International Journal of Scientific Research & Engineering Trends
Volume 10, Issue 5, Sept-Oct-2024, ISSN (Online): 2395-566X

A Comprehensive Web-Based Application for Digital Book-Keeping, Payment Process, and Secure Peer-to-Peer Transaction

Assistant Professor Shivangi Sharma[1], Devansh Gautam[2], Sanjana Rajput[3], Ritik Ghosh[4], Purva Pardhi[5]
Oriental Institute,Bhopal, Madhya Pradesh[1]
Bechelor's of Technology, Department of Computer Science and Business System,
Oriental Institute of Science and Technology, RGPV University, Bhopal, Madhya Pradesh, India[2,3,4,5]

Abstract- This paper presents the designing of a web-based financial application that implements digital bookkeeping and payment management features considering the needs of small and medium-sized businesses (SMBs). Identified financial management challenges for SMBs to track their expenses and debts as well as to make UPI-based payments are considered. The added feature of the app is the sound peer-to-peer payment with state-of-the art technologies including usage of biometric authentication, face recognition, and near-field communication. This will enable smooth financial transactions and, consequently, enhance security thereby reducing reliance on intermediaries and risk of frauds. It then delves into technical architecture, security features, and user experience, extending that with business implications of the application in a scenario of commission-based benefits. The thesis then discusses market potential and scalability of the app.

Index Terms-Digital Bookkeeping, UPI Payment Integration, Peer-to-Peer Transactions, Biometric Authentication, Near-Field Communication (NFC), Small and Medium-Sized Businesses (SMBs), Small and Medium-Sized Businesses (SMBs)

I. INTRODUCTION

1. Background

Small and medium-sized businesses, especially in emerging markets such as India, form the backbone of many economies. However, most these businesses handle their finances using lagging methods, such as manual bookkeeping and paper-based records. This constrains how they track debts and payments, and inefficient and error-ridden processes tend to impede their growth. Now that digital solutions have dawned, small businesses are finally being allowed to join the technology bandwagon, but the accessibility is still not leveled, usability questionable, and security on top of these is an issue. The existing platforms are mainly based on single solution to financial management. In that, the owner will have multiple apps that need to handle multiple things simultaneously, which requires time as well. Consequently, this paper recommends a more integrative solution by including digital bookkeeping, UPI payments, and secure peer-to-peer payments in one single web application.

2. Purpose

The intention of this paper is to design, develop, and analyze the web-based application which would provide the holistic solution of managing financial activities for a small-sized medium business group. The application ties the best digital bookkeeping and payment features with security and ease of use. The integration of biometrics, face recognition, and NFC technology has ambitions to enforce more secure peer-to-peer transactions, which are fast gaining popularity. The paper does discuss the technology, security, and business aspects associated with such an application while proposing its importance as a useful business tool for small to medium-sized businesses to run their financial affairs in secure and efficient ways.

II. LITERATURE REVIEW

There have been numerous studies on the benefits of digitalizing financial management for small businesses. So far, using digital bookkeeping has reduced errors, been effective in tracing debts, and even managed cash flow. Digital payments within India have even gone up, such as through UPI, allowing smooth real-time transactions. One of the major concerns when doing any transaction related to finances is security. Earlier studies have established the following as methods of increasing security and reducing deceitful activity while making online payments: biometric authentication, face recognition, and NFC. Digital bookkeeping applications such as Handbook and digital payment platforms like BharatPe have addressed specific areas required by SMBs. However, there still exists a lacuna that has provided an all-inclusive

© 2024 IJSRET

solution that is synchronized both in functionalities and with improved peer-to-peer payment security features. This paper tries to fill the gap by incorporating all the features into one web-based application.

III. SYSTEM DESIGN AND DEVELOPMENT

1. Requirements Gathering

The development process started by gathering the requirements both functional and non-functional from potential users. To this effect, surveys and interviews were held with a sample population of small business owners to understand their specific needs. Important requirements are tracking expenses, managing debts owed by customers, reminding payments, and receipt of payments via UPI. Users have expressed concern toward security, especially in peer-to-peer transactions. Hence, in response to these requirements, biometric and NFC-based authentication was incorporated. Non-functional Requirements focused on application ease of use, scalability, and security. With the extensive use of smartphones and Web technologies, the application had to be mobile-friendly, secure, and scalable enough for many users.

2. Architecture

The architecture of the proposed application uses the modern multi-tiered approach with separation of the front-end, back-end, and data layers. The front end of the application is developed using responsive web technologies, making it perfectly workable from desktop to mobile devices. In the design, it aims at simplifying both financial management-related tasks and making it more user-friendly. It uses cloud-based services on the back end that allows for high availability as well as scalability and large storage. A robust design of the database ensures efficient space for storing the data along with retrieval without any form of lag. This makes possible the tracing of every transaction and payment in real time. For instance, secure APIs are applied in managing integration with such biometric authentication, face recognition, and NFC technologies for peer-to-peer payments, therefore encrypting any sensitive data in case it is transmitted.

Modules for real-time reporting are also integrated into the architecture to enable users to produce financial reports and subsequently analyze the business performance.

3. Security Features

The proposed application is heavily distinguishable as much concentration is put on security and security features. Due to the inconvenience of making peer-to-peer payments, it is vulnerable to fraud and unauthorized access. To overcome all these threats, the app uses multiple layers of security. There are provisions of biometric authentication in the form of fingerprint and face recognition, ensuring that no unauthorized user can come into the app and approve the payment. With the deployment of NFC technology, it ensures safe, contact-less payment and decreases the possibilities of data interception while making transactions. Besides these features, the application encrypts user data that might seem sensitive. All financial transactions go end-to-end encrypted to protect the information of the customer and the payment details. Also, the application supports 2FA along with providing another layer of security for its users.

IV. TECHNOLOGY OVERVIEW

The new web financial application uses a wide range of the latest modern technologies to offer a simple and risk-free environment for its users. Hereafter is the overview of the key technologies applied at the development and deployment level of the application:

1. Front-End Technologies

The front-end of the application has been developed using a mix of the following technologies:

HTML5, CSS3, and JavaScript are the core web technologies that define the structure of a Web page, its styling, and the interactive behavior of the user interface. In developing the application, HTML5 is used in creating an element that is friendly to all modern browsers, whereas CSS3 provides richly enhanced visual presentations. JavaScript is also applied in terms of interactivity and responsiveness in making sure the user experience would be smooth.

The use case for React. js is the building of a dynamic, modular, and responsive user interface. Furthermore, the design of the application components in React makes it possible to reuse the UI components, which increase its efficiency in development and maintainability even further. Fast rendering and state management are also supported by React, proving to be really essential for handling real-time data that includes transactions and financial records.

Make use of the Bootstrap front-end framework to provide mobile responsiveness and a good look-and-feel for the application. The benefits of using Bootstrap consist of pre-designed UI components along with a grid system that can speed up the actual design with the assurance that the application looks good on all devices.

2. Back-end Technologies

The back-end of the application is implemented using these technologies:

Node. js with Express. js: The above application's back-end is chosen for Node. js because it handles asynchronous operations very efficiently, which are very critical in applications requiring real-time updates, like payment applications. Express. js Is a strong set of features from a

© 2024 IJSRET

Node. js framework, providing the tools for building web applications and including routing, middleware, and request handling.

RESTful API: The application uses RESTful APIs to enable communication from the front-end to the back-end, thus allowing the front-end to request any data or services such as, for instance, a history of transactions or even biometric verification in a standardized way.

MongoDB: MongoDB is a NoSQL-based data storage. Because MongoDB is document-based, it allows the flexibility to store diverse types of data, for example, the details of users, records of transactions, payment histories, and so on. It provides excellent scalability that helps deal with massive volumes of data generated by the integration of several companies.

3. Security Technologies
Many technologies and techniques have been implemented to insure the security of transactions.

Biometric Authentication: Biometric data such as fingerprint or face recognition will be captured using SDKs and incorporated into the authentication. It uses technologies such as Apple's Face ID and Google's biometric authentication APIs. The biometric data is encrypted and securely sent to the server for verification, hence maintaining privacy and security.

NFC: It is a Near-Field Communication technology that enables peer-to-peer contactless payments. In this case, it utilizes NFC libraries compatible with smartphones for the secure exchange of information during transactions, and because of this, they are safe and fast modes of payment without physical contact.

OAuth 2.0 and JWTs: The OAuth 2.0, along with the use of tokens in JWT, has been used to authenticate and authorize a user. OAuth 2.0 ensures safe access to user accounts, and the exchange of user authentication data for server-to-client and vice versa is easy through secure JWT tokens, thus reducing the risks of session hijacking.

Use encryption such as AES & RSA to encrypt all sensitive information, including payment and personal identification numbers. Although the data traveling over the network is intercepted during transmission, it will not be readable without the right decryption keys.

4. Payment Integration
The core payment gateway that has been provided to the application is UPI. Due to the availability of instant money transfers between bank accounts, the UPI system is a fast and secure payment method for customers. Therefore, UPI service provider APIs are used for processing real-time payments. Third-party SDKs are integrated via an individual provider such as Part or Razor pay to avail additional payment methods. This would enable users to make payments with a credit/debit card and wallets in addition to others.

5. Cloud Infrastructure
The application will be hosted on a cloud infrastructure where scalability, security, and high availability exist.

AWS (Amazon Web Services): The application is hosted on Amazon Web Services, using services like virtual servers with EC2, data storage using S3, and even an RDS for backup and recovery. Amazon Web Services is monitoring the application's performance via CloudWatch.

Docker: Containerization with Docker makes sure that an application can be deployed across different environments with ease. The Docker container includes the application along with its dependencies in packages that make sure the deployments are consistent and scalable.

6. Processing Real Time Data

Web Sockets: The use of Web Sockets is for facilitating real-time notifications and updates, like instant payment confirmations or reminders. Communication becomes faster, and latency is reduced against requests through traditional HTTP due to a persistent connection between a client and the server.

7. Testing Frameworks
Jest & Mocha For testing an application, Jest would be the tool used for front-end testing, while Mocha would be applicable to do back-end testing. Both test frameworks will insure that the application does not have bugs by allowing unit tests, integration tests, and end-to-end tests to be written and run.

V. IMPLEMENTATION AND TESTING

1. Feature Integration
The application integrates several features tailored to address the varied needs of SMBs. Digital bookkeeping module enables users to create ledgers, track debts, and to generate invoices. The UPI payment module enables the user to receive money in real time with minimal dependence on cash, but with a vast enhancement in the management of cash flows.

The biometric authentication and NFC-based peer-to-peer payment feature allows users to transfer money online directly without the presence of a third-party mediator. This feature is very important to businesses who often generate or receive payments from its suppliers or customers who use other means of payment aside from cash.

© 2024 IJSRET

2. Testing

The application was further tested with various tests to comply with the requirements of security, performance, and usability of financial transactions. Testing included unit testing, integration testing, and UAT, but what holds more interest is the security testing, which penetrated them as potential vulnerabilities by penetration testing. Much extensive testing was done on the biometric and NFC authentication methods to insure that they functioned correctly under worst conditions. Performance tests were executed to insure that the application could handle many transactions without noticeable degradation in performance. Usability tests were conducted with the owners of SMBs to derive feedback regarding the user interface and the overall experience.

VI. BUSINESS IMPLICATION

1. Market Potential

The market for digital financial solutions in the SMB sector is vast and continually growing. The above proposed application addresses a huge problem in this sector by providing a holistic solution to streamline finance management and security. Rapid adaptation of UPI and digital payment in India has resulted in immediate demand for the tools that would allow business houses to manage their transaction digitally. Adding on the peer-to-peer payment system, whereby the third-party mediators can be completely done away with, strengthens the value proposition of the application. The business model is commission-based where a small charge will be levied on each transaction, posing a very rich opportunity for the app developers.

2. Scalability

Application is developed to be highly scalable and indeed can be applied in almost all types of businesses, ranging from small shops to medium enterprises. Further, as the user base grows the cloud-based infrastructure can be effortlessly expanded to realize additional traffic or transactions. Modular architecture would be featured with the ability to add on new features, for example machine learning-based financial insights without disturbing the existing functionality. Scalability ensures that this application can adapt as needed according to the change in needs of the SMBs when they expand or grow their operations.

VII. CONCLUSION

This involves the development of a full-scale, web-based application that includes digital bookkeeping, UPI-based payment systems, secure peer-to-peer transactions between parties, and safe SMB management of payments. It also addresses every important financial management challenge facing small businesses. This application not only provides robust security but, upon including biometric authentication, face recognition, and NFC, will keep third-party intermediaries out of transactions entirely. With its user-friendliness as an interface and scalability in architecture, this application has the potential to revolutionize the way many will operate in SMB. Its ability to streamline and improve the financial health of business operations within such companies will be seminal. Possible future enhancements will enable machine learning algorithms that offer personalized financial insights and recommendations and will be able to empower SMBs to make better decisions.

REFERENCES

1. Khatabook:- Available from: https://khatabook.com
2. BharatPe:- Retrieved from https://bharatpe.com
3. Reserve Bank of India, RBI Report on Digital Payments: "The Evolution of Digital Payments in India: A Study on Adoption and Impact," Reserve Bank of India, 2020. Available at: https://rbi.org.in
4. UPI - A Game Changer; National Payments Corporation of India, "Unified Payments Interface: A Catalyst for Digital Payment Ecosystem," NPCI, 2021, https://www.npci.org.in
5. Biometric Authentication in Fintech – Jain, A.K., Nandakumar, K. & Ross, A., "50 Years of Biometric Research: Accomplishments, Challenges, and Opportunities," Pattern Recognition Letters, vol. 79, 2016, 80-105.

© 2024 IJSRET