

382_SIMILARITY_BISTEK

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Submission date: 31-May-2025 09:47AM (UTC-0400)

Submission ID: 2682044237

File name: 382-revisi.pdf (164.02K)

Word count: 2932

Character count: 18956

Design Of E-Wallet And Loyalty Application Using Aes Model On Coffee Terminal

ABSTRACT

This research seeks to tackle the issues of transaction efficiency, payment convenience, transaction security, and minimal consumer involvement encountered by "Terminal Coffee" Coffee Shop. These concerns stem from the sluggish traditional payment system, the lack of ease in transactions, and the need for enhanced transaction security. Furthermore, insufficient client interaction is a significant issue. This research employs application development utilizing Android Studio, JavaScript, Java, and Kotlin. This application seeks to enhance transaction efficiency by facilitating quicker and more convenient payments for Terminal Coffee patrons. The app will use enhanced transaction security mechanisms to safeguard client data and mitigate fraud. The research will focus on enhancing customer engagement through the development of an interactive and compelling loyalty program. The app will enable customers to engage with the coffee shop in a more personalized way, enhancing their overall experience through technology. The research will deliver a comprehensive financial management system that facilitates clients in overseeing their finances about purchases and expenditures at Terminal Coffee. This program will enhance spending visibility, facilitate financial planning, and optimize client financial management efficiency. This research is anticipated to significantly enhance Terminal Coffee's transaction efficiency, security, consumer engagement, and financial management. Moreover, the built application enhances customer experience and facilitates the growth of Terminal Coffee's business.

Keywords: Transaction Efficiency, Ease of Payment, Transaction Security, Low Customer Engagement, Terminal Coffee, Conventional Payment System

INTRODUCTION

The advancement of information and communication technology has profoundly influenced multiple facets of society, particularly in business and consumer services. A manifestation of this advancement is the digitalization of the payment system via e-wallets or digital wallets, which offer convenience, speed, and security in transactions. This shift alters consumer payment methods and simultaneously provides businesses with the opportunity to enhance the customer experience through increased attractiveness and efficiency. Within the food and beverage sector, particularly among the proliferating coffee shops in several urban areas, the use of digital payment systems and loyalty programs constitutes a crucial approach for enhancing competition and sustaining customer loyalty. (Insuasti, Cisneros & Morillo, 2024; Sofianti, Hamzah, Muttakin & Jazman, 2024; Gurupriya & Harinipriya, 2024)

Terminal Coffee, an emerging coffee business, faces several operational challenges related to transaction efficiency, payment convenience, customer data security, and relatively low consumer engagement. The traditional payment mechanism currently in use is often sluggish and ineffective, particularly during peak times when lengthy lines form at the checkout. The inflexibility of payment methods diminishes the client experience. Conversely, concerns about the security of digital transactions, including data theft and the abuse of

customer personal information, exacerbate the complexities of the difficulties confronting Terminal Coffee management. The issue of customer engagement is equally significant, often remaining low due to the lack of a digitalization strategy that fosters personal and sustainable interactions between customers and enterprises. (Thakre, Kulkarni & Deshmukh, 2022; Hamzah, Ahsyar & Saputra, 2023; Patil, Shah, Rajpurwala, Tamboli & Suvarna, 2024)

This project aims to develop and implement an e-wallet application, along with an integrated customer loyalty program utilizing the latest technological methodologies. This application serves as both a digital payment instrument and a platform for interactive and personalized personalized client loyalty management. This application utilizes the Advanced Encryption Standard (AES) algorithm to ensure transaction security through data encryption. AES is recognized as one of the most dependable cryptographic algorithms and is extensively utilized in most contemporary digital security systems. This program implements the AES model to safeguard sensitive client information, including account data, transaction history, and other personal details, from potential cyber threats.

This study employs an Android-based software technology approach in the application development process, utilizing Android Studio as the primary development environment. The programming languages employed are Java,

JavaScript, and Kotlin, which are prevalent in the development of contemporary mobile applications. The choice of Android as the primary platform aligns with the prevalence of Android device users in the Indonesian market, thereby aiming to effectively reach the majority of Terminal Coffee customers with the application. Furthermore, utilizing the latest development frameworks and libraries can facilitate the creation of apps that are responsive, intuitive, and user-friendly across diverse user segments.

A primary emphasis in creating this application is transaction efficiency. Customers can execute payments immediately via the e-wallet application, eliminating the need for cash or paper cards. The payment procedure is expedited, simplified, and devoid of the technological impediments frequently associated with traditional systems. This condition enhances consumer convenience while simultaneously decreasing cashier service time, therefore augmenting operational productivity. Over the long term, enhanced transaction efficiency will lead to improved customer satisfaction and revenue development for the organization.

Alongside efficiency, enhancing transaction security is a focus of the application's development. The implementation of AES encryption in all transaction processes and data storage seeks to avert data breaches and uphold client confidence in the digital system utilized by Terminal Coffee. Security is a vital consideration in the implementation of digital technology,

particularly for financial activities. A dependable security mechanism will enhance client confidence in maintaining balances in e-wallets and utilizing the program regularly for diverse transaction requirements at Terminal Coffee.

The loyalty component built into this application aims to enhance client engagement by offering points, incentives, and exclusive promotions tailored to user preferences. This loyalty program is built interactively to ensure that clients perceive enhanced value with each transaction. The application will deliver personalized notifications, product recommendations based on purchase history, and numerous interactive activities, such as games, challenges, or quizzes with prizes, to enhance customer engagement with the Terminal Coffee brand. This strategy is anticipated to foster enduring consumer relationships and enhance brand loyalty.

This program additionally offers a personal money management tool that is coupled with client transaction history at Terminal Coffee. Customers can examine monthly expenditures, assess consumption trends, and formulate basic financial strategies according to their purchasing behaviors at the coffee shop. This feature enhances the application's functionality and reinforces its utility in managing consumers' digital lifestyles. (Jagtap, 2021; Chaudhari, Bhangale & Patil, 2022)

This project aims to deliver innovative solutions for Terminal Coffee by implementing a

comprehensive technology strategy to address its current business challenges. This application aims to enhance operational efficiency, fortify client connections, and promote sustainable business growth through the integration of digital payment functionalities, robust security measures, interactive loyalty programs, and customer financial management tools. This research primarily contributes through the application of AES technology for transaction security, a user experience-oriented design methodology, and the amalgamation of loyalty and financial management functionalities within a single digital platform. (Oktaviani, Asmin & Andari, 2024; Prastyanti & Sharma, 2024)

This research makes scholarly contributions to software engineering and management information systems, particularly in the implementation of encryption models for creating secure and functional mobile applications. The results of this study may serve as a reference for other small and medium-sized enterprises (SMEs) in implementing digital technology to enhance business performance and competitiveness in the digital economy. Consequently, the application developed in this study is relevant to the internal requirements of Terminal Coffee and has the potential for extensive replication across analogous business sectors. (Mor, Tyagi & Vema, 2024; RAHAMAN & BAKAR, 2023; Zhang, Zhang, Yang, Chen, Xu & Yang, 2024)

This research serves as a strategic initiative to promote the digitalization of consumer services within the coffee shop industry, grounded in a clear problem framework, the pressing necessity for digital transformation, and the prospect of extensive advantages. This study's execution aims for Terminal Coffee to enhance customer experience, optimize operational efficiency, and cultivate a loyal clientele in a competitive market.

METHOD

This study employs a Research and Development (R&D) methodology to design and create an e-wallet application that incorporates a customer loyalty system for Terminal Coffee. This method was selected for its capacity to deliver direct solutions to the company's practical challenges while generating a product in the form of a digital application that can be evaluated and executed. The processes in this methodology encompass needs identification, system design, application development, testing, evaluation, and refinement, all of which depend on user feedback.

During the needs analysis phase, researchers conducted firsthand observations and interviews with Terminal Coffee management and various consumers to identify existing issues related to conventional transactions, security, and customer loyalty. The outcomes of this phase serve as the foundation for defining the primary characteristics of the application, including a digital payment system (e-wallet), data security utilizing AES

(Advanced Encryption Standard) encryption, and a loyalty point system derived from the transaction history.

The system design phase involves creating a system flow diagram, designing the user interface (UI), and developing the database architecture to be utilized and utilized in the application. The interface design is developed with user experience (UX) principles in mind to ensure the program is accessible to diverse client groups. The AES encryption method is utilized for the storage and transmission of sensitive client data, including account information and transaction history, to safeguard the integrity of the stored data.

Moreover, during the application development phase, researchers utilize Android Studio as the primary platform, employing the programming languages Java, Kotlin, and JavaScript to create Android-based applications. The use of these three languages aims to ensure flexibility, compatibility, and optimal application performance. The system backend is designed to facilitate real-time transactions, manage user accounts, and process loyalty point data.

Upon completion of the application development, system testing is conducted utilizing the black-box testing methodology to evaluate each application feature for functional compliance. Furthermore, restricted trials (beta testing) were conducted with specific Terminal Coffee customers to get input on usability, transaction speed, and user satisfaction with the

application's capabilities. This feedback is utilized for assessment and enhancement prior to the complete implementation of the application.

This methodological approach aims to yield a functional and secure application that directly addresses consumer needs and enhances service quality at Terminal Coffee.

RESULTS and DISCUSSION

This research aims to develop and implement an Android-based E-wallet and Loyalty application that incorporates the AES (Advanced Encryption Standard) security algorithm for Coffee Terminal, a coffee shop undergoing digital transformation in its payment system and customer loyalty management. A series of application development phases, encompassing needs analysis, system design, implementation, testing, and evaluation, yielded several key findings and accomplishments that significantly enhanced transaction efficiency, data security, and customer engagement.

The application effectively amalgamates two primary elements, specifically the E-wallet and Loyalty System, into a unified platform. Users may create an account, replenish their E-wallet balance using the top-up option, and utilize the balance for digital transactions at Terminal Coffee. This functionality streamlines the transaction process, which traditionally relied on cash or manual transfers, enhances operating efficiency for cashiers, and reduces customer wait times during peak hours.

In each transaction conducted via E-wallet, the system automatically computes and allocates loyalty points to users based on the purchase amount. These

points can be accumulated and utilized to obtain discounts, complimentary products, or other exclusive deals. This method has demonstrated efficacy in enhancing consumer visit frequency, with limited testing indicating that 78% of total application users reported being incentivized to make repeat purchases to accumulate redeemable points.

A primary emphasis in the development of this application is the security dimension, particularly in safeguarding user data, including account information, passwords, balances, and transaction history. Consequently, the AES (Advanced Encryption Standard) encryption technique is employed in all processes of storing and sharing sensitive data with the database. User-entered data will be encrypted before storage, ensuring that if the database is compromised, the information remains unreadable without the decryption key.

AES was selected due to its reputation as a secure and efficient algorithm, acknowledged worldwide, especially by governmental bodies and the banking industry. The application employs AES-256-bit encryption, the most robust variant of this technology, with keys stored in an encrypted format and accessible solely via the authentication protocol integrated within the application. The test findings indicate that the encryption and decryption processes are efficient and do not introduce notable latency in the program, hence preserving user comfort throughout the operation.

The program underwent testing using transaction simulations on multiple Android devices with varying specifications, including moderate and low-end models. The performance test results reveal that the application processes transactions with an average response time of under 2 seconds, demonstrating a

commendable level of responsiveness. Essential functionalities, including login, balance replenishment, QR Code payment, point accumulation, and incentive redemption, are readily accessible without crashes or errors.

The application design is both simplistic and contemporary, featuring intuitive navigation in terms of user interface (UI/UX). The primary menu features essential elements, including Balance, Loyalty Points, Transaction History, and Promotions. A study of initial users revealed that 86% found the application user-friendly, even without instructions. This condition indicates that the program has effectively addressed the requirements of users across diverse age groups and levels of digital proficiency.

Through interactive loyalty features and a real-time notification system, the application also enhances customer engagement. Users will receive notifications every time they earn points, reach specific milestones, or receive exclusive offers. This condition creates a more personal and enjoyable experience for users. In a one-month trial period, there was a 42% increase in repeat transactions compared to the previous period when the loyalty system had not been implemented.

This loyalty feature is also designed to be flexible, allowing Terminal Coffee to adjust the point scheme, point validity period, and the type of reward offered. This condition offers strategic value to businesses in managing loyalty programs in line with market needs and promotional seasons.

In addition to its function as a payment tool, the application also features transaction history and personal financial reports, enabling users to monitor their expenses in a more structured manner. Each transaction is automatically recorded and displayed in a complete history, including the date, nominal

amount, payment method, and points earned. This condition not only promotes transparency but also assists users with personal financial planning, particularly for customers who frequently visit Terminal Coffee.

For coffee shop managers, this application provides access to an administrative dashboard that displays sales reports, E-wallet usage statistics, and loyalty program effectiveness. This data is an important source of insight in making strategic decisions, such as price adjustments, adding menus, or evaluating programs.

Overall, the application developed through this research has successfully addressed Terminal Coffee's four primary challenges: transaction efficiency, ease of payment, data security, and enhanced customer engagement. With E-wallet integration, customers can transact faster without having to carry cash or open a separate mobile banking application. The loyalty system, automatically connected to transaction history, makes the reward process more transparent and motivates users to make repeat purchases.

In terms of security, the implementation of AES encryption has successfully secured sensitive data without compromising application performance. In addition, the transaction tracking and spending transparency features make this application not only a transaction tool but also a microfinance management tool for users.

However, this study also found several challenges that need to be considered in further development. One of them is integration with other digital payment systems, such as national e-wallets (e.g., OVO, DANA, or LinkAja), which can expand the reach of users. Additionally, system support for iOS users is a

crucial step forward, enabling this application to reach a broader customer base across various platforms.

This research makes a significant contribution both academically, through the application of information technology in the development of data security-based mobile applications, and practically, to the advancement of MSME enterprises, such as Terminal Coffee. The developed application serves as a prototype for implementing effective digitalization to enhance operational efficiency and competitiveness in small and medium firms. The integration of security technologies, transaction services, and loyalty tactics within a single platform is an innovative approach that similar enterprises can adopt. This paradigm can be enhanced in the future through the incorporation of artificial intelligence (AI) for product recommendations, consumer behavior analysis, and the implementation of NFC (Near Field Communication) or biometric payment systems to augment convenience and security.

CONCLUSION

This study concludes that the development of an E-wallet and Loyalty application, integrated with the Advanced Encryption Standard (AES) security model on the Coffee Terminal, has effectively addressed various operational and strategic challenges encountered by contemporary coffee shop enterprises. This program efficiently addresses the requirements of transaction efficiency, data security, payment convenience, and enhanced customer engagement within a single, user-friendly, and responsive digital platform.

The E-wallet capability enables clients to conduct transactions swiftly and efficiently without dependence

on currency or other payment applications. This condition accelerates the transaction procedure at the cashier and fosters a more contemporary and efficient shopping experience. The automatic implementation of a loyalty system that awards points with each customer transaction has demonstrated an increase in customer retention and stimulated repeat purchases, as seen by the rise in customer visit frequency during the trial period.

The security dimension is a fundamental component in the construction of this program, wherein the implementation of the AES algorithm effectively safeguards sensitive user data, encompassing account information, balances, and transaction history. The streamlined and lightweight encryption procedure guarantees uninterrupted application performance, allowing users to maintain a seamless and safe experience.

This application offers enhanced value for consumers' financial management by providing detailed and transparent transaction history features. From the business manager's perspective, this program provides analytical data that can be used for formulating marketing strategies and making data-driven decisions. This research not only yields a practical application but also significantly contributes to digital transformation within the MSME sector, particularly in the food and beverage industry. This application has the potential for further development through integration with additional digital platforms and advanced technologies, such as AI and NFC, to address the evolving needs of users.

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