

ABSTRACT

Manual inventory management in warehouses carries a high risk of recording errors, stock data discrepancies, and delayed information updates. This study aims to design and build a Radio Frequency Identification (RFID)-based inventory system and the ESP32 microcontroller to support automated and real-time warehouse management. The system employs two RFID RC522 modules installed independently at separate entry and exit lanes to automatically differentiate transaction types. The ESP32 microcontroller processes RFID data and transmitting it to Google Sheets via Google Apps Script using the HTTP protocol. A local interface comprising a TFT LCD display, dual-color LED indicators, and a buzzer provides immediate feedback to the operator. The Black Box Testing method was used to test nine functional scenarios. The test results showed that the RFID system's reading accuracy reached 100% within a range of 0 to 3 cm, with an average data transmission time to Google Sheets of under 4 seconds per transaction. All functional test scenarios were successfully executed with a 100% success rate. The system proved to be more efficient than conventional manual recording methods in terms of processing speed, data accuracy, and real-time accessibility of stock information.

Keywords : *ESP32, Google Sheets, goods inventory, warehouse management, RFID*