** Staff must manually maintain records, consuming time that could be better spent on other tasks. The system also helps PC Technicians identify which PCs need fixing, which is a common problem right now.

**4. Student Needs**

Based on the survey conducted with 48 student responses, the key needs and main points are clear and align with the project's objectives.

* **Automation is highly desired:** A vast majority of students (89.6%) would prefer to scan their ID to enter the library instead of writing it down.
* **Long queues and manual signing are major issues:** The most significant issues students face during entry are long queues (64.6% of responses) and forgetting to sign manually (33.3%).
* **Live PC status is a priority:** When asked about desired features, 95.8% of students requested an ID scan entry system and 54.2% wanted a live PC availability view.
* **Faulty PCs and tracking are concerns:** Key issues with the e-library PCs are that faulty PCs are not fixed (35.4% of responses) and students can't find free PCs (29.2%). The option to report a faulty PC was a requested feature from 52.1% of students.
* **Mobile access is a future requirement:** Almost all students (89.6%) use a smartphone regularly, and 95.7% would like the option to access the system via a mobile device in the future.

**5. Librarian and Admin Needs**

Based on the project's problem statement and objectives, the needs for the library and IT staff are centered on improving operational efficiency and data management:

* **Digitized Data and Reporting**: The core need is to move away from hardcopy records to a digital system that allows for easy searching, filtering, and analysis of data. This includes the ability to generate comprehensive reports (e.g., time-based and student-based usage reports).
* **Enhanced Security and Traceability**: Staff requires a reliable way to link a specific student to their library entry or PC usage session for better accountability and incident resolution. This includes a system to manage and enforce a student ban list.
* **Reduced Operational Burden**: The automated system should reduce the time and effort spent on manually maintaining logbooks and data.
* **Effective PC Management**: Admins need the ability to monitor the status of all PCs in real-time, mark them as "dumb" or "out-of-order," and track complaints. The system's SCADA-style layout is specifically designed to help PC technicians identify which PCs need fixing, saving them time.
* **Data-Driven Decision Making**: The collected data should be usable for analyzing usage patterns, which can help in future planning and resource allocation.

**6. Objectives**

This project aims to digitize student entry and PC usage tracking at IUBAT University’s library and computer section by replacing manual logs with barcode-based ID verification and automated PC assignment. This will enhance efficiency, security, and data accuracy while laying the groundwork for broader campus digitization. The primary objectives are:

* Automate library and computer section entry using barcode ID scans.
* Implement a digital PC assignment and deactivation system.
* Enable real-time entry logging and monitoring updates.
* Provide an admin dashboard for analytics and management.
* Ensure a low-delay experience for students.

**7. Implemented Methodology**

Our approach focuses on replacing manual data entry with digital ID scanning. Barcode scanners, paired with a software stack (React + Django), will fetch student data from the database and log entries in real-time. A live SCADA-style layout will display computer availability, allowing students to select and assign PCs. The system is modular and designed for incremental rollout.

**8. Project Status (Work Completed to Date)**

This section outlines the progress made on the IUBAT Smart Library Automation System:

* **Library Entry Management**: The system currently includes student identification through ID verification, real-time entry and exit tracking, and lives occupancy monitoring. A student database has been populated with 43 IUBAT University students.
* **E-Library PC Management**: We have implemented PC availability status monitoring, a student-PC assignment system, and check-in and check-out functionality. The system also tracks PC usage time and manages hardware status (operational/out-of-order).
* **Administrative Interface**: The admin interface features secure admin authentication, a comprehensive reporting system, and the ability to generate time-based and student-specific usage reports.
* **Technical Specifications**:
  + **Backend**: The backend is built on Django 4.2.23 with Django REST Framework. It uses SQLite for development and is configured for PostgreSQL in production. Authentication is session-based, and it includes CORS for frontend integration.
  + **Frontend**: The frontend is a React.js application with a responsive design and gradient styling. It uses the Fetch API for backend communication.