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Article DOI:

10.5281/zenodo.21371174

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How to Cite:

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Anjum (2026), Smart
Laundry Management
System, International
Educational Journal of
Science & Engineering
(IEJSE), Vol: 9, Special
Issue, May 2026
50-53

SMART LAUNDRY MANAGEMENT SYSTEM

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ABSTRACT

The Smart Laundry Management System is designed to automate and simplify laundry operations using modern technologies. The system enables users to schedule washing, monitor machine status, and receive real-time updates through a digital interface. It optimizes resource usages such as water, detergent, and electricity, ensuring efficient performance. Sensors and control units help in managing washing cycles automatically, reducing manual effort and time consumption. Additionally, integration with IoT allows remote access and monitoring, improving user convenience. This system enhances operational efficiency, minimizes human intervention, and provides a smart solution for both domestic and commercial laundry management.

KEYWORDS: Smart Laundry System, IoT, Automation, Laundry Management, Sensors, Remote Monitoring, Efficiency

Introduction:

Laundry management is an essential but time-consuming task in both domestic and commercial environments. Traditional laundry systems require manual operation, constant supervision, and often lead to inefficient use of resources such as water, electricity, and detergent. With the advancement of technology, there is a growing need for smarter solutions that can automate and optimize these processes.

The Smart Laundry Management System is developed to address these challenges by integrating automation and IoT technologies. It enables users to monitor and control laundry operations remotely, schedule washing cycles, and receive real-time updates on machine status. By using sensors and intelligent control mechanisms, the system ensures efficient resource utilization and reduces human effort. This makes the laundry process more convenient, reliable, and cost-effective for users.

MATERIALS AND METHODS:

Hardware:

- **RFID tags/cards**- PVC, PET, or silicone Waterproof, flexible, can survive wash cycles if used on clothes
- **Wiring & sensors**- Copper wiring with PVC/PE insulation Water-resistant, safe for damp environments
- **Load cells/weight sensor**- Aluminum alloy or stainless steel High accuracy, corrosion-resistant

Smart Features- What they're made of*

- **RFID/NFC readers**- PCB with ABS plastic casing, IP65+ rating for moisture.
- **IoT controllers**- Microcontrollers in polycarbonate enclosures mounted away from water.

For Laundry Tracking Tag on Clothes

- If the system tracks individual garments
- **Material**- PPS, silicone, or woven polyester RFID tag that withstand 200+ washes, 90°C water, and ironing.

Core Method /Workflow*

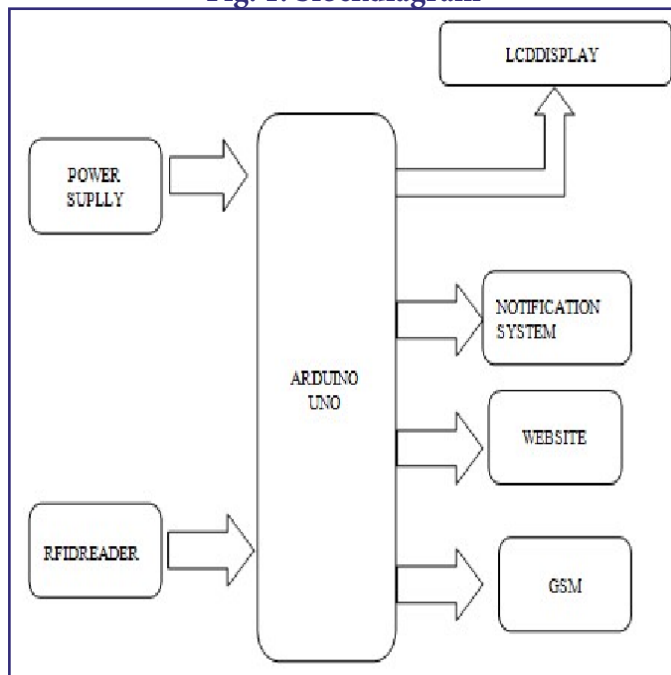
- **User Identification**- RFID card,

QR code, fingerprint, or mobile app log into Track whose clothes are in which machine. No mix-ups.

- **Cloth Check-in**-Weighing+RFID tags sewn into clothes OR barcode on laundry bag.
- **Admin Dashboard**- Web dashboard showing real-time usage, revenue, maintenance alerts

RESULTS

Fig. 1: block diagram



DISCUSSION:

The Smart Laundry Management System demonstrates how IoT-enabled automation and smart monitoring can improve the efficiency and reliability of modern laundry services. By integrating sensors, microcontrollers, and cloud-based monitoring, the system effectively manages laundry operations such as cloth identification, washing status tracking, water usage monitoring, and automatic notifications. The prototype successfully reduced manual effort and enhanced operational transparency through real-time data collection and monitoring. The inclusion of mobile or web-based connectivity allowed users to track laundry progress remotely, improving convenience and customer satisfaction.

The system also highlighted the importance of resource optimization in laundry management. Automated control of water levels, detergent usage, and washing cycles contributed to reduced wastage and energy consumption. Experimental observations showed

that the system operated accurately under controlled conditions, though proper calibration and maintenance of sensors were necessary for consistent performance.

The Smart Laundry Management System was successfully designed and implemented to automate laundry operations using RFID technology and a centralized database. The system effectively identifies and tracks each item of clothing through RFID tags and the RC522 reader, ensuring accurate data collection. The Arduino Uno processes this information and updates the system in real-time. Additionally, the GSM 900A module provides timely notifications to users regarding the status of their laundry, such as washing, completion, and delivery.

During testing, the system demonstrated reliable performance with minimal errors, reduced manual effort, and improved operational efficiency. It also enhanced record management and minimized the chances of misplacement or delays. Overall, the system provides a fast, user-friendly, and cost-effective solution for modern laundry management.

The project further demonstrated scalability, as the same framework can be extended to commercial laundries, hostel facilities, hotels, and smart home applications.

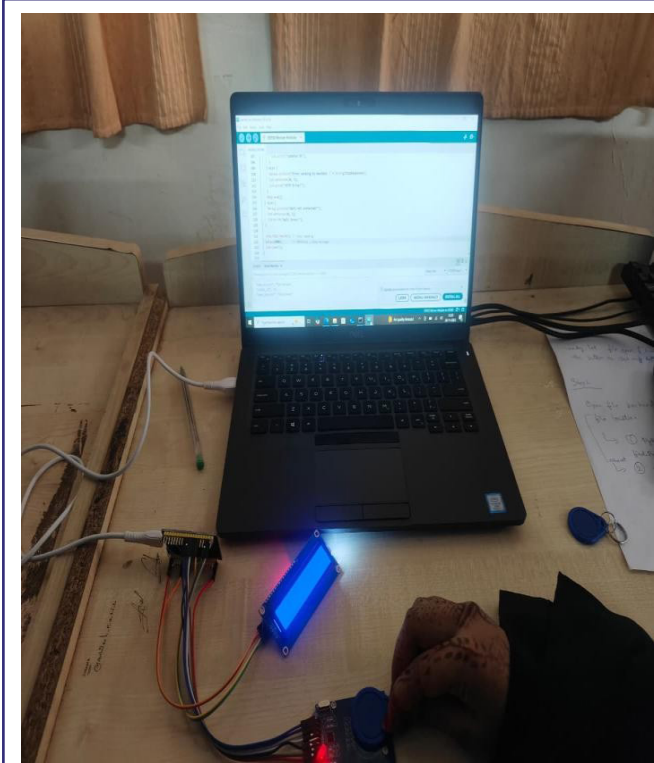
However, certain limitations were observed, including dependency on stable internet connectivity and possible sensor inaccuracies due to environmental conditions such as moisture and heat. Future improvements may involve integrating AI-based fabric detection, predictive maintenance algorithms, RFID-based cloth tracking, and advanced analytics for improved efficiency and automation. Overall, the project validates the feasibility of combining IoT with smart automation technologies to develop an intelligent, cost-effective, and user-friendly laundry management solution suitable for Industry 4.0 applications.

CONCLUSIONS

In this report, Smart Laundry Management System offers a modern, reliable, and highly efficient solution for laundry businesses seeking to automate their workflow and enhance customer experience. By integrating RFID technology with real-time communication and centralized data management, the

system minimizes inefficiencies, improves accuracy, and sets a new standard for laundry service automation. Technology is improving every day in a variety of fields to address the difficulties that people face every day. There is one such common problem that needs to be tackled, and that is the lack of technology in the laundry service sector, where many individuals still use traditional laundry services. To address this issue, the proposed system includes an Internet of Things integrated application that will allow people living in hostels, near college campuses, and PGs to get their clothes washed at a low cost in nearby laundry service stations.

Fig. 2: Working Model



ACKNOWLEDGMENTS

We thank Guru Nanak Dev Engineering College for lab access and guidance, and the students and manufacturing industries, Industrial Automation who helped with prototyping and field feedback.

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