WEB-BASED E-RECEIPT IMPLEMENTATION FOR MINIMIZING CONTACT IN TRANSACTIONS

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Abstract – *This research aims to address the risk of virus transmission and inefficiencies in traditional transaction processes by developing a web-based electronic receipt (e-receipt) system using QR code technology. The study identifies physical receipts as a medium for indirect contact, particularly concerning during the COVID-19 pandemic. Using the Research and Development (R&D) method, the system was designed to convert sales transaction data into QR codes, which customers can scan with their smartphones to receive receipts digitally. The implementation was tested in a café environment to measure its operational effectiveness. The results demonstrate that the system successfully reduces service time, minimizes customer queues, and eliminates physical interaction during payment. Additionally, the system improves cost efficiency by lowering the need for paper and printing tools and reduces labor demands at the cashier point. The findings suggest that the proposed solution not only enhances public health protocols but also supports digital transformation and environmental sustainability in small business operations. It is recommended for broader adoption across service industries seeking to modernize transaction processes and improve customer experience through contactless technologies.*

Keywords: *E-Receipt; QR Code; Contactless Transaction; Web-Based System; Digital Innovation*

I. INTRODUCTION

The shift toward digitalization has significantly transformed consumer transaction behavior, especially in the aftermath of the COVID-19 pandemic. Public health measures have pushed businesses to reduce physical contact points, including those traditionally considered minor—such as the exchange of printed receipts (Manurung & Lestari, 2021). Studies show that these printed receipts not only pose hygiene risks but also contribute to operational inefficiencies and paper waste (Yusuf & Hakim, 2024). Electronic receipts (e-receipts) have emerged as a practical and sustainable alternative. They allow customers to receive proof of transactions via mobile devices, QR codes, or email, reducing the need for paper and face-to-face interaction. Arifiyanto and Masya (2021) proposed an Android-based e-receipt integrated with SMS Gateway for enhanced accessibility. Suharianto et al. (2021) successfully implemented a QR Code system in cafés to minimize ordering time and reduce contact. Similarly, Nugraha (2021) applied QR-based payments in food and beverage contexts to shorten queue times and improve customer flow.

Kosadi et al. (2021) examined how digital receipts can support financial reconciliation and reporting in SMEs, though they highlighted barriers in system integration. Rahayu et al. (2022) emphasized the contribution of e-payment platforms to financial performance, particularly when paired with user behavior analytics. However, adoption is still influenced by perceived trust and ease of use (Primadineska & Jannah, 2021; Suryani & Hidayat, 2022), which can become challenges for small enterprises unfamiliar with digital tools. Lutfhan (2022) developed a mobile-based digital receipt app tailored for small-scale retailers, noting its usability but platform dependency. Alfendah et al. (2021) linked e-money ecosystems to the national cashless society agenda, underlining the importance of QR code standardization. Other studies explored how such systems are being integrated into wider digital ecosystems: Sansprayada and Mariskhana (2021) implemented QR-based ticketing in transportation, while Ridwan and Sulistyo (2021) proposed POS systems with QR receipt output for SMEs.

Newer approaches like those suggested by Mohamad and Jannah (2023) indicate that post-pandemic recovery requires building consumer trust through simple, reliable contactless transaction systems. Sunaryo and Yuliana (2023) explored user acceptance in microbusinesses, finding that minimal learning curves increase adoption. Wijaya and Ramadhani (2022) also reported that smart receipt systems contribute to faster service and better inventory tracking in cafés and food outlets. Despite these innovations, most solutions are built on mobile OS platforms, require apps, or need third-party APIs—making them costly or technically limiting for micro-enterprises. This study addresses that gap by designing a lightweight, web-based e-receipt system using QR code technology. The goal is to offer a low-barrier, browser-accessible solution that minimizes physical contact, increases service efficiency, and supports digital transformation among small, service-oriented businesses.

II. LITERATURE REVIEW

The implementation of e-receipt systems is closely tied to the growing demand for digital transaction technologies and contactless services, particularly following the COVID-19 pandemic. Various studies have investigated the development and application of e-receipts, QR codes, and related innovations in both large and small-scale business contexts. Arifiyanto and Masya (2021) proposed an Android-based e-receipt application integrated with SMS Gateway to reduce paper usage and streamline transaction documentation. Similarly, Suharianto et al. (2021) designed a QR code-based ordering system to minimize physical contact and improve service speed in café environments. Nugraha (2021) also applied QR-based payment systems to reduce queuing time and support contactless interactions.

Kosadi et al. (2021) examined how digital receipts contribute to financial reconciliation and reporting in SMEs. While offering clear benefits in data management, they noted challenges in integrating such systems with existing business processes. Rahayu et al. (2022) emphasized the role of digital payment innovation in boosting financial performance, particularly when businesses leverage customer behavior data. Primadineska and Jannah (2021) focused on perceived security and trust as major factors influencing electronic payment adoption. Their findings align with those of Suryani and Hidayat (2022), who found that perceived ease of use and usefulness strongly predict digital tool acceptance. Lutfhan (2022) explored mobile-based receipt systems for small-scale retailers, concluding that usability was high but implementation remained limited by platform dependency.

The role of e-receipts in broader ecosystems is also discussed by Alfendah et al. (2021), who linked digital receipts to the expansion of cashless society initiatives supported by national standards such as QRIS. Sansprayada and Mariskhana (2021) extended the use of QR codes in transport ticketing, showing operational benefits through reduced manual input. Ridwan and Sulistyo (2021) proposed a web-based point-of-sale system that outputs receipts via QR codes, improving efficiency for SMEs. Emerging studies during the post-pandemic recovery phase highlight the importance of simplicity and trust in digital systems. Mohamad and Jannah (2023) identified that consumer trust in contactless solutions is influenced by reliability and low complexity. Sunaryo and Yuliana (2023) found that micro-business owners prefer systems with intuitive interfaces and minimal technical barriers. Wijaya and Ramadhani (2022) reported that smart receipt systems help optimize inventory tracking and speed up service in food service operations.

Despite these innovations, most systems rely heavily on mobile operating systems, downloadable apps, or third-party platforms. This creates technical and financial entry barriers for micro-enterprises. Therefore, there is a need for lightweight, web-based e-receipt solutions that offer similar benefits but with reduced complexity and infrastructure requirements.

III. METHODS

This research adopts the Research and Development (R&D) methodology, which is appropriate for the creation and evaluation of new products, particularly in the field of information systems. The goal is to design, develop, and test a web-based e-receipt application using QR code technology that minimizes physical contact during transactions in small business environments such as cafés. The R&D process in this study follows a simplified adaptation of the model proposed consisting of the following key stages.

Preliminary Study and Problem Identification:

1. A preliminary analysis was conducted to observe current transaction practices in a café. The study identified that printed receipts contributed to extended service time and unnecessary contact between staff and customers. The problem was contextualized within the broader concern of health risks and the need for digital transformation in small-scale service operations.
2. Data Collection
   Supporting data were gathered through observation, interviews with café staff and customers, and literature review on QR code applications and digital transaction systems. Technical data regarding QR code generation and web-based system development were also collected.
3. Product Design
   A prototype of the e-receipt system was designed using web technologies including PHP for backend development, MySQL for database management, and a QR code library for dynamic code generation. The system includes modules for transaction input, automatic calculation, QR code conversion, and receipt visualization on mobile devices.
4. Product Validation and Testing
   The system was implemented in a real café setting for testing. Transaction data before and after implementation were compared to evaluate improvements in service speed and reduction in physical contact. Observations and user feedback were collected to identify technical or usability issues.

5. Revision and Finalization
   Based on the feedback from the trial implementation, minor revisions were made to improve the user interface and enhance QR code responsiveness on various mobile devices. Contingency options were also included, such as manual receipt fallback in the event of QR code scanning failure.
6. Dissemination and Implementation
   The final product was deployed in full within the test environment, and a final performance evaluation was conducted. The system was deemed functional and effective in minimizing contact, reducing service time, and enhancing operational efficiency.

This structured approach ensures that the application developed is not only technically feasible but also practical, user-friendly, and adaptable to other small business contexts with minimal resource investment.

IV. RESULTS AND DISCUSSION

The developed e-receipt system was implemented and tested in a café environment to evaluate its functionality, efficiency, and impact on physical interactions during transactions. The application successfully converted sales transaction data into QR codes, which were then scanned by customers to receive their digital receipts on personal mobile devices. Quantitative comparisons were conducted to measure service performance before and after the system's implementation. Prior to using the e-receipt system, the average time to complete a transaction ranged between 4–5 minutes, involving manual order entry, receipt printing, and physical handover. After implementation, the average service time reduced to 1–2 minutes, as transactions were automatically processed and QR codes were generated instantly. This represented a 50–60% improvement in efficiency.

Furthermore, the number of daily customer queues decreased significantly. Initially, up to 6 customers could be seen waiting during peak hours; this number was reduced to 2–3, as the transaction process became faster and more seamless. The café also reported a reduction in the need for two cashier staff to just one, reflecting labor efficiency. System reliability was high, with QR codes successfully scanned by various smartphone brands. Technical contingencies, such as network failures or scanning errors, were mitigated by preparing printed receipts as backups and providing a mobile hotspot for connectivity when needed.

Table 1. Table 1. Operational efficiency comparison before and after the e-receipt system implementation.

Operational Parameter	Before Implementation	After Implementation	Impact / Outcome

Average Transaction Time	4–5 minutes	1–2 minutes	Reduced by 50–60%
Queue Length During Peak Hours	6 customers	2–3 customers	Shorter queue, faster turnover
Number of Cashier Staff Needed	2 persons	1 person	Labor cost reduced
Receipt Delivery Method	Printed paper receipt	QR code digital receipt	Contactless and paperless
Customer Interaction Level	Direct handover	Scan via mobile device	Minimal physical contact
Paper and Ink Usage	High	None	Eco-friendly and cost-saving
Technical Reliability (QR scan)	Not applicable	High (compatible with various smartphones)	Smooth implementation

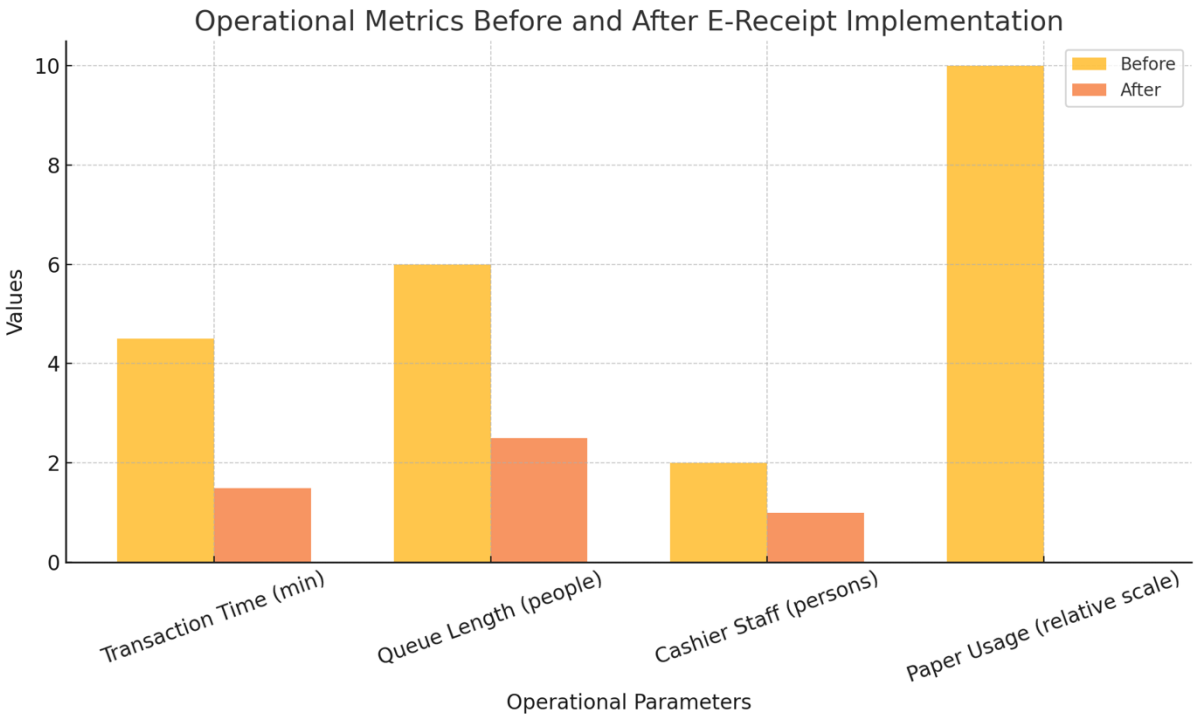

Figure 1. Operational performance before and after the implementation of the e-receipt system.

The implementation of a web-based e-receipt system provided several key benefits:

1. Contact Reduction:
   By replacing printed receipts with QR-based digital receipts, the system eliminated the need for direct handover, supporting health protocol compliance during and after the pandemic.
2. Time Efficiency:
   Automated calculations and QR generation accelerated the transaction process, reducing customer wait times and improving service throughput.

3. Cost and Resource Efficiency:
   The café reduced its usage of receipt paper, printer ink, and related maintenance costs, while also decreasing staffing needs at the cashier point.
4. User Experience:
   Customers found the system intuitive, and scanning QR codes to retrieve their receipts was both novel and convenient. This aligns with broader trends toward self-service and mobile-based transactions.

These findings confirm prior research highlighting the effectiveness of QR code-based systems in enhancing transaction speed and safety (Suharianto et al., 2020; Nugraha, 2021). However, this study differs in its focus on low-cost web-based solutions that can be adopted even by micro-enterprises with limited digital infrastructure. The success of the system demonstrates that digital transformation is not exclusive to large organizations. With minimal development effort and infrastructure investment, small businesses can achieve meaningful operational improvements while promoting sustainable and hygienic business practices.

V. CONCLUSION

This research demonstrates that the implementation of a web-based e-receipt system using QR code technology is an effective solution for minimizing physical contact during transactions, improving service speed, and enhancing operational efficiency in small business settings. By converting traditional printed receipts into scannable digital formats, the system supports health protocols, reduces paper waste, and streamlines the point-of-sale process. The results show significant improvements in transaction time, customer queue management, and labor efficiency. The system proved to be reliable, user-friendly, and adaptable to a real café environment, with minimal infrastructure requirements. These findings validate the feasibility of lightweight digital solutions for micro and small enterprises that often lack access to advanced technology platforms.

This study contributes to the growing body of research on digital transformation in the retail and service industries, particularly under pandemic-related constraints. It offers a practical and replicable model for businesses seeking to adopt contactless and sustainable transaction technologies. Future research may explore integration with broader payment systems, user data analytics, and multi-platform deployment to further enhance the system's scalability and utility.

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