

Scientiarum: A Multidisciplinary Journal
Vol. 2 No. S1 (2026): Supplement Issue
DOI: 10.54646/SAPARS.2026.70

SAPAR SERVICES LLP
Scholarly Articles Publication And Repository Services

SMART FOREIGN CURRENCY EXCHANGE AND FRAUD PREVENTION SYSTEM

Ms. Sangeetha K N [1], Mr. Manjunatha S [2]

Student [1], Professor [2]

Head, Department of Computer Science and Application

S.E.A College of Science, Commerce and Arts, Bengalore[1,2] sangeethakn446@gmail.com 1 ,

manjus.reddy@gmail.com 2

Abstract

The rapid growth of digital financial services has changed the way foreign currency exchange activities are performed. Traditional currency exchange processes may involve manual rate checking, limited vendor comparison, payment delays, and difficulties in identifying suspicious transactions. This paper proposes a Smart Foreign Currency Exchange and Fraud Prevention System, a web-based platform designed to provide a secure and organized environment for currency exchange management. The system provides separate access for Users, Vendors, and Administrators. Users can view live exchange rates, convert currencies, compare vendor rates, buy or sell currencies, make payments, view transaction history, and receive digital receipts and notifications. Vendors can manage exchange rates, currency availability, customer transactions, and payments, while Administrators can manage users, vendors, currencies, transactions, fraud alerts, reports, and system settings. The system follows a three-tier architecture consisting of presentation, application, and database layers. It is developed using Python, Flask, HTML, CSS, JavaScript, and SQLite3. Fraud prevention mechanisms such as duplicate transaction detection, high-value transaction monitoring, failed

payment monitoring, and suspicious transaction alerts are included to improve transaction security and reliability.

Keywords: Foreign Currency Exchange, Fraud Prevention, Live Exchange Rates, Vendor Comparison, Digital Receipt, Flask, Python, SQLite3.

Introduction

The development of digital technology has transformed financial services and made many banking and currency-related activities accessible through online platforms. Foreign currency exchange is an important financial activity for travellers, businesses, students, and other users who need to convert one currency into another. Online exchange systems can provide faster access to exchange rates and reduce the effort involved in manually comparing vendors.

However, currency rates change continuously, service charges differ between vendors, and payment or transaction errors may occur during the exchange process.

A well-organized foreign currency exchange platform should provide current exchange-rate information, simple currency conversion, vendor comparison, secure payment processing, transaction tracking, and proper record management. It should also provide mechanisms for identifying unusual or potentially fraudulent activities. The proposed Smart Foreign Currency Exchange and Fraud Prevention System brings these functions together in a centralized web application. The system connects Users, Vendors, and Administrators through role-based access and provides each role with appropriate functionality.

The application uses a three-tier architecture that separates the user interface, business logic, and database operations. The presentation layer provides responsive web pages, the application layer handles currency exchange and fraud-prevention logic using Flask, and the database layer stores user, vendor, transaction, payment, and notification information using

SQLite3. The system is intended to provide a secure, efficient, transparent, and user-friendly environment for foreign currency exchange management.

Problem Statement

Foreign currency exchange may become difficult when users have to check different vendors separately, calculate conversion amounts manually, verify service charges, and maintain transaction records. Rapid changes in exchange rates can also make it difficult to provide accurate information if rates are not updated regularly. Payment failures, duplicate transactions, unusually large transactions, and suspicious activities create additional risks for users and vendors.

There is therefore a need for a centralized platform that provides live exchange rates, currency conversion, vendor rate comparison, secure payment processing, transaction history, digital receipts, and fraud monitoring in one system. The proposed system addresses these problems by providing separate User, Vendor, and Admin modules with controlled access and centralized data management.

Literature Review

Digital financial platforms have increasingly been used to provide online payment, banking, and foreign exchange services. Research and technical development in financial technology emphasize the importance of timely information, secure transactions, reliable data management, and user-friendly interfaces. Online currency conversion services demonstrate that automated exchange-rate retrieval can reduce manual calculation and improve accessibility for users.

Studies and industry practices related to fraud detection indicate that transaction monitoring can help identify unusual activities such as repeated transactions, abnormal transaction values, failed payment patterns, and other suspicious behaviour. Rule-based

monitoring and risk scoring are commonly used as practical approaches for detecting transactions that require further attention.

Vendor comparison is also important in digital exchange services because different providers may offer different buying and selling rates, commissions, and service charges. A centralized comparison mechanism can help users make informed choices before completing an exchange. Digital receipts and transaction histories further improve transparency by allowing users to verify and track completed transactions.

Based on these concepts, the proposed system combines live foreign exchange rates, vendor comparison, transaction management, payment processing, digital receipts, notifications, and fraud monitoring in a single web-based platform. The system focuses on integrating these functions into a simple and role-based environment suitable for Users, Vendors, and Administrators.

Architecture of Proposed System

The proposed Smart Foreign Currency Exchange and Fraud Prevention System uses a three-tier architecture consisting of the Presentation Layer, Application Layer, and Data Layer. The Presentation Layer provides the web interface using HTML, CSS, JavaScript, and Bootstrap. The Application Layer uses Python and Flask to manage authentication, currency conversion, vendor comparison, payments, transactions, notifications, and fraud-prevention operations. The Data Layer uses SQLite3 to store and retrieve structured system information.

The system provides three main roles: User, Vendor, and Administrator. Role-based access ensures that each user receives only the functions appropriate to their responsibilities. External live Forex APIs can be used to retrieve updated exchange-rate information, while payment processing and transaction records are handled through the application and database layers.

System Components

User Interface Module

The User Interface Module acts as the main interaction point for Users, Vendors, and Administrators. It provides responsive dashboards and organized pages for registration, login, currency exchange, vendor comparison, payments, transaction history, digital receipts, notifications, support, and system management. The interface is developed using HTML, CSS, JavaScript, and Bootstrap.

Authentication and Authorization Module

The Authentication and Authorization Module manages user registration, login, sessions, and role-based access. Users, Vendors, and Administrators are authenticated before accessing protected functions. Role-based access prevents unauthorized users from accessing vendor or administrator functions.

User Management Module

- User registration and login
- Profile management and password management
- KYC information management
- Live exchange-rate viewing
- Currency conversion
- Buying and selling currencies
- Vendor rate comparison
- Payment and transaction tracking
- Digital receipt and notification viewing

Vendor Management Module

- Vendor registration and profile management
- Buying and selling rate management

- Currency availability management
- Customer transaction management
- Order and payment monitoring
- Vendor balance and settlement management

Currency Exchange Management Module

The Currency Exchange Management Module provides the main exchange functionality of the system. Users can select a source and target currency, enter an amount, and view the corresponding converted amount using the available exchange rate. The system supports multiple international currencies and can retrieve live rates through an external Forex API. The module also supports buying and selling foreign currencies and calculates the applicable service charges before transaction completion.

Vendor Comparison Module

The Vendor Comparison Module allows users to compare exchange rates offered by different vendors. It displays relevant buying and selling rates and other applicable charges so that users can select a suitable vendor. This improves transparency and reduces the need for users to check different exchange providers separately.

Payment Management Module

The Payment Management Module handles payment information associated with currency exchange transactions. Users can select supported payment methods, submit payment information, and receive payment status updates. The system records payment references and transaction details and updates the transaction status after successful processing.

Transaction Management Module

The Transaction Management Module maintains records of completed, pending, failed, and cancelled exchanges. Each transaction is associated with a unique Transaction ID.

Users can search and filter their transaction history, while Vendors and Administrators can monitor transactions according to their access permissions.

Digital Receipt Module

The Digital Receipt Module generates a digital record after a successful exchange. The receipt contains important information such as Transaction ID, currencies, exchanged amount, exchange rate, vendor information, payment method, service charges, and final amount. This provides users with a convenient record for verification and future reference.

Fraud Prevention and Security

Security and fraud prevention are important components of the proposed system because currency exchange transactions involve financial and personal information. The system uses authentication and role-based authorization to restrict access to protected functions. User, vendor, payment, and transaction information is stored in the database and accessed according to user permissions.

Fraud Monitoring

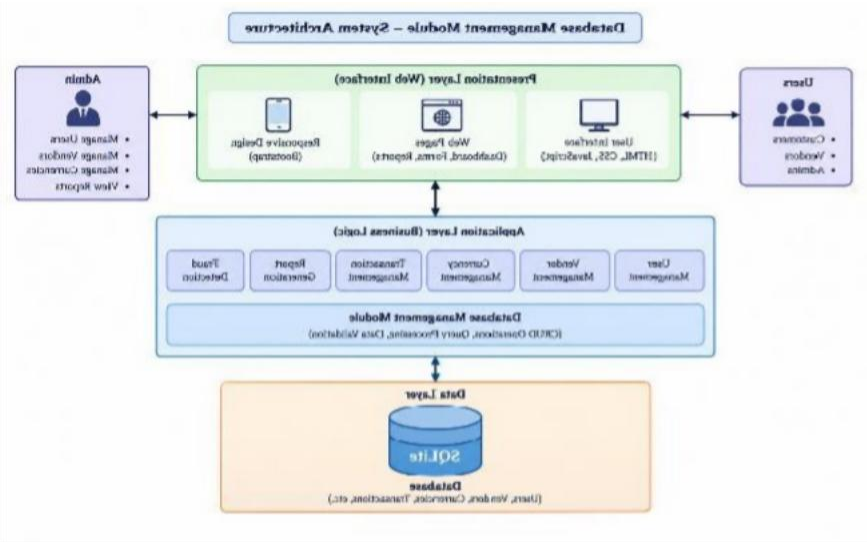
- High-value transaction monitoring
- Duplicate transaction detection
- Failed payment monitoring
- Suspicious transaction alerts
- Transaction risk assessment
- Real-time fraud notifications

The fraud monitoring module examines transaction information and generates alerts when defined suspicious conditions are detected. Administrators can review fraud alerts and take appropriate action. These mechanisms are intended to reduce the risk of repeated, abnormal, or suspicious transactions and improve the overall reliability of the system.

Database Management Module

The Database Management Module manages the storage and retrieval of system data using SQLite3. The database stores user details, vendor information, currency rates, transactions, payments, settlements, fraud alerts, notifications, support requests, and related records. Structured database tables and appropriate relationships help maintain consistency and make transaction information easier to manage.

Figure 1: Database management module



Methodology

Development of the proposed Smart Foreign Currency Exchange and Fraud Prevention System follows a systematic methodology consisting of requirement analysis, system design, implementation, testing, and evaluation.

Requirement Analysis

Functional and non-functional requirements are identified based on the needs of Users, Vendors, and Administrators. Requirements include live exchange rates, currency conversion, vendor comparison, payment processing, transaction management, digital receipts, notifications, and fraud prevention.

System Design

The system architecture, use case diagram, class diagram, activity diagram, sequence diagram, data flow diagram, ER diagram, and database structure are designed to define the overall organization and data flow of the application.

Implementation

The application is implemented using Python, Flask, HTML, CSS, JavaScript, Bootstrap, and SQLite3. Live Forex API integration is used to obtain updated exchange-rate information, while Flask handles the main application logic and database operations.

Testing

Functional, integration, system, and acceptance testing are carried out to verify authentication, currency conversion, vendor comparison, payments, transaction records, digital receipts, notifications, and fraud monitoring.

Evaluation

The system is evaluated based on usability, functionality, performance, security, reliability, and effectiveness in managing foreign currency exchange activities.

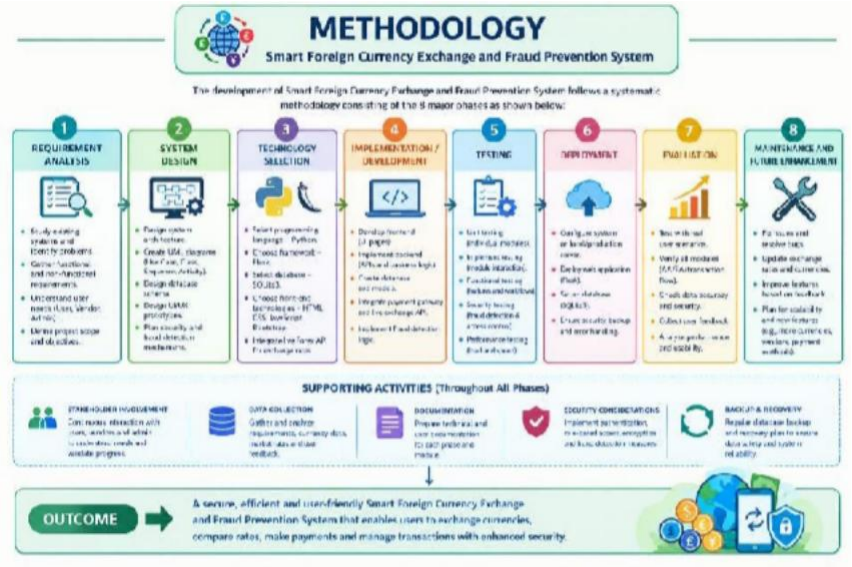


Figure 2: Methodology

Transaction Management and Data Security

Secure handling of user and transaction information is essential for the proposed system. The application provides access control and data-management mechanisms to protect important information and maintain transaction integrity.

Authentication

Only registered and authenticated Users, Vendors, and Administrators can access protected system functions according to their roles.

Access Control

Role-based access ensures that users can access only the dashboards and functions assigned to their responsibilities. Administrative functions are restricted to authorized administrators.

Protection of Information

User profiles, vendor information, KYC details, payment records, transactions, and fraud-related information are stored in the database and managed through controlled application functions.

Transaction Integrity

The system assigns unique transaction identifiers and maintains transaction status information to reduce duplicate processing and support accurate tracking.

Privacy Protection

Personal and financial information is made available only to authorized users and system roles. Proper access management helps maintain privacy and protects sensitive records.

Limitations

- The system depends on a stable internet connection for live exchange-rate and external service access.

- The accuracy of displayed exchange rates depends on the availability and reliability of the external Forex API.
- SQLite3 is suitable for the initial application but may require migration to a larger database for very high transaction volumes.
- Payment processing depends on the availability and reliability of the selected payment service.
- Fraud detection based on defined rules may not identify every new or complex fraudulent pattern.
- Users may require some time to become familiar with online currency exchange operations.
- Regular maintenance, security updates, API updates, and database backups are required.
- The current system is web-based and can be further extended into mobile applications.

Challenges

- Maintain the confidentiality of user, vendor, payment, and transaction information.
- Protect the system against unauthorized access, phishing, and other web-based security risks.
- Maintain accurate and updated foreign exchange rates through external API integration.
- Handle multiple international currencies and changing exchange rates efficiently.
- Compare different vendor rates, commissions, and currency availability in a clear manner.
- Prevent duplicate, abnormal, high-value, and suspicious transactions.
- Handle incomplete, incorrect, or duplicate transaction information.

- Maintain accurate payment and transaction status during successful or failed payments.
- Provide fast and responsive access while maintaining security and reliability.
- Manage increasing numbers of users, vendors, currencies, and transactions.
- Maintain proper database backup, recovery, and transaction records.
- Provide a simple interface for users with different levels of digital literacy.
- Maintain the system according to changes in financial-service and data-protection requirements.

Future Scope

- Advanced fraud detection using machine learning and behavioural transaction analysis can be introduced.
- Mobile applications can be developed for Android and iOS to improve accessibility.
- Additional payment gateways such as UPI, cards, and net banking services can be integrated.
- Real-time push notifications and automated rate alerts can be added.
- Advanced analytics can be introduced to analyse currency trends, vendor performance, and transaction patterns.
- The system can be deployed on cloud infrastructure to improve scalability, availability, backup, and recovery.
- Multi-factor authentication can be implemented for stronger account security.
- The database can be migrated from SQLite3 to MySQL or PostgreSQL for large-scale deployment.
- More currencies and international vendors can be added as the system expands.

- QR-based receipt verification and enhanced digital receipt features can be developed.
- Chat support or virtual assistants can be added to improve customer assistance.
- Integration with banking, travel, and other financial platforms can be considered in the future.

Conclusion

The Smart Foreign Currency Exchange and Fraud Prevention System provides a centralized and secure approach to managing foreign currency exchange activities through a web-based platform. The system allows Users to view live exchange rates, convert currencies, compare vendor rates, buy and sell currencies, make payments, track transactions, receive digital receipts, and manage notifications.

The system provides separate modules for Users, Vendors, and Administrators. Users can perform currency exchange operations and monitor their transactions, Vendors can manage exchange rates, currency availability, and customer transactions, and Administrators can manage users, vendors, currencies, payments, transactions, fraud alerts, reports, and system settings. Fraud monitoring features such as duplicate detection, high-value transaction monitoring, failed payment monitoring, and suspicious alerts improve the security of the platform.

The system is developed using Python, Flask, HTML, CSS, JavaScript, and SQLite3, with live Forex API integration for exchange-rate information. Overall, the proposed system reduces manual work, improves rate comparison and transaction management, provides greater transparency, and offers a practical platform for secure foreign currency exchange and fraud prevention. The modular structure also provides opportunities for future expansion through advanced fraud detection, mobile applications, cloud deployment, additional payment gateways, and larger database systems.

References

Bootstrap. (n.d.). *Bootstrap documentation*. https://getbootstrap.com/docs/

Exchange Rate-API. (n.d.). *Exchange Rate API documentation*. https://www.exchangerate-api.com/docs/overview

Mozilla Developer Network. (n.d.). *HTML, CSS and JavaScript documentation*. https://developer.mozilla.org/

Pallets Projects. (n.d.). *Flask documentation*. https://flask.palletsprojects.com/

Python Software Foundation. (n.d.). *Python documentation*. https://docs.python.org/

Real Python. (n.d.). *Python programming tutorials and development resources*. https://realpython.com/

SQLite. (n.d.). *SQLite documentation*. https://www.sqlite.org/docs.html

Visual Studio Code Documentation. (n.d.). *Code editor and development environment guide*. https://code.visualstudio.com/docs

W3Schools. (n.d.). *Web development tutorials and references*. https://www.w3schools.com/

Various research papers and articles related to foreign currency exchange, financial technology, fraud detection, and secure web application development.