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Innovating Mess Services: A Digital Transformation

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Abstract: Across industries, digital transformation has reshaped how services are delivered, improving both efficiency and transparency. Yet, most hostel and college mess facilities still rely on manual processes such as paper coupons and handwritten registers. These outdated practices lead to long queues, inaccurate billing, food wastage, and poor accountability. This work presents the design and implementation of a digital mess management system intended to automate daily operations, improve visibility, and minimize wastage. The platform combines mobile and web applications that connect students, vendors, and administrators through modules for meal booking, payment, and feedback. Real- time analytics support better resource planning and service quality. The study shows that applying digital transformation principles even to small campus services can enhance sustainability and operational performance.

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I. INTRODUCTION

In colleges and hostels, the mess or canteen is an essential service supporting hundreds of students daily. However, the management of these facilities often remains manual—meal coupons, registers, and verbal communication dominate everyday operations. This leads to inefficiency, lack of transparency, and frequent disputes over billing and attendance. Industries such as e-commerce and finance have already proven the benefits of digital transformation. Extending similar concepts to campus mess management can modernize processes without increasing costs.

The objective of this project is to build a digital platform that streamlines booking, automates billing, and applies analytics for meal forecasting. The proposed system aims to cut manual effort, ensure transparent records, and improve satisfaction among both students and staff.

II. LITERATURE REVIEW

➢ *Prior Research Highlights how Digitalization Improves Service Operations in Various Sectors:*

- Tiffin Management Systems: Kumar and Sharma (2020) built a mobile app for food booking and delivery. It enhanced convenience but lacked data analytics and scalability.
- Digital Transformation in MSMEs: Andriansyah et al. (2021) reviewed digital adoption among small businesses, identifying benefits alongside barriers such as cost and limited literacy.
- Public Service Digitization: Bekkers and Moody (2024) emphasized inclusivity, data ethics, and user- centric design in e-government initiatives.

These studies demonstrate that digital tools drive efficiency when paired with thoughtful implementation. The present project adapts such methods to resource-constrained college environments, prioritizing usability, scalability, and transparency.

III. METHODOLOGY

The project follows the Agile development approach, enabling continuous feedback and iterative improvement.

- Requirement Analysis: Workflows of existing mess operations were mapped through surveys and observation.
- System Design: UML, DFD, and ER diagrams were created to visualize stakeholder relationships.

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- Implementation:

✓ *Frontend:* React JS for web and Kotlin for Android.
✓ *Backend:* Node JS with Express for REST APIs.
✓ *Database:* PostgreSQL for structured data and Firebase for real-time updates.

- Testing: Unit and integration tests ensured functionality and reliability.
- Deployment: Cloud hosting on Heroku or Firebase provided scalability and easy maintenance.

The platform consists of three key modules:

✓ Customer Module: Handles bookings, cancellations, subscriptions, and feedback.
✓ Vendor Module: Manages menus, stock, and order tracking.
✓ Admin Module: Generates reports, oversees payments, and analyzes demand trends.

- *System Architecture:*
  The system follows a three-tier architecture:

✓ Presentation Layer: A responsive web and mobile interface through which users interact with the system.
✓ Application Layer: Implements business logic for booking, inventory control, and communication. It connects to third-party APIs such as Razorpay and SMS gateways.
✓ Database Layer: Maintains consistent records of users, meals, and payments.

Security is ensured through JWT authentication, UPI-based payments, and SSL encryption. The use of a Progressive Web App (PWA) design allows accessibility even on low-bandwidth networks.

IV. SYSTEM REQUIREMENTS

➢ *Functional Requirements*

- Digital meal booking and cancellation
- Menu updates and push notifications
- Subscription-based plans
- Online payments and receipts
- Feedback and complaint registration

➢ *Non-Functional Requirements*

- *Performance:* Fast response under multiple concurrent users
- *Scalability:* Expandable to multiple hostels
- *Security:* Encrypted storage and secure authentication
- *Usability:* Clean interface suitable for non-technical users

- Software Stack: Node JS, PostgreSQL, React JS, Firebase, Android Studio

V. RESULT AND DISCUSSION

➢ *After Implementation, the System Produced Noticeable Improvements:*

- Reduced Manual Effort: Automated booking replaced coupon distribution, saving staff time.
- Greater Transparency: Digital records built trust among students and administrators.
- Optimized Resources: Forecasting functions cut food waste by roughly 20 percent.
- Higher User Satisfaction: Instant feedback helped vendors respond faster to service issues.

The framework can easily extend to other campus food or service facilities. Future work may incorporate AI-based demand prediction and IoT sensors for kitchen monitoring to further improve efficiency.

VI. CONCLUSION

This paper demonstrates that digitizing even a small service such as a hostel mess can yield major gains in efficiency and sustainability. By integrating automation, secure digital payments, and data analytics, the system supports smarter decision-making and transparent operations.

The project aligns with broader smart-campus goals and shows how technology can enhance day-to-day student services. Ongoing work will focus on advanced analytics and linking the mess system with attendance or ID-based campus platforms.

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