

Mobile Banking Application and Digital Banking

Project report submitted in partial fulfillment of the requirement for the degree of Bachelor of Technology

in

Computer Science and Engineering

By

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Under the supervision of

Dr. Aman Sharma

to



Department of Computer Science & Engineering and
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Candidate's Declaration

I hereby declare that the work reported in the B.Tech Project Report entitled "Mobile Banking Application and Digital Banking" submitted at the Jaypee University of Information Technology, Wagnaghat, India is an authentic record of our work carried out under the supervision of Dr. Aman Sharma and Mr. Murari Lal. I have not submitted this work elsewhere for any other degree or diploma.

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

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Aarush Saxena (191315)

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ABSTRACT

The creation of a mobile banking application for Shivalik Bank is the main goal of this project. The goal is to develop a safe, effective, and easy app that lets users effortlessly access and manage their financial accounts on mobile devices. According to an agile development process, the project may be improved continuously and through iterative development based on user feedback.

Essential functions including account management, money transfers, bill payment, transaction histories, and push alerts are provided via the mobile banking app. For the confidentiality and integrity of client data and transactions, the development team implements strong security measures, such as encryption techniques, authentication methods, and adherence to industry standards.

The app is created as a cross-platform solution using React Native, providing interoperability with both iOS and Android smartphones, to address the varied demands of the bank's client base. To guarantee a high-quality and dependable application, extensive testing is carried out throughout the development process. This includes functional testing, security testing, and user acceptability testing.

Shivalik Bank will be able to provide its clients with a cutting-edge and practical banking experience through a safe and user-friendly mobile application after this project is successfully completed. In an increasingly digital banking environment, the app's seamless functioning, improved security measures, and user-friendly layout will help to increase client happiness, engagement, and retention.

CHAPTER-1

1.1 Introduction

Shivalik changed its name from Urban Co-operative Bank to become India's first Small Finance Bank. In providing retail banking products and services, we have more than 24 years of banking experience.

Shivalik has always placed a strong emphasis on technology, with customer centricity as a fundamental tenet. The Infosys Finacle Core Banking and Digital Banking Suite, which includes online and mobile banking, power the Bank. The Bank has unequalled agility thanks to the cloud-based architecture, which enables cost-effective scale management and growth. Shivalik is a direct member of the National Financial Switch and is accessible on all retail payment platforms.

Having been founded in 2018, Shivalik Small Finance Bank is a relatively recent addition to the Indian banking industry. Despite being a young participant, the bank has already established a reputation for its dedication to offering its clients top-notch financial services.

The bank's focus on the needs of its clients is one of its main advantages. In order to suit its clients' unique financial demands, Shivalik Small Finance Bank makes an effort to comprehend them and offers solutions that are tailored to their needs. Relationship managers at the bank collaborate closely with clients to create a financial strategy that matches their goals and objectives. This tactic has helped the bank build a loyal clientele and a strong reputation in the market.

Another advantage of Shivalik Small Finance Bank is its sophisticated technical infrastructure. To provide its customers with speedy, secure, and efficient financial services, the bank makes use of cutting-edge technology. Customers may easily use the bank's online and mobile banking technologies to access their accounts and a range of financial services. Aside from that, the bank uses technology to enhance its risk management and compliance operations, ensuring that it complies with regulatory requirements and providing a secure banking

environment for its customers.



Fig 1. Technology Partners of Shivalik Bank

environment for its customers.

A variety of financial goods and services, including deposits, loans, insurance, and investment options, are provided by Shivalik Small Finance Bank. The bank offers flexible periods and attractive interest rates on its deposit products, which include savings accounts, current accounts, and fixed deposit accounts.

The bank offers a variety of loan products such as personal loans, business loans, and agricultural loans that are tailored to each customer's particular requirements.

Shivalik Small Finance Bank provides investment options such mutual funds, stocks, and bonds in addition to its standard banking goods and services. To assist clients in achieving their financial objectives, the bank's wealth management division offers specialised investment guidance and solutions.

Overall, Shivalik Small Finance Bank has made a name for itself in India as a trustworthy and client-focused financial company. The bank is in a good position to take the lead in the Indian banking industry because to its dedication to provide top-notch financial services, cutting-edge technological infrastructure, and a variety of financial goods and services.



Fig 2. Digital Banking in Shivalik Bank

Purpose

- Socially conscious impact lender
- Adopting a digital first strategy for all of our offerings for goods and services
Innovator in financial goods and processes
- Financial inclusion and raising financial literacy Aim to supply our clients with comprehensive solutions. Create value for all stakeholders, including society, employees, and customers
- Environment, social, and governance (ESG) compliance In that order: Customer, Organization, and Shareholders

The ideals of the organization are incorporated with diverse elements of nature in the Shivalik Bank logo. The small green mountain/triangle and the blue on top of the image icon in the photo stand for the earth and the sky, respectively. It also suggests reaching upward because there is an arrow pointing up. These characteristics are essential to the company's values since Shivalik Bank strives to stand securely on the ground while reaching for the stars.



Fig 3. Shivalik Bank Logo

Mountains are symbolic of stability, strength, and growth when seen abstractly. The image's mountain range, which is hidden by other mountains, symbolizes the brand's forward-thinking nature. For all of our services, we are interconnected, and the team's collective effort is as powerful as a mountain range. This demonstrates the power of serving our internal and external customers. The blue portion of the sky represents the universe, which also represents our potential customers. This reveals a lot about our potential and goals. The icon's rounded blue edge illustrates our clients' humble, polite, friendly, and professional communication skills.

The earthy tones used by Shivalik Bank to represent a grounded attitude are the inspiration for the colour green. Despite having a clear goal of continuing to develop, we never placed our customers before anything. Our practical approach is what gives Shivalik Bank its "client first" mentality.

With purposeful omission, the negative space demonstrates how Shivalik Bank supports growth.

The banking industry is a vital part of every economy since it acts as a conduit for money transfers between people, companies, and the government. Banks are financial institutions that offer both consumers and businesses a variety of financial services, including deposits, loans, and investments. The industry is essential to the economy since it provides the funding required for expansion and development. In this essay, we'll talk about how the banking industry operates and why it's important.

The two main tasks that the banking industry does are lending and accepting deposits. Banks receive deposits from both individuals and businesses, which they then use to offer their clients loans and other financial services.

Savings accounts, checking accounts, and certificates of deposit (CDs) are all acceptable forms of deposits. These deposits generate interest, which is a portion of the deposit amount that the bank pays to the depositor. The bank's policies and the state of the market influence the interest rates on deposits.

The second role of banks is lending, where they give loans to both people and businesses. The interest rate charged on loans, which can be secured or unsecured, depends on the type of loan, how long it will last, and the creditworthiness of the borrower. Banks make money by charging interest on loans that is higher than the interest paid on deposits.

In addition to accepting deposits and disbursing loans, banks also offer a wide range of other financial services, including insurance, investment banking, foreign exchange, and wealth management. Banks act as middlemen, enabling the transfer of money between investors, businesses, and private citizens. Banks also provide financial coaching and other services to aid people and companies in successfully managing their money.

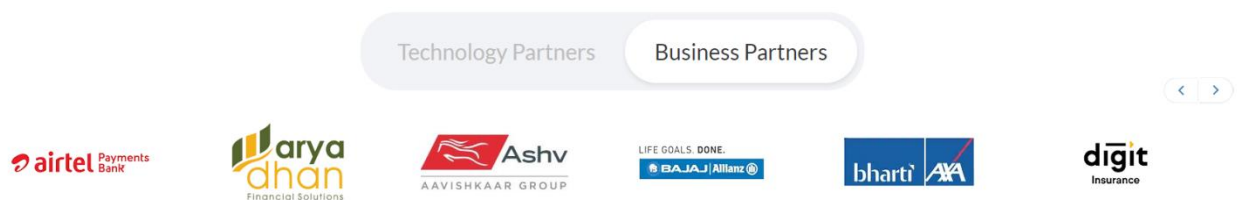


Fig 4. Business Partners of Shivalik Bank

To preserve the integrity and stability of the financial system, governments place stringent controls on the banking sector. Banks are required to maintain a minimum reserve ratio, or the amount of cash they must have on hand, in order to satisfy consumer withdrawal requests. Banks must also follow by a variety of

regulations, such as anti-money laundering legislation, in order to stop financial crimes.

In conclusion, the banking sector is crucial to the growth and development of every economy since it provides the funding needed for it. Deposits from both people and businesses are used to fund loans and other financial services offered by the sector. Other financial services provided by banks include insurance, investment banking, wealth management, and foreign exchange. The industry is highly regulated in order to maintain the integrity and stability of the financial system, making it a crucial part of any economy.

Delivering financial services to consumers is done using a methodical, organized manner in the banking industry. The banking business is a dynamic, complicated one that needs meticulous planning, implementation, and administration of numerous tasks. We shall go into great detail about the working process in the banking industry in this article.

Understanding the wants and expectations of the client is the first stage in the methodology of work in the banking industry. To offer individualized financial solutions, banks must determine the customer's financial goals, risk tolerance, and investment objectives. Relationship managers at the bank work closely with clients to comprehend their financial needs and create an appropriate financial plan.

The second phase is gathering client data and supporting documentation in order to confirm the clients' legitimacy, income, and creditworthiness. To stop financial crimes, banks must abide by a number of rules, including KYC (Know Your Customer) and AML (Anti-Money Laundering). The compliance team at the bank checks the documentation and information provided by the customer to make sure it complies with all legal requirements.

The third step involves providing customers with financial solutions based on their financial goals and aspirations. Financial services offered by banks include investments, loans, insurance, and deposits. The bank's relationship managers work closely with customers to develop a financial plan that is specific to their needs.

In the fourth step, the customer's financial portfolio is handled, and regular updates on their investments are provided. Banks use a range of tools and techniques, such as portfolio management software and risk management models, to track customer investments and provide regular updates. The relationship managers at the bank conduct routine evaluations of the client's financial plan and implement any required adjustments in light of the market environment and the client's shifting financial objectives.

The fifth phase entails giving consumers outstanding support and customer service. Banks make significant investments in educating their employees to deliver excellent customer service. The bank's customer care department is open 24/7 to address client concerns and questions.

In conclusion, the banking industry employs a methodical and organized approach to providing clients with financial services. Banks must comprehend their clients' demands and requirements, gather client data, offer tailored financial solutions, oversee their clients' financial portfolios, and offer superior client care. To offer consumers high-quality financial services, the banking sector is a complex and dynamic enterprise that needs careful planning, implementation, and administration of many operations.

1.2 Problem Statement

In recent years, mobile banking has grown to be crucial to the banking sector. Customers anticipate banks to offer a convenient and safe mobile banking

application given the rising use of smartphones and other mobile devices. But some banks still do not offer a mobile banking app, which can cause a number of issues.

First of all, gaining and keeping clients may be difficult for banks without a mobile banking application. Today's consumers want a smooth and convenient banking experience, therefore the absence of a mobile banking application can be a big letdown. Customers could decide to change banks in favour of those that provide mobile banking services, which might result in a loss of market share for financial institutions without a mobile banking application.

Second, banks without a mobile banking app can find it difficult to adapt to their clients' shifting demands and preferences. Customers expect banks to offer a variety of services through their mobile banking application due to the growing popularity of mobile banking. Banks that do not provide a mobile banking application may be perceived as out-of-date and may find it difficult to draw in younger, tech-savvy consumers.

Thirdly, security issues may arise for banks without a mobile banking application. To protect consumer transactions, mobile banking applications utilize cutting-edge security measures like biometric verification and two-factor authentication. Customers may not receive the same degree of protection from banks that do not offer mobile banking applications, which might result in loss of customer trust and confidence.

The fourth issue is that banks without a mobile banking app could experience operational inefficiencies. Applications for mobile banking can simplify several banking procedures and cut expenses. Banks without mobile banking applications may be forced to use inconvenient and time-consuming traditional banking procedures.

Last but not least, institutions without a mobile banking app can run into regulatory issues. Banks are required by regulatory agencies like the Reserve Bank of India (RBI) to offer clients secure and effective financial services. Absence of a mobile banking app may result in noncompliance with legal regulations, which may result in penalties and fines.

In summary, banks without mobile banking applications may have a number of issues, such as a loss of market share, security issues, operational inefficiencies, and regulatory difficulties. In order to remain competitive and fulfill consumers' shifting requirements and preferences, banks must offer a smooth and simple mobile banking experience to clients.

1.3 Objectives

Numerous goals of mobile banking applications contribute to giving users a simple and safe method to access banking services on their mobile devices. The main goal is to give clients quick, safe access to financial services via mobile devices. However, there are a number of other crucial goals that support the general success of mobile banking applications.

Offering users a pleasant and user-friendly interface that enables them to do a variety of financial operations quickly and effortlessly is one of the goals of mobile banking applications. Anywhere and at any time should be able to access this interface.

Another important goal for mobile banking applications is security. To guarantee that consumer transactions are secure and to safeguard against fraud and cyber attacks, they should implement cutting-edge security features like biometric authentication, two-factor authentication, and encryption.

Another key goal for mobile banking applications is personalization. Customers should have a personalised banking experience from them by receiving services that are tailored to them based on their transactional history and preferences.

Another crucial goal of mobile banking applications is efficiency. They should boost efficiency, cut operating expenses, and streamline banking procedures. This goal may be attained with the use of features like automatic bill payments, financial transfers, and account management.

Another goal of mobile banking applications is accessibility. All consumers, including those with impairments, should be able to use them thanks to accessibility features like text-to-speech and screen reader technology.

Another crucial goal for mobile banking applications is integration. To give users a whole financial management experience, they should interface with other financial programmes like trading and investing software.

Another important goal of mobile banking applications is innovation. To provide clients fresh and inventive banking experiences, they need to keep developing with new technologies and trends like speech recognition and artificial intelligence.

In conclusion, the goals of mobile banking applications include giving users an innovative, personalized, secure, easy, and seamless banking experience. Mobile banking applications can help banks maintain their competitiveness and adapt to the shifting demands and preferences of their clients by fulfilling these goals.

1.4 Methodology

To guarantee that a mobile banking application fits both the expectations of users and the security and compliance requirements imposed by banking laws, a well-

planned approach must be used throughout development. The following is a general process that may be used to create a mobile banking application:

Define the scope and requirements: To begin, specify the requirements and the scope of the mobile banking application. This includes choosing the features that will be used, designing the user experience, and figuring out the necessary security and compliance levels.

Research and analysis: Find out which mobile banking applications are now available on the market and what features they provide. This can aid in locating gaps that the new application can cover and offer information on user preferences and expectations.

Create the user interface: Create the user interface when the requirements have been established. In order to decide on the design, navigation, and functionality of the application screens, wireframes and mockups must be created.

Develop the programme: Utilise the proper frameworks and programming languages when creating the application. Make sure that the app is speed and security optimised. To make sure the programme satisfies the criteria and is error-free, extensively test it.

Integration with banking systems: To provide seamless data and transaction transmission between the mobile banking application and the core banking systems, integration with banking systems is required.

Implement security and compliance features: To guarantee that customer data and transactions are secure, implement the essential security and compliance features, such as two-factor authentication, biometric authentication, encryption, and data privacy protections.

Conduct user acceptability testing to make sure that the programme satisfies user expectations and offers a smooth user experience.

Launch the app: After it has through extensive testing and validation, the app should be launched on the app stores and promoted to draw in users.

Assist with continuous maintenance and support to keep the application safe, up to date, and error-free. Assist with ongoing maintenance and support.

In conclusion, the methodology for developing a mobile banking application entails defining the scope and requirements, performing research and analysis, designing the user interface, creating the application, integrating it with banking systems, putting security and compliance features in place, performing user acceptance testing, releasing the application, and offering ongoing maintenance and support. By using this process, banks may create a mobile banking application that satisfies client expectations and offers the essential security and compliance capabilities.

1.4.1 Hardware:-

The hardware and operating system of a mobile device determine the minimal specifications needed for a mobile application to function. The prerequisites for the two most widely used mobile operating systems are as follows:

Android: A mobile device must have an Android operating system version of 4.4 or higher in order to execute an Android application. The computer should have 8GB of internal storage and at least 1GB of RAM. It must support OpenGL ES 2.0 graphics and have a screen resolution of at least 320 x 480 pixels.

iOS: A mobile device must have iOS 9.0 or later in order to launch an iOS application. A minimum of 1GB of RAM and 16GB of internal storage are

required. It must support OpenGL ES 2.0 graphics and have a screen resolution of at least 640 x 960 pixels.

In addition to meeting these minimal software and hardware specifications, the mobile application should be tuned for speed and usability across a range of gadgets. Making sure the programme is responsive and functions properly on gadgets with various screen sizes and resolutions is part of this. Additionally, the application needs to be battery-life optimised and shouldn't use up too much of the mobile device's battery.

In order to make sure the mobile application satisfies the criteria and offers a smooth user experience, it should lastly be carefully tested on a number of devices. The mobile application may improve the user experience and draw in more people by fulfilling the basic criteria and optimizing the programme for speed and usability.

CHAPTER-2

2.1 Requirements

To create a functioning, secure, and user-friendly mobile banking application, a mix of tools and technologies is needed. A few of the tools and technology needed to create a mobile banking application are listed below:

Platform for developing mobile apps: A platform for developing mobile applications offers resources and tools for creating and testing mobile applications. Platforms for creating mobile apps include Xcode, Xamarin, and Android Studio.

Programming languages: Depending on the platform, several programming languages are used to create mobile banking applications. Java or Kotlin are used as the main programming languages for Android apps, whereas Swift or Objective-C are used for iOS apps.

Tools for user interface design: Designers utilize programmes like Sketch, Adobe XD, and Figma to create the user interface for the mobile banking application. These resources aid designers in producing aesthetically beautiful, user-friendly layouts for application interfaces.

Backend development tools: Depending on the platform, the backend development of the mobile banking application requires technologies like Node.js, Ruby on Rails, or PHP. The server-side components of the programme are created and managed by developers with the aid of these technologies.

Application Programming Interfaces (APIs): APIs allow for communication between financial systems and mobile applications. Developers may create safe,

quick, and seamless data transmission and transaction processing between their applications and financial systems with the use of APIs.

Cloud storage solutions: For mobile banking apps, cloud storage solutions like Amazon Web Services (AWS) or Microsoft Azure offer safe and scalable data management.

Tools for security and compliance: Robust security and compliance elements are needed for mobile banking apps. Secure access and authentication techniques are provided for the application through tools like SSL, OAuth, and OAuth2.

Using testing and debugging tools, such as TestFlight, Firebase Test Lab, or Android Debug Bridge (ADB), developers may make sure their applications are free of defects and mistakes.

In conclusion, creating a mobile banking application requires a variety of tools and technologies, including platforms for developing mobile apps, programming languages, tools for designing user interfaces, tools for developing backends, APIs, cloud storage services, security and compliance tools, and tools for testing and debugging. These technologies enable programmers to build strong, user-friendly mobile banking applications that satisfy the needs of both users and banking regulations.

CHAPTER 3

System Development

3.1 System Overview

The goal of Shivalik Small Finance Bank is to use React Native technology to create a mobile banking application.

Both current bank clients and new bank customers will be served by the application. The programme must provide a rich user experience to keep people interested.

The app will enable remote banking, financial management, and product availability, 24-hour availability, time savings, and effective and efficient transaction monitoring.

Users of Android and iPhone devices may get the programme from the Play Store and AppStore, respectively.

Following are the feature modules which shall be covered to ensure that a minimum viable product has been achieved:

- Pre-Login
- Registration
- Login
- Customer Care
- Dashboard
- Beneficiary
- Fund Transfer
- Term Deposits
- Services
- Information
- Add on Services
- Account Opening

- Cheque
- Debit Cards
- Profile
- Reports
- Admin
- API's

3.2 System Algorithm

The primary components that have been used to make this build a possibility are Figma, React Native, Postman, Databases etc.

When creating a mobile banking application, key tools like Figma, React Native, Postman, and databases are essential. Each of these tools helps with the development process in the following ways:

Figma: Figma is a tool for user interface design that aids designers in producing aesthetically pleasing, intuitive layouts for application interfaces. It enables collaborative collaboration among designers, sharing of designs, and real-time feedback. In order to expedite the creative process, Figma also offers a large selection of design materials including templates, icons, and fonts.

React Native: React Native is a framework for creating mobile apps that allows programmers to create cross-platform mobile applications from a single codebase. It cuts down on the time and effort required for development by enabling JavaScript to be used to create native mobile applications for both iOS and Android platforms. A variety of pre-built components and APIs are also available from React Native that may be utilised to build a seamless user interface.

Developers may design and test APIs for the mobile banking application using Postman, an API testing and development tool. It offers a user-friendly interface

for testing API endpoints, making any problems that may develop simpler to debug and resolve. Developers may also distribute their APIs to other team members and stakeholders via Postman.

Databases: A vital part of any mobile banking application are databases. They maintain user data, transaction records, and other important data in storage. Applications for mobile banking frequently employ the database technologies MySQL, MongoDB, and Firebase. By offering features like data backups and encryption, databases also play a significant part in guaranteeing the security and integrity of user data.

In conclusion, databases, React Native, Postman, and Figma are essential technologies for creating mobile banking applications. The creation of user-friendly layouts is made possible by Figma, the development of cross-platform apps is made possible by React Native, the testing and development of APIs is made possible by Postman, and the management of user data is made secure and dependable by databases. Developers may produce a strong and user-friendly mobile banking application that satisfies the requirements of both users and the banking sector by successfully using these resources.

3.3 System Design

i) Registration:-

The registration process goes through the steps mentioned below

- Sim binding
- Selecting the way of Registration
- All the methods having their own process of detail filling
- OTP verification
- Aadhaar Card verification
- Temporary Pin verification
- Mobile number verification
- m-Pin creation
- Biometric enablement

Working:-

Sim binding: The user's mobile number and bank account are connected during the sim binding process. This makes sure that only the mobile number that is registered may use the mobile banking application linked to that bank account.

The user may choose from a number of registration alternatives, including self-registration using the mobile banking application itself, online registration, and bank branches.

complete details The user must provide their personal information, including name, address, date of birth, and other necessary data, regardless of the registration method they choose. This step might involve submitting the necessary data online or at the local bank location.

OTP confirmation: Following the completion of the personal information, an OTP (One-Time Password) is given to the provided mobile number for confirmation.

To confirm their cellphone number, the user must input the obtained OTP.

Verification of the Aadhaar Card: The mobile banking application may

occasionally ask for Aadhaar Card verification. The user must validate their entry using their registered cellphone number and their Aadhaar Card number.

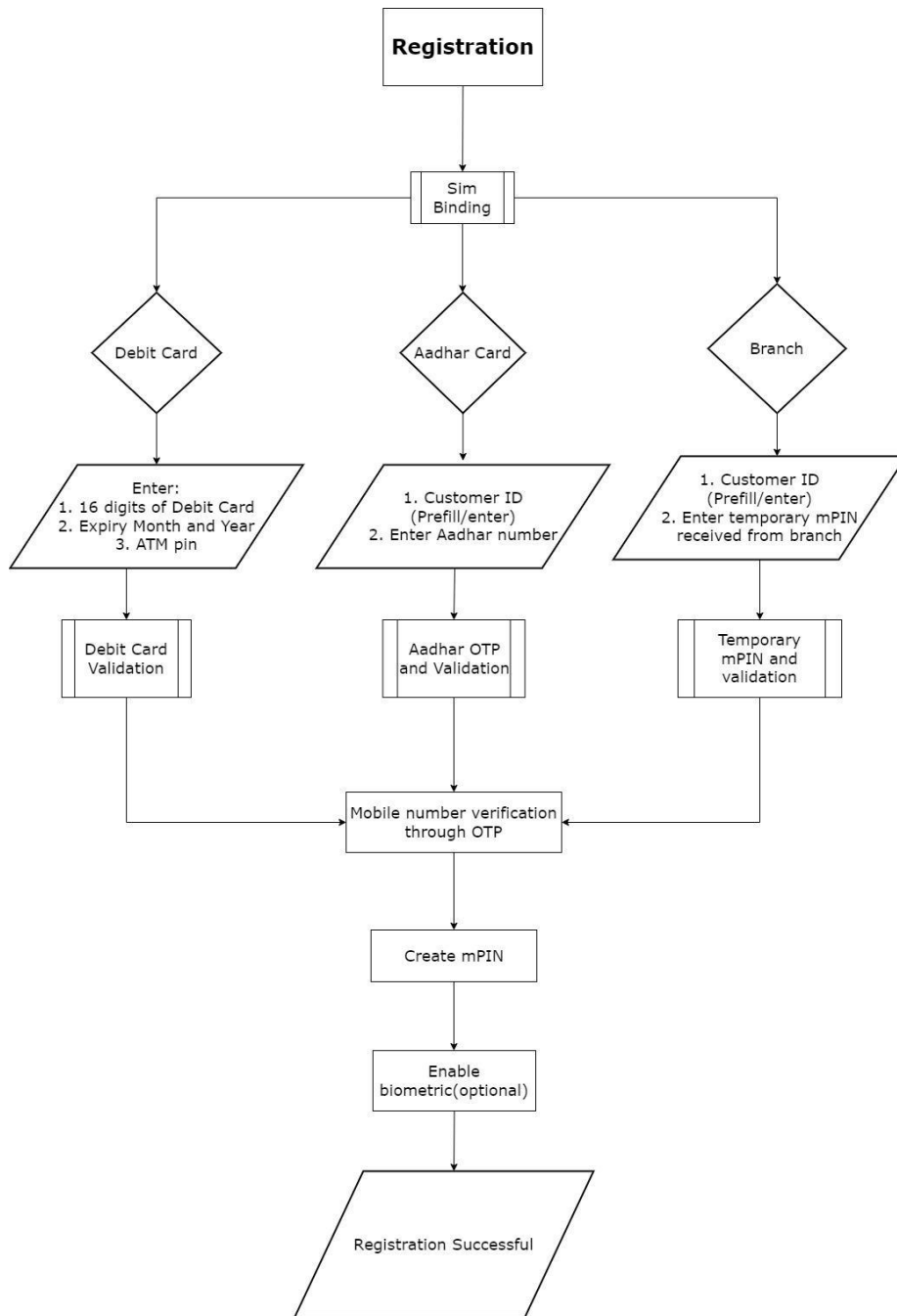


Fig 5. The registration process to be followed in the application

Verification with a temporary PIN: A temporary PIN may be produced and sent to the registered cellphone number in order to further verify the user's identity. For verification, the user must enter the temporary PIN. Verification of the user's mobile number: As an extra measure of security, the user's mobile number may be validated by entering a verification link or code.

Create an m-PIN: The user is requested to do so when all verifications have been performed successfully. An m-PIN is a mobile personal identification number. The mobile banking application will employ the m-PIN, a secure numeric code, for future login and transaction authentication.

Biometric authentication: For increased security and convenience during login and transactions, it may be possible to activate biometric authentication, such as fingerprint or face recognition, depending on the capabilities of the user's mobile device. This safeguards the user's financial information and aids in preserving the security and integrity of the mobile banking application.

ii) Beneficiary Transfer Method

When using mobile banking, users may safely and simply send money to other people or organizations via the beneficiary transfer method. For upcoming transactions, it offers a simpler procedure for maintaining and adding beneficiaries. The beneficiary transfer mechanism in mobile banking is described as follows:

Adding a beneficiary: Users must enter the beneficiary's information into their mobile banking application in order to start a transfer. The beneficiary's name, bank account number, bank name, and branch information are often included. Users can add beneficiaries using their cell numbers or email addresses in some mobile banking services.

Verification: The mobile banking application validates the beneficiary information when it is submitted to make sure it is accurate. Verifying the bank

account number, looking for the account in the bank's database, or conducting real-time validations.

Users are often asked to approve the inclusion of a beneficiary in order to protect the security of financial transactions. One-Time Passwords (OTPs), which are texted to the registered cellphone number, or biometric authentication can be used to do this.

Account validation: Prior to adding a beneficiary, users of the mobile banking application could occasionally be asked to authenticate their own accounts. In order to prevent unauthorized users from starting financial transfers, this is done.

Beneficiary activation: The mobile banking application makes the beneficiary available for future transfers once the beneficiary information has been added and confirmed. Within the application, users may view and manage their list of beneficiaries.

Users must first choose the recipient from their list of options before entering the amount to be transferred to them. Users might be able to provide a description or reference for the transfer depending on the mobile banking application.

Security and authorization: Users are often needed to approve the transaction through extra security procedures before the transfer is performed. This can be done by inputting an OTP, employing biometric authentication, or entering an m-PIN (Mobile Personal Identification Number).

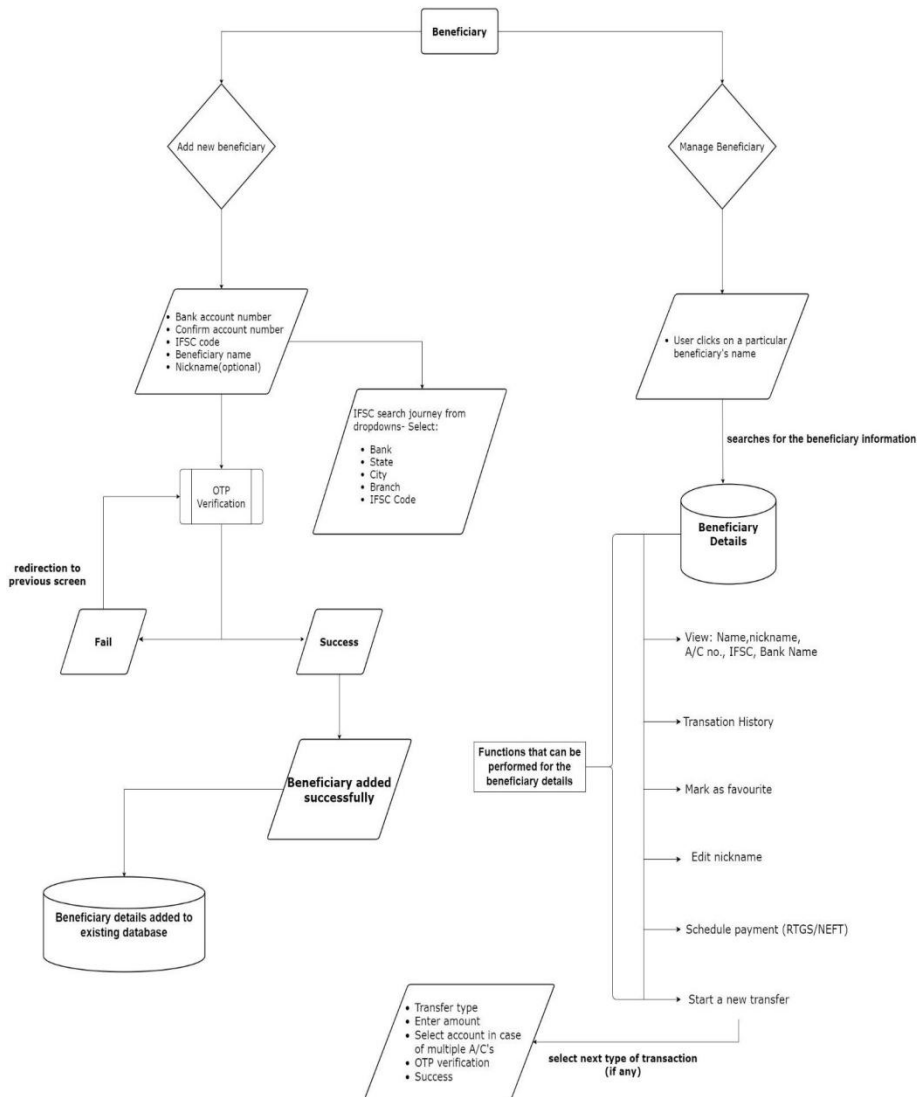


Fig 6. Beneficiary Transfer Process

Transfer confirmation: The mobile banking application starts the transfer when the authorisation is finished. A message or notification informing users that the transfer was successful is sent.

Transaction history: The mobile banking application keeps track of all transactions, enabling users to follow their transfers and examine information like the date of the transaction, the name of the beneficiary, and the amount of the transfer.

The beneficiary transfer technique in mobile banking makes it easier to send money to other people or organizations. Users may manage and authorize transactions in a safe and practical way with its help, ensuring that transfers are carried out precisely and quickly.

iii) Debit Card Login Method

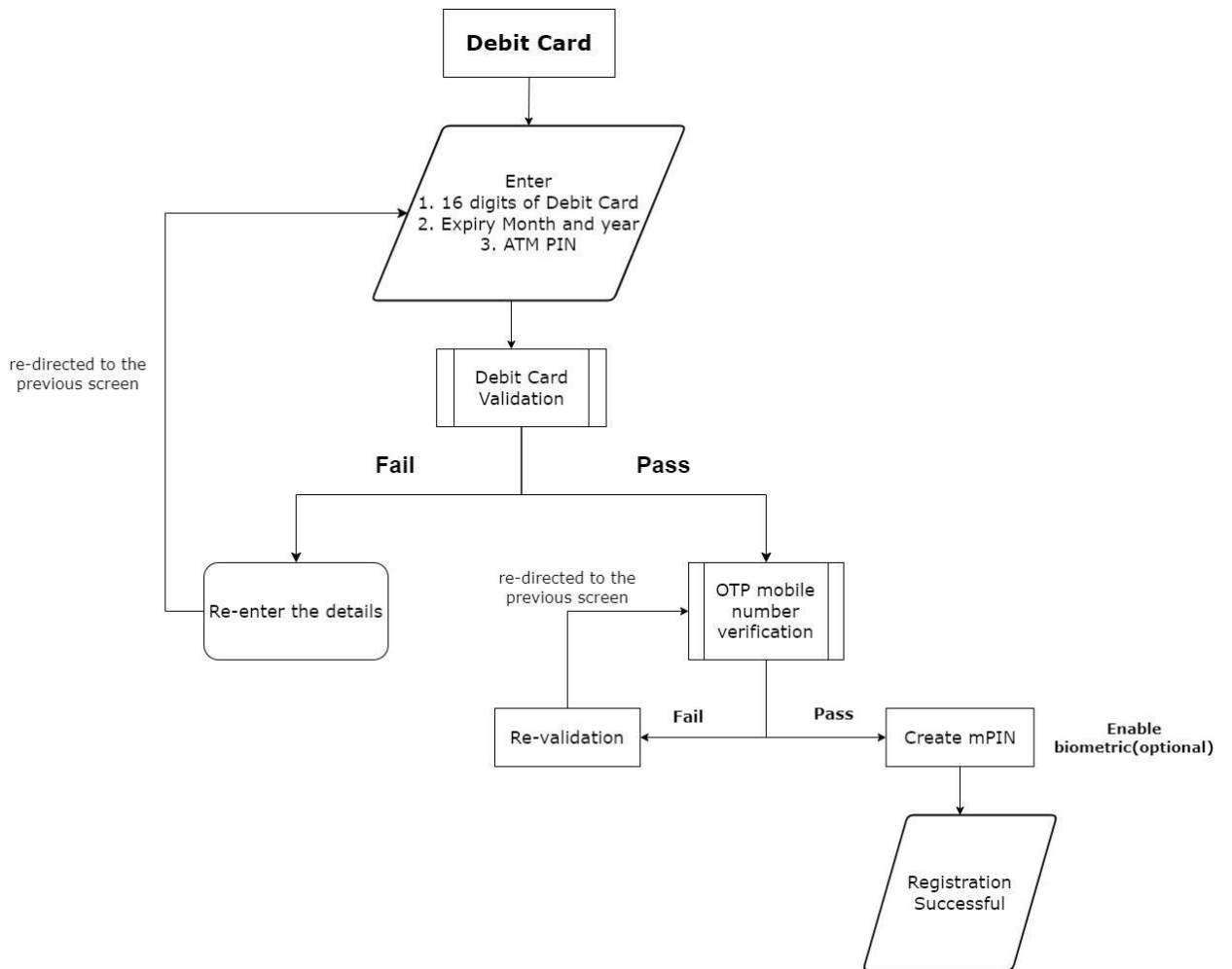


Fig 7. Debit Card process for login

The Debit Card login process consists of the user entering the 16 digit Debit Card Number, the expiry month and year and the ATM pin. The validation occurs via an OTP process which confirms and checks for the account details and mobile number. The user can configure the m-Pin and sign up for mobile banking services when the verifications are complete.

iv) Account Statement Generation Method

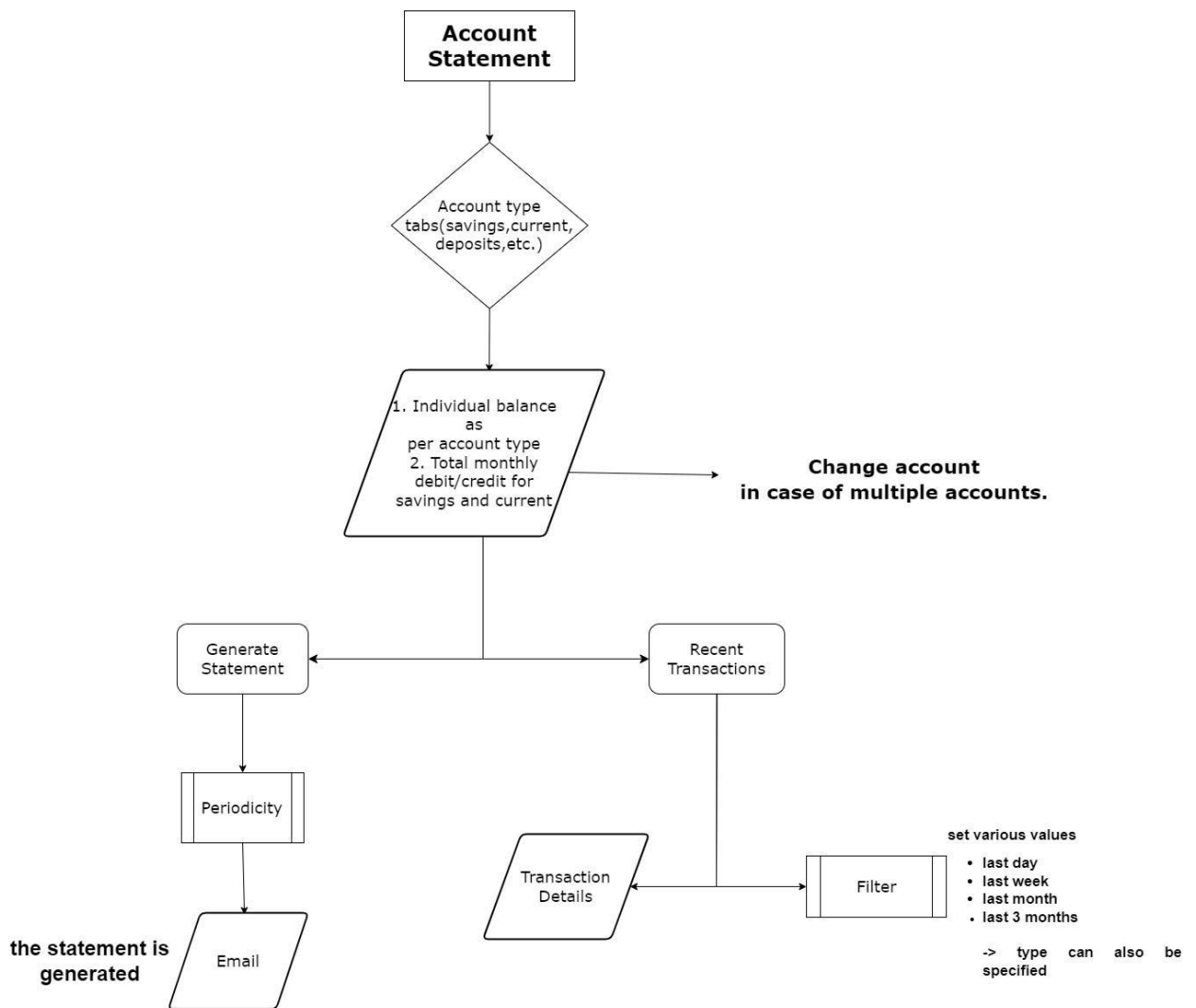


Fig 8. The Account Statement Generation Process Flow

Users may access and examine comprehensive information about their banking operations and account activities using the account statement production technique in mobile banking. It offers consumers a convenient method to monitor their expenditures, analyse their financial data, and balance their accounts.

Account selection: Customers can use the mobile banking application to pick the particular account for which they want to produce an account statement. Any account linked to their mobile banking login is affected by this, including credit card accounts, checking accounts, savings accounts, and others.

The date range that the user wants to view on the account statement is selectable. To fit their needs, clients may change the date range or choose to produce statements for a month, quarter, or year, for instance. Statement generating: Users can start the account statement generation process after choosing the account, date range, and format. The mobile banking application connects to the appropriate banking system and receives the transaction data for the selected account during the defined time frame.

Data processing and compilation: The mobile banking application creates a detailed account statement from the collected transaction data after processing it. This entails categorizing the transactions according to the date, kind, amount, and other pertinent information.

Account holder name, account number, starting and closing balances, and any other pertinent information regarding the specified period are normally included in the summary information section of the account statement.

Transaction information: The account statement includes a thorough explanation of each transaction that took place within the specified time period. This contains details such as transaction dates, kinds (such as deposits, withdrawals, and transfers), descriptions, and amounts. Users may select how they wish to receive their account statements when they are created. The options may include sending the statement to a registered email address, downloading it immediately to the mobile device, or safely saving it within the mobile banking application for later access.

Users who utilise mobile banking have easy access to their financial information thanks to the account statement production mechanism. Mobile banking software enable users to keep track of their accounts and maintain accurate financial records while on the move by providing customisable date ranges, several statement formats, and thorough transaction data.

v) Quick Transfer (IMPS) Process

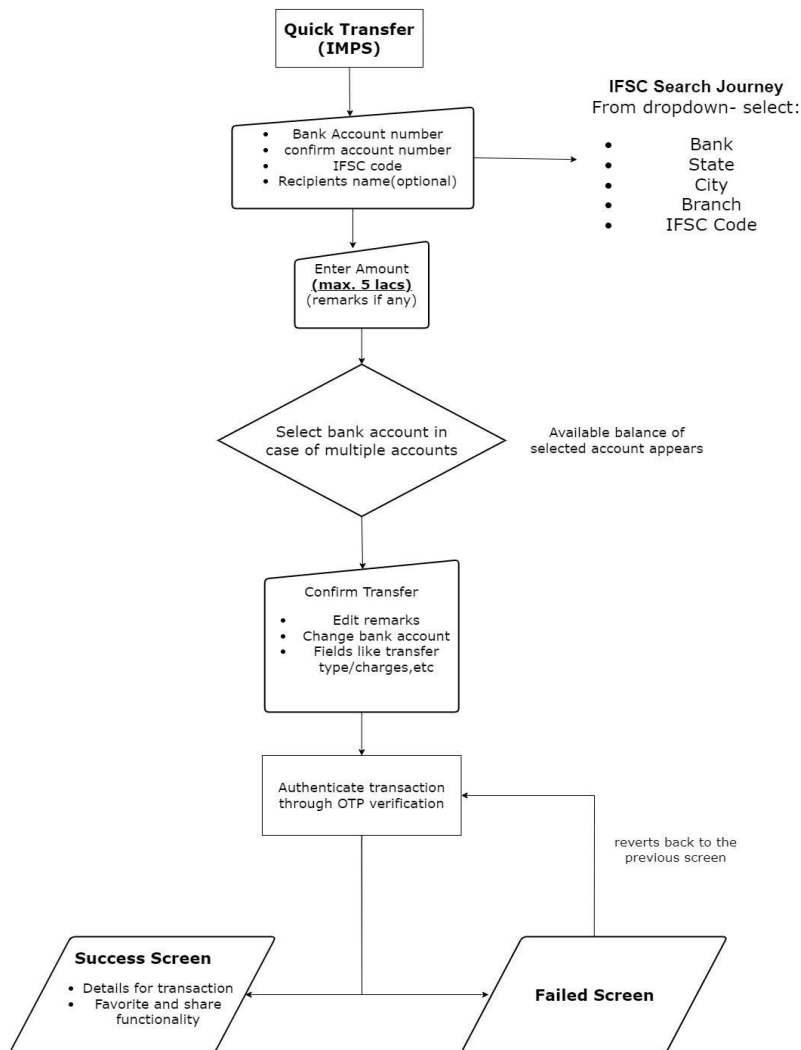


Fig 9. Quick Transfer process (IMPS) flow

Users may immediately and securely transfer money using the popular payment technique known as the Immediate Payment Service (IMPS) in mobile banking. Person-to-person (P2P) and person-to-merchant (P2M) transactions are made easy and swiftly possible.

Beneficiary addition: In order to send money via IMPS, users must include the beneficiary's information, including name, bank account number, and Indian Financial System Code (IFSC) of the receiving bank. This procedure makes sure that the beneficiary has permission to receive the payments.

Starting the transaction: After adding the beneficiary, customers may use their mobile banking application to start an IMPS transaction. They choose the beneficiary, input the transfer amount, and include any other information that is necessary.

Validation of transactions: The mobile banking application verifies the specifics of the transaction and determines if the user has enough money in their account to cover the transfer.

Authorization: Using their m-PIN or other available security measures, users must verify the transaction's authenticity. This process guarantees the transaction's security and guards against unauthorized access.

Transferring money: Following authorisation, the mobile banking application interacts with the bank's systems to enable a quick transfer of money from the user's account to the beneficiary's account. Since the transaction is handled in real-time, the receiver will have access to the funds right away.

Users receive a transaction confirmation on their mobile banking application as soon as the transfer is finished. The transaction reference number, date, time, and transfer amount are normally included in this confirmation.

Transaction history: By maintaining a transaction history, the mobile banking application enables users to look back on and follow their IMPS transactions. For the purpose of reference and reconciliation, this history offers a record of previous transfers. Users of mobile banking have access to a quick, safe, and real-time fund transfer option thanks to the IMPS procedure. Due to its immediate nature, it is appropriate for many use cases, including bill payments, online shopping, and more. Users may easily start and finish IMPS transactions by utilising the mobile banking application and following the required authentication procedures.

vi) Fund Transfer (RTGS) Process

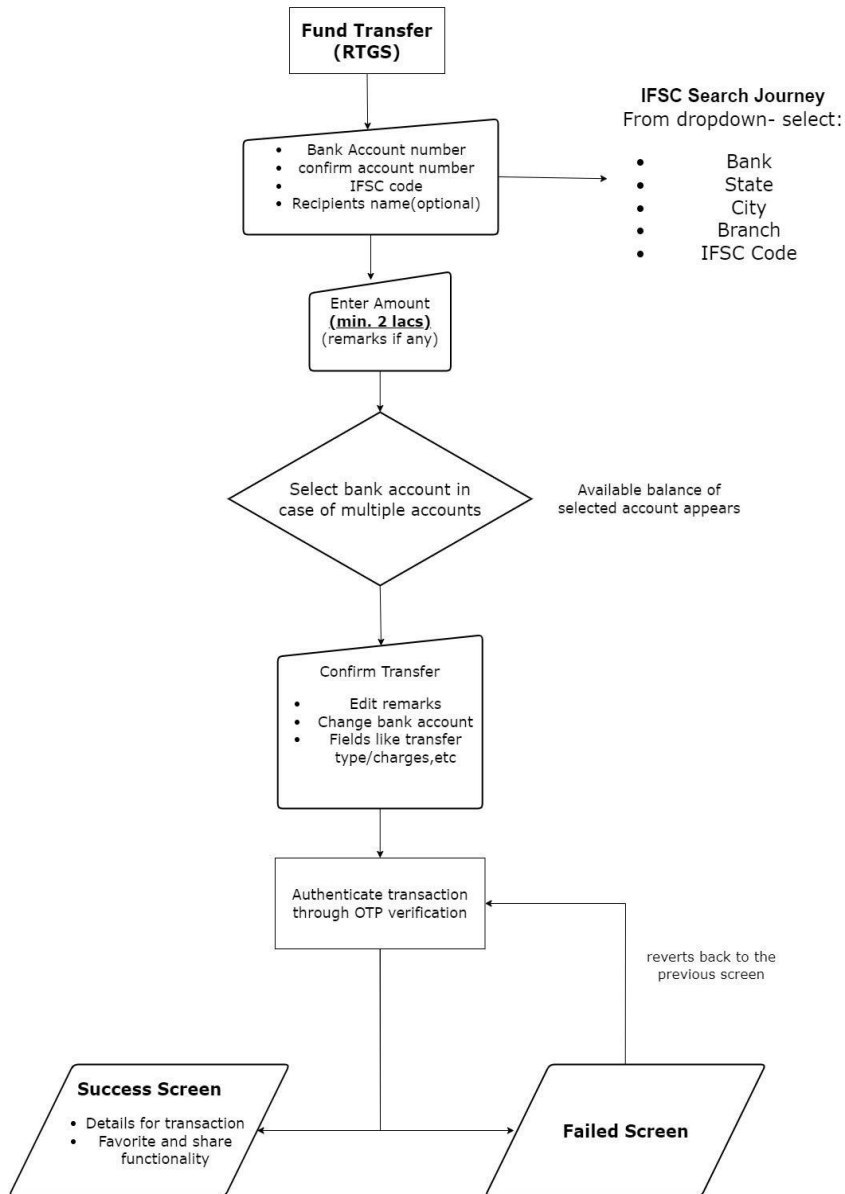


Fig 10. Fund Transfer (RTGS flow)

A payment system called Real-Time Gross Settlement (RTGS) enables both private persons and commercial entities to perform time-sensitive, high-value

financial transfers in real time. It is frequently applied in mobile banking to speedily and securely enable high-value transactions.

Beneficiary addition: Users must add the beneficiary's information in order to make an RTGS payment. This information must include the beneficiary's name, bank account number, and Indian Financial System Code (IFSC) for the beneficiary bank. This procedure makes sure that the beneficiary has permission to receive the payments.

Starting the transaction: After adding the beneficiary, customers may use their mobile banking application to start an RTGS transaction. They list the beneficiary, input the transfer amount, and provide any other necessary details, such as the notes or the reason.

Validation of the transaction: The mobile banking application verifies the transaction information, including whether there are enough funds in the user's account to carry out the transfer. It confirms the correctness of beneficiary information and guarantees adherence to RTGS regulations.

Authorization: In order to authorise the transfer, users must authenticate the transaction using their m-PIN or other available security mechanisms. By taking this action, further security is added and unauthorised access is avoided.

When a transaction is approved, the mobile banking application connects to the bank's systems to start the RTGS payment. The beneficiary receives the cash right away since they are moved in real-time from the user's account to their account.

Confirmation: Users receive a transaction confirmation on their mobile banking application once the transfer has been successfully completed. The transaction reference number, date, time, transfer amount, and beneficiary information are normally included in this confirmation.

Transaction history: By maintaining a transaction history, the mobile banking application enables users to look back on and follow their RTGS transactions. This history offers a record of previous transfers for use in comparison, reconciliation, and ongoing oversight.

Users of mobile banking may send and receive high-value funds swiftly and securely thanks to the RTGS procedure. Users may easily begin and finish RTGS transactions by using the mobile banking application and following the required authentication procedures, guaranteeing quick and accurate money transfers.

vii) Fund Transfer (NEFT) Process

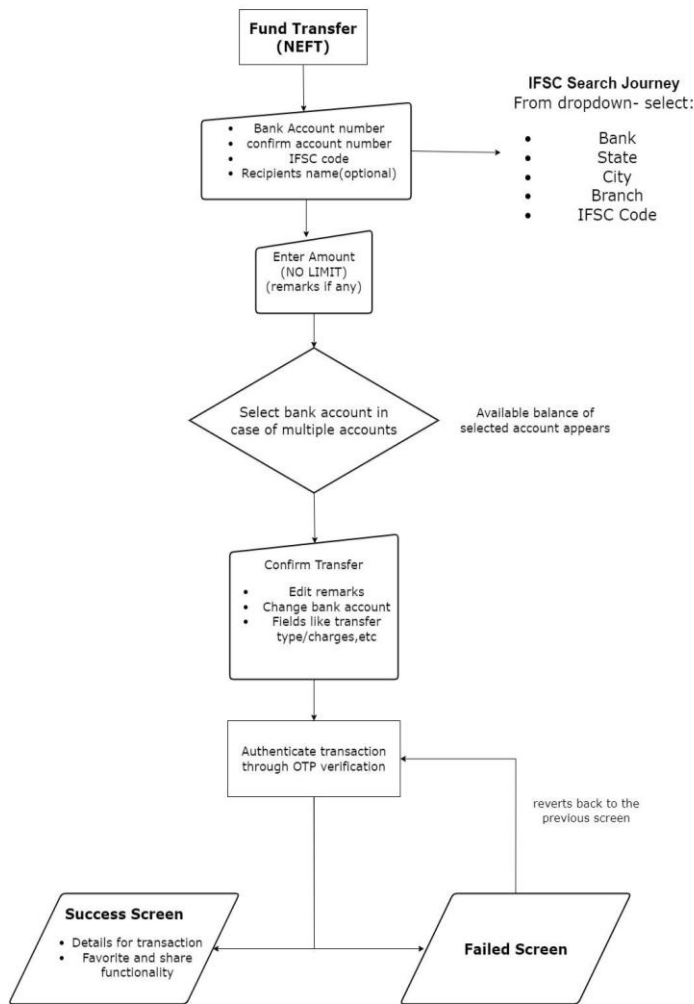


Fig 11. Fund Transfer (NEFT process) flow

A well-known electronic payment system called the National Electronic Funds move (NEFT) makes it possible for people and companies to move money between bank accounts in a safe and practical way. It is frequently used in mobile banking to enable flexible scheduling for transactions.

Beneficiary addition: In order to send a NEFT payment, users must provide the beneficiary's information, which must include the recipient's name, bank account number, and Indian Financial System Code (IFSC) of the recipient bank. This procedure makes sure that the beneficiary has permission to receive the payments.

Beginning a transaction: After adding the beneficiary, customers may utilise their mobile banking application to start a NEFT transaction. They list the beneficiary, input the transfer amount, and provide any other necessary details, such the notes or the reason.

Validation of the transaction: The mobile banking application verifies the transaction information, including whether there are enough funds in the user's account to carry out the transfer. It confirms the validity of beneficiary information and guarantees adherence to NEFT regulations.

Authorization: In order to authorise the transfer, users must authenticate the transaction using their m-PIN or other available security mechanisms. By taking this action, further security is added and unauthorised access is avoided.

Initiation of the fund transfer: After the transaction is approved, the mobile banking application connects to the bank's servers to start the NEFT payment. Through the safe NEFT network, the monies are sent from the user's account to the beneficiary's account.

NEFT transactions are handled in batches throughout the day, allowing for numerous settlement cycles during the settlement procedure. The transaction is submitted to the bank's settlement system via the mobile banking application, which also initiates the financial transfers and aggregates the transactions.

Confirmation: Users receive a transaction confirmation on their mobile banking application when the NEFT transfer is finished. The transaction reference number, date, time, transfer amount, and beneficiary information are normally included in this confirmation.

Transaction history: By maintaining a transaction history, the mobile banking application enables users to look back on and follow their NEFT transactions. This history offers a record of previous transfers for use in comparison, reconciliation, and ongoing oversight.

Users of mobile banking have access to a quick and safe way to transfer money between bank accounts thanks to the NEFT procedure. Users may simply begin and finish NEFT transactions by using the mobile banking application and adhering to the required authentication procedures, guaranteeing a reliable and effective transfer of money.

3.4 System Implementation

To give users of mobile banking applications and digital banking a safe, convenient, and effective experience, numerous crucial measures and considerations must be taken. An outline of the implementation procedure is provided below:

- Understand the unique needs of the mobile banking application and the digital banking platform by doing a requirement analysis. Determine the target market, the needed features, the security procedures, and the integration needs with the current financial systems.
- **Technology Stack Selection:** Based on platform needs, scalability, security, and user experience factors, select the best technology stack. For cross-platform development or native development for particular systems, common technologies include React Native or Flutter.
- **User Interface Design:** Create a user-friendly user interface with an emphasis on simplicity, simple navigation, and responsive design for various devices for the mobile banking application. To visualise the application flow and get input from stakeholders, use wireframing and prototyping tools.
- **Construction:** Create the mobile banking app using the chosen technology stack. Implement functionality including user sign-up, login, account dashboard, transaction history, money transfers, bill payment, and other pertinent elements. To safeguard user data, use secure coding guidelines and encryption standards.
- Integrate the mobile banking application with the industry's current payment gateways, customer databases, core banking systems, and other

financial software. Make sure that the mobile application and backend systems synchronise data seamlessly and get changes in real time.

- Implement strong security measures to protect client information and transactions. To reduce risks and make sure you are in compliance with industry requirements, use encryption techniques, secure communication protocols (such as HTTPS), two-factor authentication, biometric authentication, and routine security audits.
- Testing: Perform in-depth testing to find and fix any functional or usability problems. Test the mobile banking application end-to-end, in units, and with integration to make sure it works as it should and offers a smooth user experience.
- Prepare the mobile banking app for release on app marketplaces, such as the Apple App Store and Google Play Store. Follow the platform-specific submission procedures and criteria to have your app approved by the app store.
- Continuous Monitoring and Maintenance: Keep an eye on the performance, security, and usability of the mobile banking application. Update the programme often with new features, security updates, and bug fixes. To develop and enhance a product based on client demands, collect user feedback.
- Provide thorough customer service channels, such as helplines, chatbots, and FAQs. Also provide customer training. To instruct consumers on how to use the mobile banking app and digital banking services successfully, hold training sessions or write user guides.

For clients to have a smooth and safe banking experience, the implementation of a mobile banking application and digital banking involves careful planning,

development, and integration. Banks may provide their clients practical and effective digital banking solutions by adhering to industry best practises and maintaining current with new technology and security regulations.

CHAPTER 4

Performance Ananalysis

4.1 Analysis

Given that the user has downloaded the Shivalik Mobile app from Playstore/ Appstore,

- When the user views the splash screens and gives consent to the required permissions (like location access, phone/SMS access, etc.)

- Then the user shall be able to select preferred language out of English(default) and Hindi, and shall proceed on to registration. Given that user has proceeded on the registration screen,

- When the user shall be asked if they are existing Shivalik Bank customers.

- Then the user shall go through the following journey if they select the yes option. Given the user is ETB, the user shall see the mobile number selection screen.

- When the user comes on the mobile number selection screen,

- Then the app will auto detect the mobile numbers in the device along with their respective network providers.

- Then the user must select the mobile number linked with the Shivalik bank account through the use of radio buttons, and click on the proceed button.

1. The SIM binding activity shall take place at the back-end.

2. The mobile number has to be validated from the Bank's customer database to authenticate the user as ETB.

3. If the mobile number isn't available in the bank's database, the user shall be redirected to an error screen where a message will be showcased

“The selected mobile number isn’t registered with us. Please approach your base branch to update your number”.

Given the user is on the abovementioned error screen, two options shall be available:

- When the user selects the “Select another number” button,
- Then the user shall be redirected to the mobile number selection screen.
- When the user selects the “I am not a Shivalik Bank Customer” button,
- Then the user shall be recognized as NTB, and will go through the NTB journey.

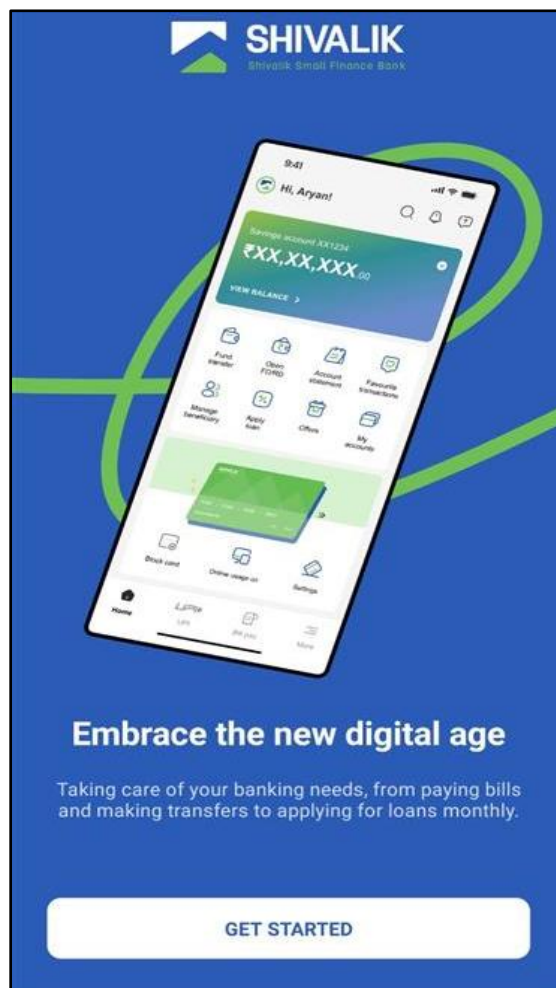


Fig 12. The First Page of the Application

After the user's basic setup (ETB/NTB, mobile number selection, SIM binding), the user shall have to choose and go through registration process by selecting one of the following modes:

1. Registration through Debit Card.
2. Registration through Aadhar number.
3. Registration through Branch.

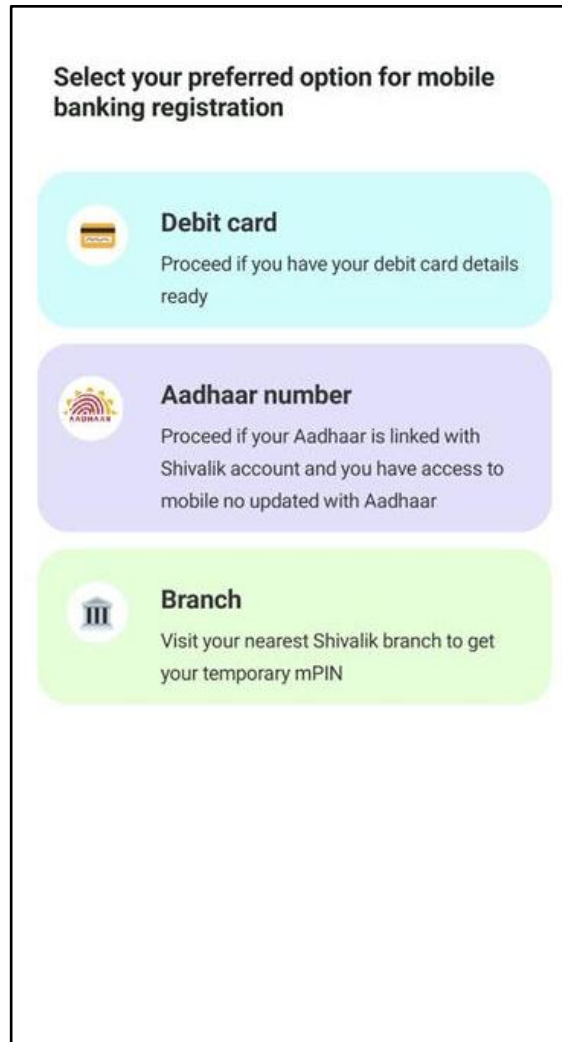


Fig 13. The Splash screen to choose the Registration method

As a registered ETB user, I shall log-in the application using mPIN/Biometrics, so that I can view the dashboard screen and navigate further.

Given the user has logged in successfully,

- Then the user shall be navigated to post-login/
Dashboard screen.

• Then the user could view/access the following sections:

- Quick Balance
- Debit Card: card last 4 digits and name always visible, OTP verification to view actual details, swipe left to view multiple cards(if any)
- Fund transfer
- Open FD/RD
- Account statements
- My Accounts
- Offers
- Favorite transactions
- Manage Beneficiary
- Apply Loans (next phase)

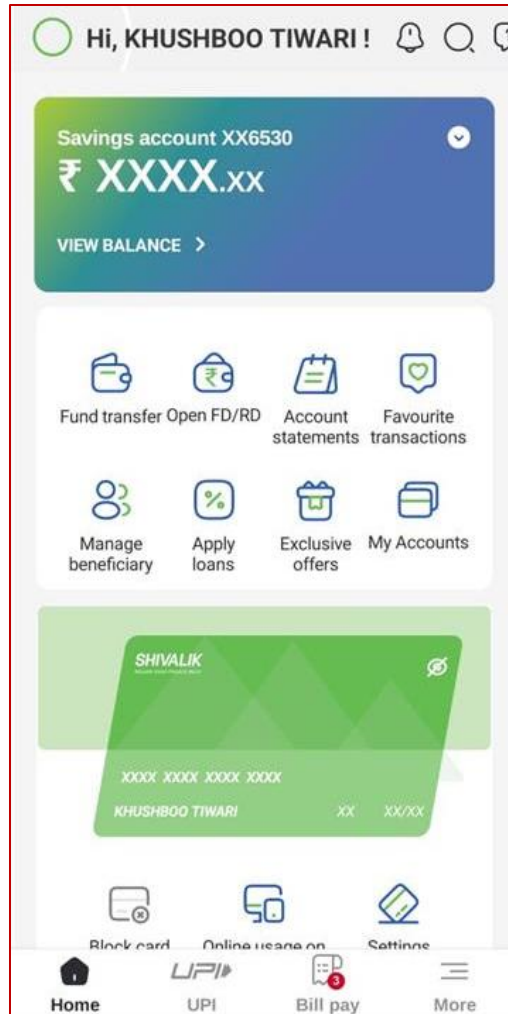


Fig 14. Post-Login page of the app

Given that the user opts for registration through Branch option,

- When the user selects such option
- Then the user shall view the steps for opting mPIN from the branch. The user shall click on the “I have received temporary pin” option.

Given that one mobile number may be linked to more than one Customer ID(CIF).

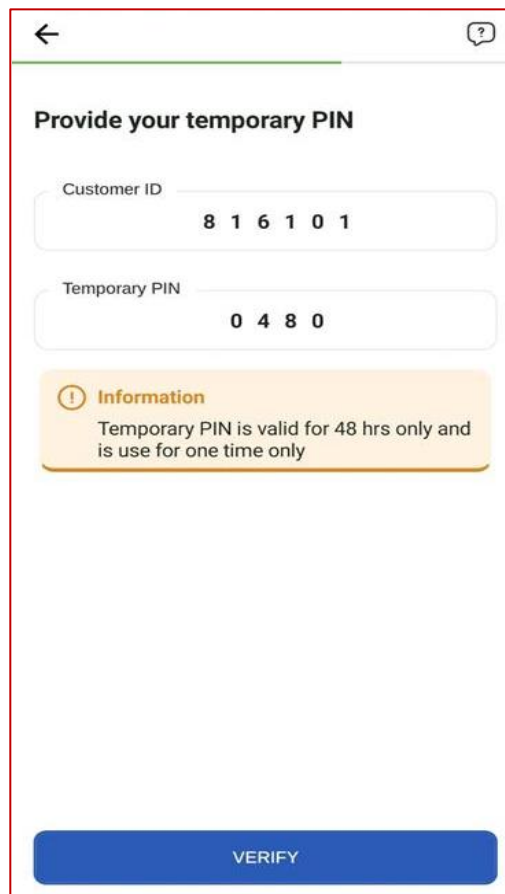
- When multiple CIFs are linked to a single mobile number,
- Then the Customer ID field shall be manually entered by the user.
- When single CIF is linked to single mobile number,

- Then the Customer ID field shall be prefilled and uneditable.

Given that ETB authentication is successful and sim binding process is complete,

- When the user selects registration through branch card option,
- Then the user shall have to enter/ view the following details mandatorily:
 1. The Customer ID (shall be prefilled/ editable as the case may be)
 2. 4 digits of temporary mPIN received on mobile. (Only numeric keyboard should be shown here)

The temporary mPIN shall be created through admin module, and shall be valid for 48 hours.



The screenshot displays a mobile application interface for entering a temporary PIN. At the top, there is a back arrow on the left and a help icon on the right. The main heading is "Provide your temporary PIN". Below this, there are two input fields. The first field is labeled "Customer ID" and contains the digits "8 1 6 1 0 1". The second field is labeled "Temporary PIN" and contains the digits "0 4 8 0". Below the input fields is an orange information box with a warning icon and the text "Information: Temporary PIN is valid for 48 hrs only and is use for one time only". At the bottom of the screen is a large blue button labeled "VERIFY".

Fig 15. Setting up page of Temporary Pin

Given the user has logged in successfully,

- Then the user shall be navigated to post-login/ Dashboard screen.
- Then the user could view/access the following sections:

- Quick Balance
- Debit Card: card last 4 digits and name always visible, OTP verification to view actual details, swipe left to view multiple cards(if any)
- Fund transfer
- Open FD/RD
- Account statements
- My Accounts
- Offers
- Favourite transactions
- Manage Beneficiary

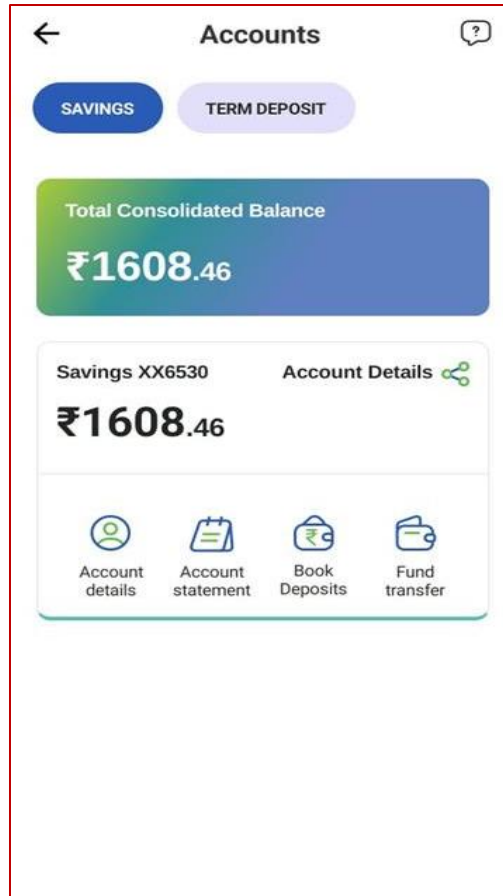


Fig 16. Balance view page in the application

Given that the user has navigated inside the account statements section, When the user is inside particular tab (savings/ current/ deposits/loan), then the user shall be asked to select default account (only in case user has multiple accounts of single account type)

When the user has selected the account, then the respective account balance, account number, last 30 transactions shall be visible.

1. Current Month total debits and credits shall be visible in case of Savings and Current type tab.
2. The last 30 transaction shall mention the date, amount, debit/ credit and narration.

When the user clicks on Filter icon,

Then the user can opt for following filter functionalities:

- o Date: Last week/month/ 3 months
- o Amount: Low to High/ High to Low
- o Transfer type: debit/ credit
- o Time period: Start and End date (maximum 2 years)
- o Amount

When the filter is applied, then the search results shall get 90 transactions from CBS and show results according to the filter.

In case the selected date range has more than 90 transactions, only then an information icon will show that “transaction count exceeds 90 transactions, generate statement to get all details emailed”.

Given that the user wants to generate statement

When the user clicks on generate Statement button,

Then the user shall have to choose periodicity out of

- o Last month
- o Last quarter
- o Last Financial Year
- o Custom date (validation: period of not more than 2 years can be chosen at the same time)

When the user has selected the required periodicity,

Then the user shall click on email statement.

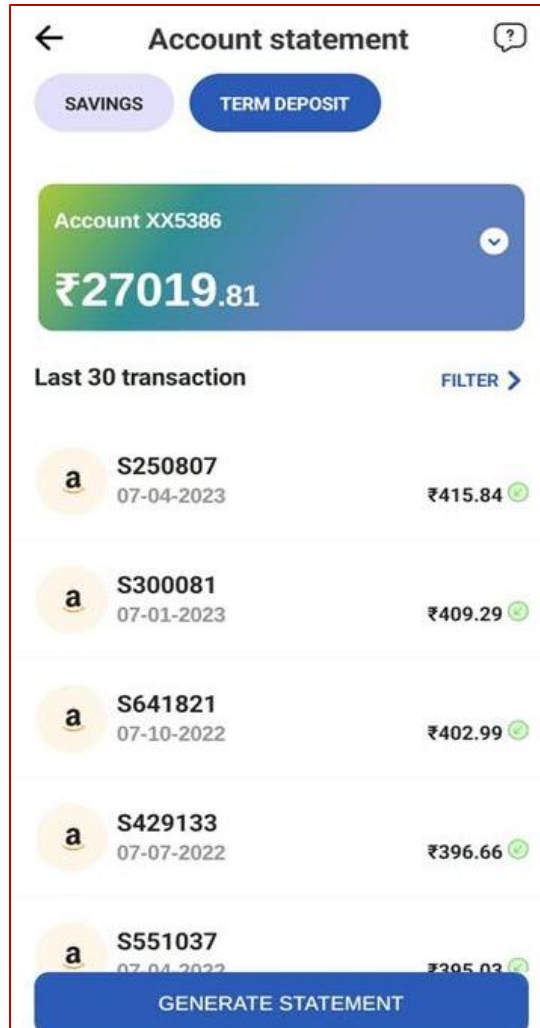


Fig 17. The account statement page for term deposit in the application

As a registered logged in ETB user, I want to transfer funds successfully and safely.

Given that the user has opted for the fund transfer

- Then the user shall have to choose from the following options:
 - o Quick Transfer
 - o Transfer to Beneficiaries
 - o Manage Beneficiaries
 - o My Shivalik A/c's
 - o Scheduled Transfers

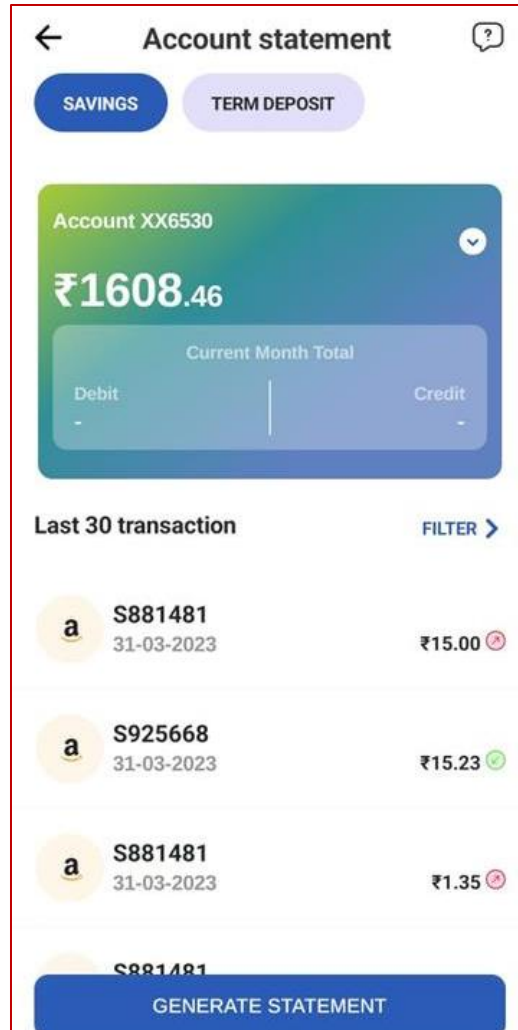


Fig 18. Account statement page for savings in the application

Given that the user has opted for the add/manage/transfer to beneficiary, Then the user shall follow the journey explained in flow diagram above.

1. Transfer type can be IMPS/ RTGS/ NEFT.
2. Schedule transfer can only be made through RTGS/ NEFT, so if IMPS is chosen, then the schedule transfer icon shall get disabled.
3. When Beneficiary holds account with Shivalik bank (Winjit team shall recognise this through IFSC, then transfer type shall not be chosen, directly transfer within Shivalik bank's API shall be used)

4. Whenever new Beneficiary is added, cooling period shall be for 30 minutes, i.e., user cannot make any payment (IMPS/ RTGS/ NEFT) for 30 minutes.
5. New beneficiary: name and Nickname: alphanumeric, 25 characters, no special characters.
6. Nickname shall be shown on the base screen of Transfer/manage beneficiaries.
7. Once beneficiary is added, also when cooling period is over: the customer shall be sent an SMS.
8. Edit beneficiary shall allow the user to edit only the nick name of beneficiary.

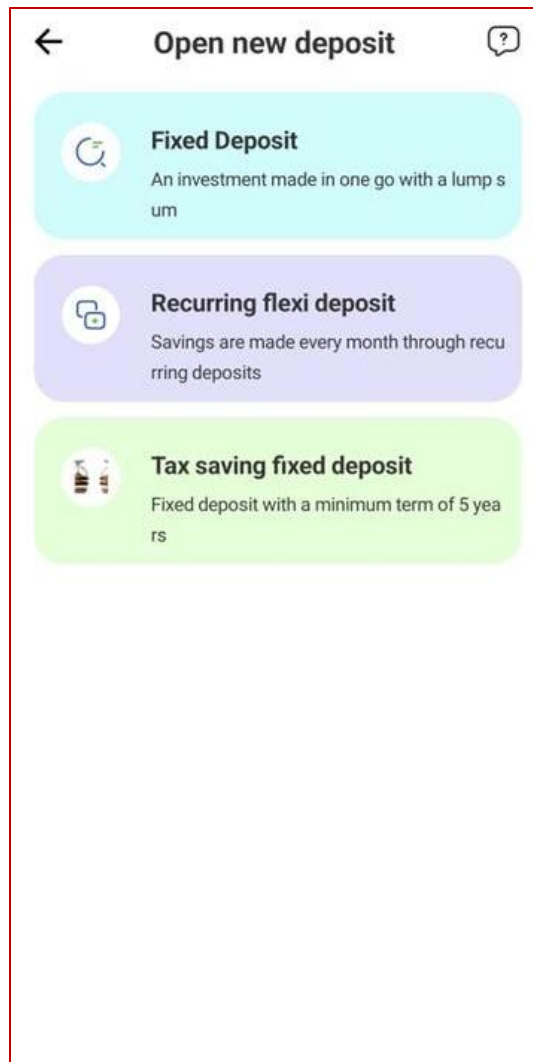


Fig 19. Landing page for term deposit opening page

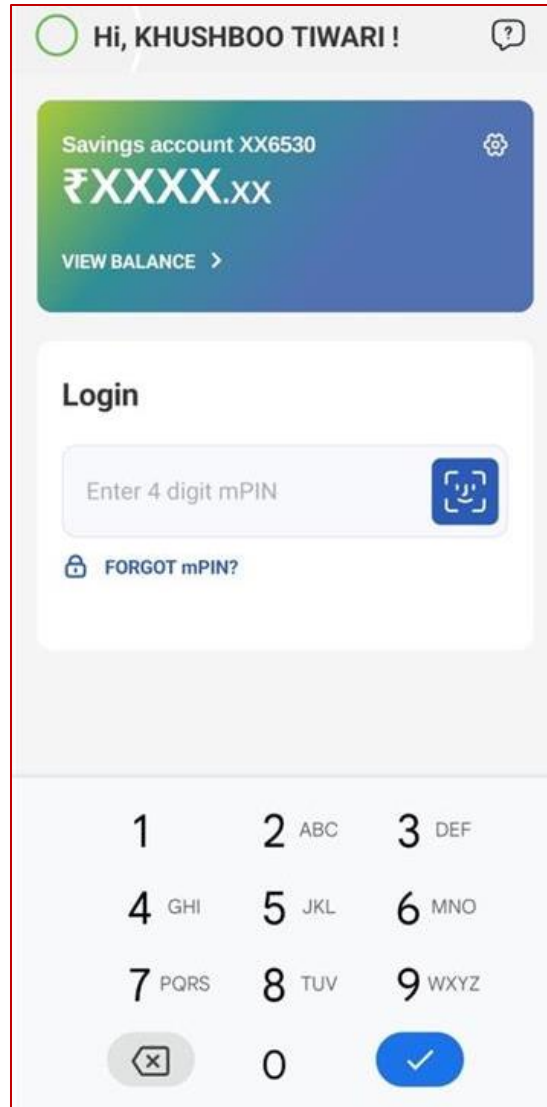


Fig 20. Login Page in the application

Given that the user clicks on My Shivalik A/c's

When the user is displayed with their list of accounts under the CIF

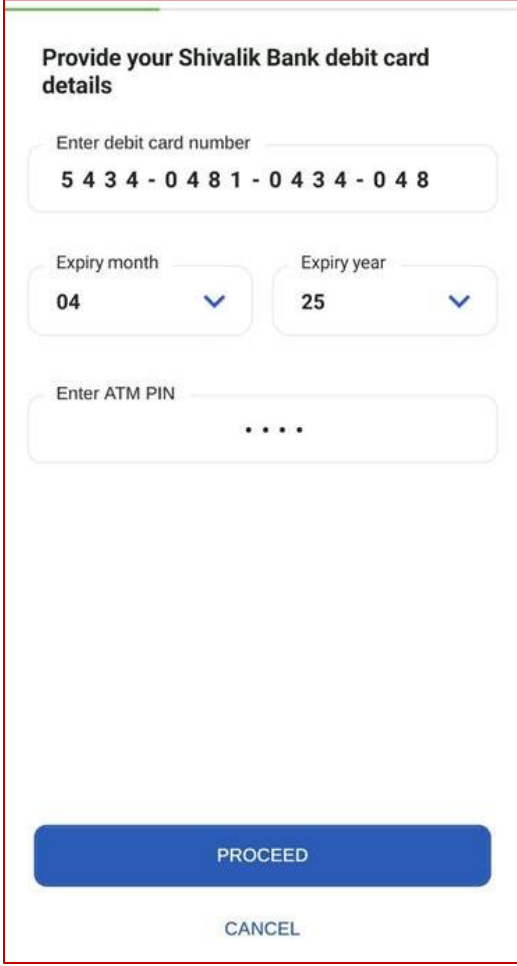
Then the user shall choose the account where they wish to transfer funds to

When the user shall enter the amount, remarks, schedule (if any) (Note: no radio buttons for selection of transfer type like IMPS/RTGS/NEFT) to be given here)

Then the user shall select the account from which the transfer is to be made.

When the confirmation and OTP verification is successful, such transfer within CIF is successful

1. The account from which transfer is to be made, and account to which transfer is to be made cannot be the same.
2. When transfer is made to loan account, then the amount should be minimum 100 Rs., and shall not exceed the Overdue amount+ One advance EMI.
3. No limit for transaction within CIF (except loan).



The image shows a mobile application screen for registering a Shivalik Bank debit card. The screen has a white background with a red border. At the top, the text "Provide your Shivalik Bank debit card details" is displayed in bold. Below this, there are three input fields: "Enter debit card number" with the value "5 4 3 4 - 0 4 8 1 - 0 4 3 4 - 0 4 8", "Expiry month" with the value "04", and "Expiry year" with the value "25". Below these, there is a field for "Enter ATM PIN" with four dots. At the bottom, there are two buttons: a blue "PROCEED" button and a grey "CANCEL" button.

Fig 21. Debit Card registration page

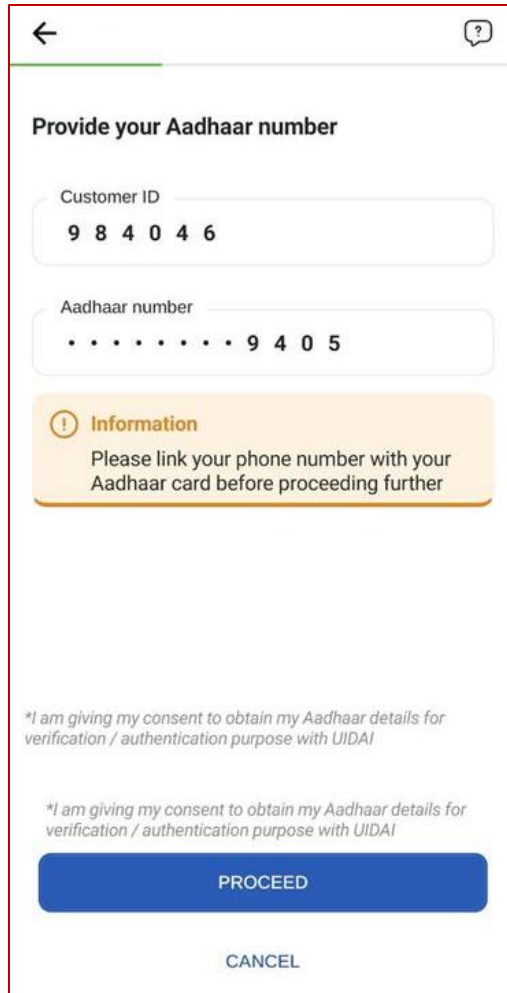


Fig 22. Aadhaar Card Login Method

As a registered logged in ETB user, I wish to schedule transfers/
view upcoming scheduled transfers.

Given the user clicks on scheduled transfer,

Then the user can choose to schedule new transfer or view
scheduled transfers. When the user clicks to view scheduled
transfer,

Then the user shall view the listing of transfers which are already scheduled
by them and are upcoming:

One time: Beneficiary name, transfer date (in order of next), amount.

Recurring: Beneficiary name, next transfer date, last transfer date,
frequency amount.

Then user can also stop a scheduled transfer by clicking on stop icon and going through successful OTP verification.

When the user clicks to schedule new transfer,

Then the user shall select the beneficiary, amount, transfer type (NEFT/RTGS), Then the user shall confirm scheduling details:

If One time: transfer date (date period shall be from next day till 1 year)

If Recurring: frequency (weekly, fortnightly, monthly, quarterly, half-yearly), first transfer date, number of transfers. (Winjit team shall calculate the last transfer date) (maximum last date can be till 1 year, validation to be put, i.e. user can schedule a recurring transfer only till 1 year from current date)

When the scheduling confirmations are made,

Then the user shall choose the account through which transfer to be made, this screen shall only be applicable when there are multiple accounts.

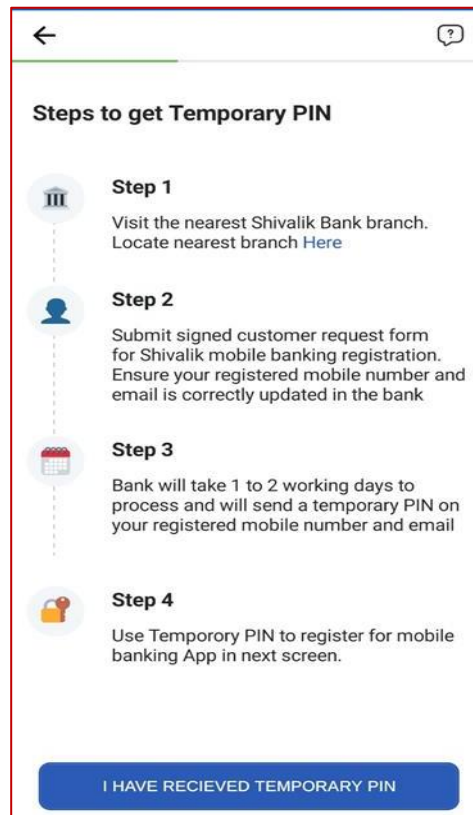


Fig 23. Branch Login method using temporary Pin

4.2 Performance Requirements

To provide a seamless and effective user experience, mobile banking applications must meet strict performance criteria. To handle user interactions efficiently, the application should have quick reaction times, quick loading times, and little latency. It need to be able to manage several concurrent users without experiencing performance reduction. To give users accurate and current information, the application should also have effective data synchronisation and real-time updates. In order to ensure compatibility and responsiveness across multiple mobile platforms, the mobile banking application should also be optimised for various devices and screen sizes. By ensuring that customers can quickly and easily access their financial services, meeting these performance standards improves their overall happiness with the mobile banking experience.

4.3 Security Requirements

When it comes to a mobile banking application, security is crucial. To safeguard private user information and stop unauthorised access, the application must adhere to strict security standards. To make sure that only authorised users can access their accounts, it should adopt strong authentication methods like two-factor authentication, biometric authentication, or secure login credentials. Strong encryption methods should be used by the mobile banking application to protect data transit between the application and the server, preventing interception or manipulation. In order to safeguard user data on the device, such as account information and transaction history, it should also employ secure storage procedures. To find and close any security gaps, routine security audits, vulnerability assessments, and penetration testing should be carried out. The mobile banking application may boost user confidence by upholding stringent security standards, safeguarding the confidentiality and integrity of their financial activities.

CHAPTER 5

5.1 CONCLUSIONS

In summary, a mobile banking app is a potent tool that gives consumers efficiency, accessibility, and convenience while managing their money. The criteria for performance, security, and user experience must be carefully considered for the effective deployment of a mobile banking application. The programme may provide a smooth and user-friendly experience by guaranteeing quick response times, effective data synchronisation, and interoperability with different devices. Furthermore, putting strong security measures in place helps safeguard sensitive user data and fosters confidence in the programme. These measures include strong authentication procedures, data encryption, and frequent security audits. In light of these factors, a well-thought-out and secure mobile banking application may revolutionise how users interact with their money by providing them with a dependable and easy banking experience while on the go.

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