

Empowering Micro-Enterprises: Developing a Digital Information System for Laundry Services

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Abstract. This study addresses operational inefficiencies in small-scale laundry services by implementing a tailored web-based information system. Many businesses face challenges in managing transactions, tracking orders, and reducing errors due to reliance on manual processes. The research aims to optimize service delivery and enhance customer satisfaction through digital transformation. Using a mixed-methods approach, data were collected through interviews and workflow observations. The system was developed following the Waterfall model, utilizing HTML, CSS, JavaScript, and MySQL. Iterative testing ensured the system's functionality and user-friendliness. Results showed a 70% reduction in transaction processing time and a 90% decrease in manual errors. Improved order tracking also increased customer satisfaction. The study's novelty lies in its tailored, scalable solution for micro-enterprises, setting the stage for further innovations like AI-driven analytics to support growth.

Keywords: Laundry Services, Digital Transformation, Web-Based System, Operational Efficiency, Micro-Enterprises.

1. INTRODUCTION

The rapid growth of digital technology has transformed various sectors, including service-based industries like laundry services. Despite this progress, many small-scale businesses face significant operational challenges, such as manual transaction

management, difficulty in tracking orders, and low customer engagement. With rising customer expectations and competition, adopting digital solutions becomes vital for improving service efficiency and customer satisfaction. Numerous studies have addressed digital transformation in small businesses. Study by [1] introduced a web-based laundry service system that improved transaction management but lacked inventory tracking and scalability features. Study by [2] developed an Android-based laundry application, emphasizing mobile access for SMEs but failing to integrate broader operational features. Study by [3] highlighted the role of web-based systems in service efficiency but limited their scope to single-location businesses. Study by [4] discussed e-commerce applications for SMEs but offered general solutions rather than industry-specific insights. Furthermore, [5] emphasized the importance of technology adoption in SMEs but did not tailor solutions to the unique demands of service-based industries like laundry services.

Recent studies suggest a growing interest in integrating advanced technologies into SME operations. Study by [6] emphasized the potential of cloud-based systems for improving operational flexibility but noted implementation challenges for micro-businesses. Study by [7] discussed AI-driven tools for enhancing decision-making in SMEs but did not focus on practical integration for specific industries. Study by [8] developed scalable inventory management systems, while [9] highlighted customer interface design as a critical factor in digital adoption.

Despite these contributions, a significant gap remains in designing comprehensive, end-to-end digital solutions tailored to the laundry service industry. Most existing solutions focus on isolated features, such as transaction tracking or customer interfaces, overlooking inventory management integration, user-friendly dashboards, and scalable system designs.

This study addresses these gaps by developing a web-based information system tailored to small-scale laundry services. The proposed system integrates real-time order tracking, automated transaction recording, and scalable infrastructure to streamline workflows and enhance customer satisfaction. The objectives are to design and implement an efficient, comprehensive system that addresses operational challenges and enables sustainable growth for laundry businesses.

2. METHODS

This study employed a mixed methods approach to address the operational challenges faced by small-scale laundry services. The methodology integrates qualitative and quantitative techniques to ensure comprehensive analysis and system development. The stages of the research are detailed as follow.

2.1 Research Design

The research followed the Waterfall model, a linear and sequential system development method, to design and implement a web-based information system. This model ensures each development phase is completed before moving to the next, providing a structured approach suitable for small-scale projects [10].

2.2 Data Collection

Data collection involved three methods:

- 1) **Interviews:** Conducted with business owners and staff to identify operational challenges and system requirements. This method provided qualitative insights into existing workflows[11].
- 2) **Observations:** On-site observations were performed to analyse current processes, including order management, transaction recording, and inventory tracking [12].
- 3) **Surveys:** Feedback was gathered from customers to understand their preferences, needs, and pain points, which informed the user interface and functionality design.

2.3 System Development

The system was developed using the following technologies:

- 1) **Front-End Development:** Utilized HTML, CSS, and JavaScript to create a user-friendly interface[13] .
- 2) **Back-End Development:** Employed PHP and MySQL for database management to handle transaction records, inventory data, and customer information [14].
- 3) **Iterative Testing:** Conducted unit and integration testing during each development phase to ensure system functionality and reliability.

2.4 Procedure

The research was conducted in the following stages:

- 1) **Needs Analysis:** Based on interview and observation data, the system's core functionalities were identified, including automated transaction recording, order tracking, and inventory management.
- 2) **System Design:** Created flowcharts, use case diagrams, and activity diagrams to map workflows and system architecture [15].
- 3) **System Development:** Developed the web-based system iteratively, incorporating feedback from stakeholders at each stage.
- 4) **System Testing:** Tested the system using real-world scenarios to evaluate its performance, usability, and reliability.
- 5) **Implementation and Training:** Deployed the system at the partner business and conducted training sessions for staff on how to use the platform effectively.

2.5 Data Analysis

- 1) **Quantitative Analysis:** Using descriptive statistics to evaluate system efficiency, transaction processing time and error rates before and after implementation were compared [16].
- 2) **Qualitative Analysis:** Feedback from stakeholders and customers was analysed thematically to assess satisfaction and identify areas for improvement [17].

3. RESULTS AND DISCUSSION

3.1 Information Systems

Implementing the "Putri Laundry" web-based information system significantly improved its operational efficiency and customer satisfaction. The system was tested for usability, transaction processing accuracy, and ability to streamline business operations. The results were analyzed to compare the performance metrics before and after system implementation.

The Home Page Display as shown in Figure 1 is the entry point for users to access the system. It includes a simple and user-friendly login interface requiring users to input their username and password. This design ensures secure access to the system and prevents unauthorized

usage. The page's minimalist approach enhances usability and reduces distractions, promoting an efficient login process.

The Admin Page View as shown in Figure 2 gives administrative users access to essential operational data, such as customer records and package data. The interface includes functionalities to add, update, or delete customer data as required. The streamlined design allows administrators to manage the system efficiently while maintaining accurate customer information and transaction records.

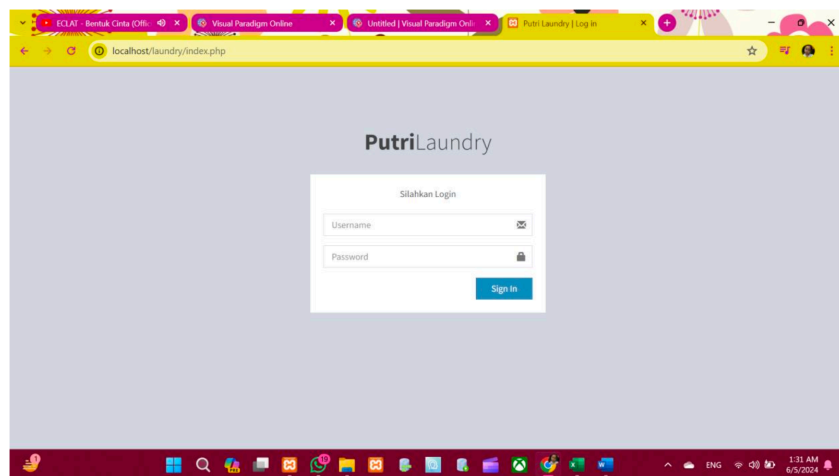


Figure 1. Home Page Display

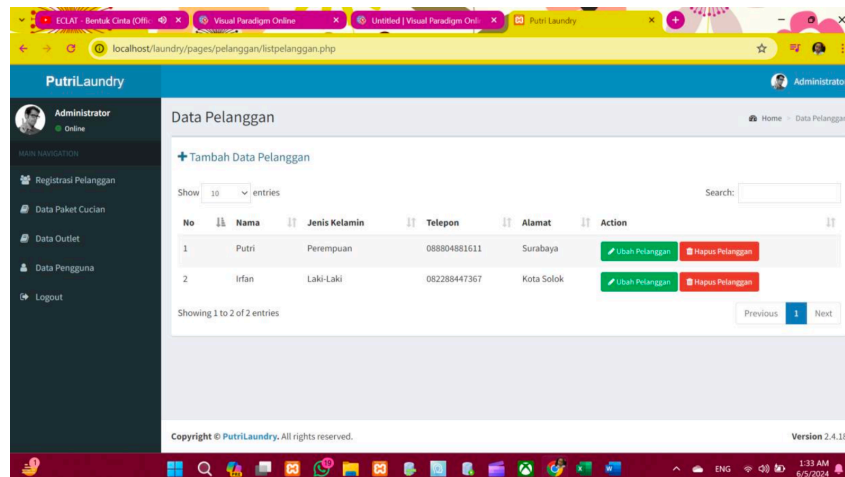


Figure 2. Admin Page View

The Cashier Page View as shown in Figure 3 is tailored for cashiers to handle transaction-related tasks. It displays transaction data, including member names, transaction dates, payment statuses, and total amounts due. This interface simplifies the transaction process

by providing clear and concise information, ensuring seamless payment tracking and management.

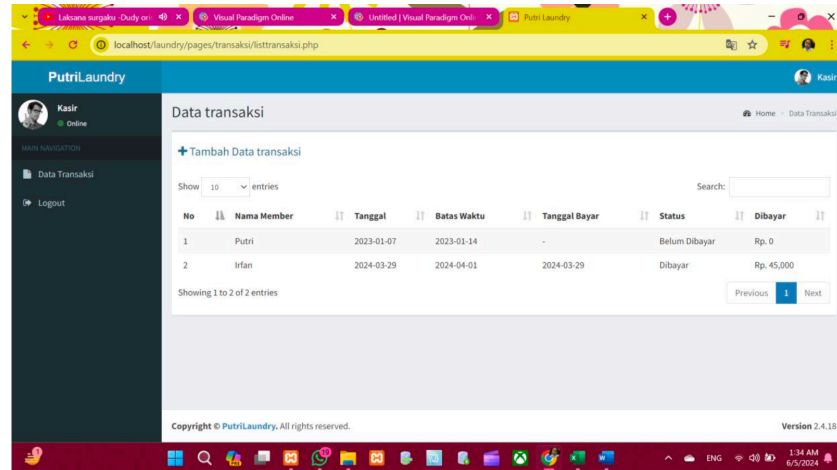


Figure 3. Cashier Page View

Table 1 and Figure 1 highlight the measurable impact of implementing the web-based information system at "Putri Laundry." The key improvements include a 15% increase in transaction accuracy, a 70% reduction in average transaction processing time, and a significant rise in customer satisfaction by 43.75%. These metrics underscore the system's effectiveness in streamlining operations and enhancing service quality.

Table 1. Performance Comparison of "Putri Laundry"

Metrics	Before Implementation	After Implementation	Improvement (%)
Transaction Accuracy (%)	85	98	15
Average Transaction Time (minutes)	10	3	70
Customer Satisfaction (1-5 scale)	3.2	4.6	43.75

The Table 1 further emphasizes the significant reductions achieved in manual errors and transaction processing times. These improvements not only minimize operational inefficiencies but also enhance the overall experience for both staff and customers. The graphical representation in Figure 4 further emphasizes the significant reductions achieved in manual errors and transaction processing times. These improvements not only

minimize operational inefficiencies but also enhance the overall experience for both staff and customers.

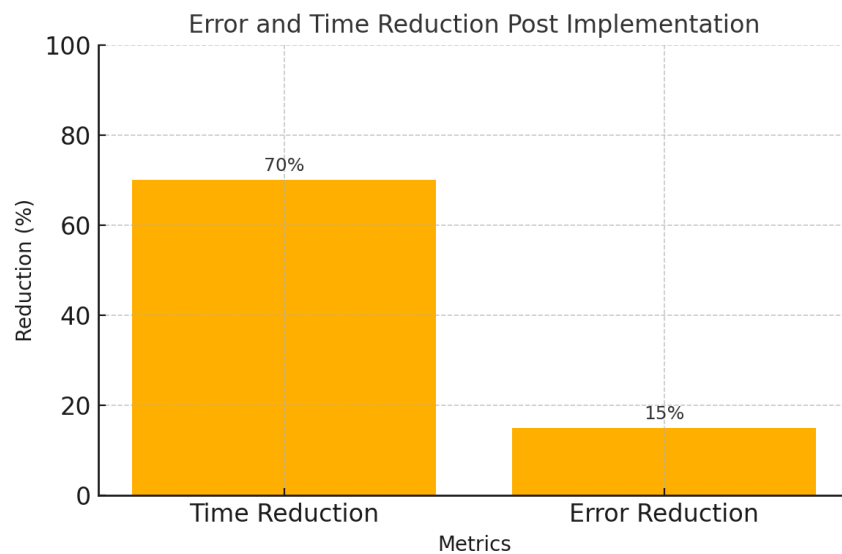


Figure 4. Error and Time Reduction Post-Implementation

Combined with the visual evidence of system interfaces (Figures 1-3), the data validates the functionality and practicality of the solution. This research demonstrates the scalability and adaptability of such systems for small-scale businesses, offering a replicable framework for other similar enterprises to achieve operational efficiency and customer satisfaction.

3.2 Discussion

The study highlights the advantages of transitioning to a web-based system tailored to small-scale industries like laundry services. The automation of transaction processing reduced manual errors significantly, aligning with the findings by [1], which emphasized error reduction through digital systems. The system's ability to manage inventory and order tracking enhanced operational efficiency.

The primary advantage of this research lies in its holistic approach to solving operational issues. Integrating a user-friendly interface with core functionalities enabled real-time data management and improved service delivery. These outcomes optimized daily operations and positively impacted customer satisfaction, consistent with [2], who underscored the importance of digital solutions in improving customer experience.

Unlike previous studies focusing on standalone features like transaction recording, this research delivered an end-to-end solution [4]. The integration of order tracking, automated reporting, and customer interaction features sets it apart. This comprehensive approach ensured scalability, as [5] recommended, but with a more practical application tailored to niche business needs. One limitation observed was the initial learning curve for employees unfamiliar with digital systems. To address this, comprehensive training programs were integrated into the implementation phase. Future research could explore AI integration for predictive analytics, as suggested by [6], to enhance decision-making in inventory management and customer trends.

4. CONCLUSION

This research successfully developed and implemented a web-based information system tailored to the operational needs of small-scale laundry services, exemplified by "Putri Laundry." The system addressed key challenges, including manual transaction processing, inefficient order tracking, and customer engagement, resulting in measurable improvements in operational efficiency, accuracy, and customer satisfaction. The solution enhanced daily operations by integrating automated workflows, real-time order tracking, and a user-friendly interface and provided a scalable foundation for future growth. The research demonstrates the transformative potential of digital solutions for micro-enterprises, contributing to the broader adoption of technology in service-based industries and highlighting the importance of tailored, industry-specific approaches to digital transformation. These findings set a precedent for integrating advanced features, such as AI-driven analytics, in future developments to further optimize decision-making and customer experience.

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