

DEVELOPMENT OF AI-ENABLED SMART GROCERY BAG DEPOSIT AND RETURN KIOSK SYSTEM FOR SUSTAINABLE RETAIL OPERATIONS

Muhammad Iqbal Maulana

Program Studi Teknik Informatika

Jurusan Teknologi Informasi

ABSTRACT

This project develops and evaluates a proof-of-concept SmartBag Kiosk for reusable grocery bag borrowing and return in retail environments. The system addresses repeated tote bag purchases caused by shoppers forgetting to bring reusable bags.

The prototype uses an ESP32 microcontroller, RC522 RFID reader, passive RFID tags, an IR sensor, an active buzzer, JSON serial output, and a local Web Serial dashboard. RFID identifies registered bags, while the IR sensor assists in validating return attempts. Deposit and refund functions are represented as simulated system statuses.

Functional testing showed that all ten test cases passed, including RFID identification, borrowing, incomplete and successful returns, buzzer feedback, JSON output, and dashboard updates. User evaluation involving 46 respondents indicated moderate acceptance, with mean scores between 3.05 and 3.10.

The prototype demonstrates the feasibility of an IoT-enabled reusable bag circulation workflow. Future work may include real payment integration, cloud support, mobile notifications, improved kiosk design, and AI-assisted bag verification.

Keywords: SmartBag Kiosk; reusable grocery bag; Internet of Things (IoT); RFID; deposit-return system; Web Serial dashboard; sustainable retail operations