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Solution Requirements Document

## INTRODUCTION

At a time when financial technology is rapidly evolving, Scotiabank's adoption of the Unified Payments Interface (UPI) represents a strategic move to meet the dynamic needs of its tech-savvy customer base. With UPI, Scotiabank offers customers the ability to make instant transfers, manage multi-currency transactions and seamlessly integrate their banking activities into a unified application interface. This leap improves the banking experience and highlights Scotiabank's commitment to innovation, security, and customer satisfaction. UPI integration positions Scotiabank as a forward-thinking industry leader, ready to deliver efficient, secure, and borderless financial services.

## SUMMARY OF EXISTING FUNCTIONALITY

In this scenario where Scotiabank decides to implement UPI, here's a summary of the existing features that could be available based on UPI's capabilities and integration within a banking structure.

Summary of UPI Features in Scotiabank:

* **Instant Transfers:** Customers can transfer funds quickly without waiting for the banking processing times.
* **Virtual Payment Address (VPA):** For sharing customers' bank account numbers, they can use a VPA like [username]@scotiabank to send or receive money.
* **Multi-Currency Support:** Considering Scotiabank’s presence, a feature might allow currency conversions during UPI transactions subject to permissions.
* **Unified App Interface:** Scotiabank’s banking app could have an interface where users can manage UPI transactions and regular banking activities.
* **Peer to Peer (P2P) and Peer to Merchant (P2M) Payments:** Customers can utilize UPI for user transactions and payments to registered merchants.
* **Scan and Pay:** The app might include QR code functionality that enables users to scan payment merchant codes.
* **Multi-bank integration:** Users may have the option to link accounts from banks into Scotiabank’s UPI interface, providing them with a platform for managing all their UPI transactions across different versions.
* **Transaction Limits:** Depending on the regulations and policies of the bank, there could be limits on the number or number of UPI transactions that can be done daily or monthly.
* **Enhanced Security Measures:** To ensure the safety of UPI transactions, advanced security features such as two-factor authentication, end-to-end encryption, and real-time fraud detection may be implemented.
* **Real-Time Alerts:** Customers will receive notifications for all transactions made through UPI, ensuring they are always informed about their account activities.
* **Seamless Integration with Global Services:** Given Scotiabank’s presence, there might be features that enable UPI payments across borders. However, it is essential to note that these features will still comply with banking regulations.

## REQUIREMENT DETAILS

**FUNCTIONAL REQUIREMENTS**

|  |  |
| --- | --- |
| **ID** | FUNCTIONAL REQUIREMENTS |
| FR-01 | **User Registration for UPI Services**  Users can easily register for UPI services by connecting their bank account and mobile number and confirming their identity. This process allows users to create a UPI ID and set up their account for transactions, ensuring authenticated transactions. |
| FR-02 | **Initiation of UPI Transactions**  The system should allow users to start transactions by entering the recipient's UPI ID, choosing their associated bank account, and inputting the amount they want to transfer. This is a feature that enables users to send funds through UPI. |
| FR-03 | **Two-Factor Authentication**  To enhance the security of transactions and prevent access, the system will implement two-factor authentication. This involves sending a one-time password (OTP) to the user's registered number for transaction authorization. Doing so adds a layer of protection and ensures that all transactions are properly authenticated and safeguarded. |

**SECURITY REQUIREMENTS:**

|  |  |
| --- | --- |
| **ID** | **SECURITY REQUIREMENTS** |
| SR-01 | **End-to-End Encryption**  The UPI platform will incorporate encryption measures to ensure that transaction data transmitted between user devices and bank servers remains secure and inaccessible to individuals. This is crucial for safeguarding personal information against potential cyber threats. |
| SR-02 | **Data Privacy and Compliance**  The system must comply with data protection regulations such as the General Data Protection Regulation (GDPR) or other relevant local laws about data privacy. It will guarantee that user data is processed, stored, and shared by standards and only for purposes. |
| SR-03 | **Multi-Factor Authentication**  UPI users will undergo a factor authentication process to enhance security when initiating transactions, registering devices, or modifying account settings. This may involve methods like one-time passwords (OTPs), biometrics or security questions. These authentication measures verify transactions and account changes, adding protection. |

* 1. **PERFORMANCE REQUIREMENTS:**

|  |  |
| --- | --- |
| **ID** | **PERFORMANCE REQUIREMENTS** |
| PR-01 | **Transaction Speed**  The UPI system needs to process transactions within 10 seconds to deliver on its promise of hassle-PRee transfers. It should consistently achieve this transaction speed during usage periods to guarantee uninterrupted service. |
| PR-02 | **System Availability**  Scotiabank UPI service aims for an availability of 99.95%, ensuring that users can always access and use the system except for scheduled maintenance or unforeseen incidents. This highlights the reliability and accessibility of the system. |
| PR-03 | **Scalability**  The UPI platform must handle increasing user load and transaction volumes, ensuring efficient performance as the user base and transaction frequencies grow. |

## ASSUMPTIONS & Prerequisites

**ASSUMPTIONS**

* **UPI Popularity:** There is a growing trend of UPI (Unified Payments Interface) adoption. There is a specific need for Scotiabank to integrate UPI to cater to its clientele.
* **Scotiabank Infrastructure:** Scotiabank has the IT infrastructure in place. Is willing to invest in it for facilitating UPI transactions.
* **Legal Framework:** The regions where Scotiabank operates have or will soon have frameworks that allow UPI-based transactions.
* **Demand:** Scotiabank customers are familiar with UPI. There is a demand from them for such a service.
* **Security:** The UPI system can meet the security and compliance standards the bank sets. It can be modified to meet those standards.
* **Integration:** UPI can seamlessly integrate into Scotiabank’s existing mobile and online banking platforms.
* **Operational Costs:** Scotiabank believes that the benefits of adopting UPI will outweigh any costs involved.

**PREREQUISITES**

* **Regulatory Approval:** Scotiabank would need to obtain permission from each country's bank or monetary authority where it intends to introduce UPI services.
* **Understanding of UPI Protocol:** A dedicated team at Scotiabank should thoroughly understand the intricacies of the UPI protocol and its various integration aspects.
* **Technical Infrastructure:** Adapting IT systems at Scotiabank to ensure compatibility with UPI standards. This could involve using servers, gateways for transactions and facilities for storing data.
* **Collaboration:** If UPI is primarily based in a country (for example, India), Scotiabank may need to work with local banks or payment gateways to ensure smooth integration.
* **Ensuring Security:** Implementing security measures such as end-to-end encryption, two-factor authentication and real-time fraud detection.
* **Customer Education:** Launching initiatives to educate customers about the advantages and functioning of UPI. This might include tutorials, FAQ sections and training for customer support.
* **Testing Environment:** Before implementation, Scotiabank should have a testing environment in place to thoroughly test the functionality of UPI. This ensures that all transactions are processed securely and efficiently.
* **Feedback Mechanism:** Establishing a system to gather feedback from adopters of the UPI system to improve the service.

## **SOLUTION #1** (**ADDING THE UPI OPTION IN THE EXISTING SCOTIA BANK MOBILE APP)**A screenshot of a phone Description automatically generated

**HIGH-LEVEL DESIGN**

The high-level design for adding UPI fund transfers to the Scotia Bank mobile app covers the primary architectural components and functionalities needed to give consumers a seamless and safe UPI-based transaction experience.

1. **Architecture:**

**Client-Server Model**: The system will be built with a client-server model. UPI transactions are handled by the bank's servers, with the mobile app acting as the client.

**Integration Layer**: To connect the mobile app with the UPI system and ensure safe data transfer, an integration layer will be put up.

1. **Modules:**

*Scotia Bank’s UPI option on the Mobile App Home Page*

**User Interface (UI):** The app's UI will include a dedicated section for UPI fund transfers. Users will access this section from the app's My Accounts menu.

**UPI Transaction Handling**: This module will manage the flow of UPI transactions, including initiating transfers, verifying recipient details, and confirming payments.

**Error Handling:** Error handling will be an integral part of the system to provide users with clear and informative error messages in case of issues.

**Backend Integration**: This module is responsible for connecting with external UPI service providers, such as the UPI network and recipient banks.

* **User Interface (UI):** The app's UI will include a dedicated section for UPI fund transfers. Users will access this section from the app's My Accounts menu.
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* **Backend Integration**: This module connects with external UPI service providers, such as the UPI network and recipient banks.

1. **Interactions:**

* **User Interaction**: Users will interact with the mobile app's UPI feature to initiate fund transfers, input recipient information, review and confirm transactions, and receive status updates.
* **API Interaction**: The mobile app will interact with UPI service provider APIs to process transactions, validate recipient details, and retrieve transaction status.
* **Backend Interaction**: The app will communicate with Scotia Bank's backend systems to perform necessary checks, such as account balance verification and transaction authorization.

1. **Data Flow:**

* **User Data:** User data, including profiles and transaction history, will be managed within the mobile app and synchronized with the bank's backend systems.
* **Transaction Data:** Transaction details, such as recipient information, transaction amounts, and timestamps, will flow from the mobile app to external UPI service providers and Scotia Bank's backend.
* **Error Data:** Error data, including error codes, descriptions, and timestamps, will be exchanged between the mobile app, external services, and the bank's systems.

1. **External Interfaces:**

* **UPI Service Providers**: The mobile app will interact with UPI service providers, such as the UPI network, to process fund transfers and verify recipient details.
* **Scotia Bank Backend:** The mobile app will connect to Scotia Bank's backend systems to validate user profiles, authorize transactions, and update account balances.
* **Recipient Banks:** For transfers to external banks, the system will interact with recipient banks to facilitate the transfer.

1. **Scalability and Performance:**

The architecture will be designed to scale to accommodate increasing user volumes, ensuring that the mobile app can handle a growing number of UPI transactions. Performance optimization strategies will be in place to provide users with a smooth and responsive experience during fund transfers.

**Low-level Design**

**User Interface:**

1. **Screens and Layouts:**

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* Create three distinct options: "Recipient Selection," "Transaction Details Input," and "Payment Confirmation."
* The "Recipient Selection" screen should list existing recipients, allowing users to tap on a recipient's name to select them.
* The "Transaction Details Input" screen should include fields for entering the recipient's Virtual Private Identity (VPI) or bank account details and the transaction amount.
* The "Payment Confirmation" screen should provide a clear transaction summary, including recipient information and transaction amount. It should have a prominent "Confirm" button.

1. **User Interactions:**

* On the "Recipient Selection" screen, users can interact by tapping on a recipient's name to select them as the transaction recipient.
* On the "Transaction Details Input" screen, users interact by tapping input fields to enter recipient details and transaction amount.
* In the "Payment Confirmation" screen, users review the payment details and confirm by tapping the "Confirm" button.

1. **User Input Validation:**

* Implement real-time validation for recipient details, ensuring that the provided VPI or bank account details are accurate and in the correct format.
* Validate the transaction amount to ensure it is within transaction limits and represents a valid numerical value.
* Display immediate error messages for any incorrect or incomplete user inputs.

1. **Error Handling:**

* Develop a system for displaying pop-up error messages with descriptive text when errors occur during recipient selection, input validation, or payment confirmation.
* Include options for users to retry the action or take corrective measures based on the error message's guidance.

**Data Structures:**

1. **User Profiles:**

* Define the structure for user profiles, including fields for usernames, email addresses, and linked bank accounts. Ensure that this data is stored securely and retrieved accurately.
* Utilize database tables or data storage mechanisms to maintain user profiles.

1. **Transaction Details:**

* Create a structured format for transaction details, including unique transaction IDs, transaction amounts, recipient information (VPI or bank account), and timestamps. This data should be used for auditing and tracking.
* Implement transaction logs for historical record-keeping.

1. **Error Logs:**

* Define a log format that includes error codes, descriptive error messages, timestamps, and related transaction data.
* Ensure that error logs are securely stored and accessible to administrators for debugging and issue resolution.

1. **Recipient Information:**

* Define the structure for storing recipient contact information, such as names, email addresses, phone numbers, and security codes for verification.
* Securely manage recipient information within the application.

**Algorithms:**

1. **Validation Algorithm:**

* Implement an algorithm to validate Virtual Private Identities (VPAs) for uniqueness and adherence to naming conventions.
* Design the algorithm to return specific error codes and messages in case of non-compliance.

1. **Payment Authorization Algorithm:**

* Develop an algorithm that considers available funds, transaction limits, and two-factor authentication requirements to authorize or decline payments.
* Ensure the algorithm aligns with security and compliance standards.

1. **Error Handling Algorithms:**

* Create algorithms that generate error codes and messages based on specific error conditions.
* Ensure that the algorithms provide consistent and informative error reporting to users.

**Error Handling:**

1. **Error Codes:**

* Define a comprehensive list of error codes for scenarios like insufficient funds, incorrect recipient information, and network connectivity issues.

1. **Logging:**

* Specify error logging mechanisms, including log entry format, storage location, and accessibility for administrators for debugging and issue resolution.
* Consider using structured log files or database tables to store error information.

1. **User Notifications:**

* Design the user notification system, including pop-up dialogues with user-friendly error messages and in-app notifications.
* Ensure that error notifications include clear descriptions and offer options for users to take corrective actions.

**Payment Authorization:**

1. **User Interface:**

* Develop the payment confirmation screen with a user-friendly layout, including a transaction summary, recipient details, and clear authorization buttons.
* Include informative feedback on successful transactions (e.g., "Payment Successful").

1. **Backend Logic:**

* Implement backend logic to authorize payments based on available funds, transaction limits, and two-factor authentication requirements.
* Ensure that the backend logic aligns with security and compliance standards.

1. **Transaction Confirmation:**

* Design a process to confirm transactions, including notifications sent to users upon successful completion.
* Include details about the content of confirmation notifications, such as transaction IDs and timestamps.

**VPA Management:**

1. **Creation:**

* Specify the steps for users to create new VPAs, including inputting essential user data, such as VPA name.
* Implement secure generation and linking of VPAs to user accounts.

1. **Editing and Deletion:**

* Create user interfaces for editing or deleting existing VPAs, ensuring validation checks to prevent unauthorized actions and data loss.
* Include confirmation steps to avoid accidental deletions.

**Fund Transfer:**

1. **Recipient Details Input:**

* Define the recipient details input process, specifying how users input recipient details, whether they transfer to VPAs or bank accounts.
* Implement validation checks to ensure accurate recipient information entry.

1. **Transaction Processing:**

* Outline the steps for processing transactions, including debiting the source account, crediting the recipient, and updating transaction logs.
* Include security measures to protect the integrity of funds during the transfer process.

1. **Notification:**

* Design the notification system to inform users of transaction status, including success or failure notifications sent in real-time.
* Ensure that users receive immediate feedback on the outcome of their transactions.

**Integration:**

1. **API Endpoints:**

* Identify and document specific API endpoints for integrating UPI service providers or external bank systems.
* Include details about the data exchanged through these endpoints and the required authentication methods.

**Data Formats:**

* Describe the data formats used for data exchange, specifying the structure and content of data transmitted between the mobile app and external systems.
* Ensure compatibility with industry standards, such as JSON or XML.

**Data Synchronization:**

* Implement data synchronization mechanisms to keep transaction data up-to-date between the mobile app and external systems.
* Allow for real-time updates of transaction history and account balances.

This precise information offers a thorough method for putting each component of the low-level design for enabling UPI fund transfers in the current mobile app from Scotia Bank into practice. It guarantees programmers have a precise road map for the system's technical implementation.

**Out of scope**

* **UPI Full Suite Features:** The solution deals with only fund transfers in UPI implementation. Bill payment, mobile recharge, and in-store payments are all outside this project's scope.
* **International Transactions**: The solution is limited to domestic fund transfers within the country. It does not cover international transactions or currency conversion.
* **UPI Merchant Transactions**: This solution has no functionalities for UPI-based commercial payments.
* **Currency Exchange:** The solution does not involve money exchange services. The mobile app does not allow currency conversion by users.
* **Advanced Investment Services:** Beyond simple financial transfers, investment and wealth management services are outside the scope.
* **Integration with Other Banking Services**: The integration of UPI with other banking services, such as loans or mortgage accounts, is not part of this solution.

**Impact Analysis**

**Positive**

* **Customer satisfaction**: By offering a quicker and easier manner of fund transfer within the mobile app, enabling UPI fund transfers improves client convenience.
* **Competitive advantage**: Competitive advantage by offering a modern and versatile payment solution, setting itself apart from traditional banks and also helping maintain or increase the market position in the industry
* **Operational efficiency**: UPI is more of an automated process, which leads to reduced cost and efficiency, reducing manual interventions.
* **Regulatory Compliance:** Maintaining a high reputation and regulatory status requires, but also benefits from, ensuring compliance with financial laws and UPI standards.
* **Improved Customer Retention:** Offering UPI enhances customer satisfaction and loyalty, reducing churn and increasing the retention of existing customers.
* **New Revenue Streams**: UPI could open doors to new revenue streams, such as partnerships and value-added services, benefiting the bank's bottom line.
* **Efficient Transaction Processing**: UPI ensures quick and efficient fund transfers, enhancing customer satisfaction and attracting new users.
* **Facilitating Digital Payments**: By enabling safe and practical digital payments, UPI puts Scotia Bank in line with current consumer trends.

**Negative**

* **Customer Resistance**: Some existing customers may resist change or not trust the new technology, leading to slower adoption.
* **Operational & Technical Challenges**: Operational issues can arise from UPI implementation, necessitating time and money for integration and training.
* **Costs and Investments**: There will be an Initial cost for infrastructure, development, integration, and employee training, which may impact the bank's budget.
* **Security Risks:** UPI may introduce new security risks, and any breaches can impact the bank's reputation and customer trust.
* **Employee training:** We must train employees to understand and support the UPI feature.

**Risk and Mitigations**

* **Technical Issues and Outages**

**Risk:** Technical errors, system failures, or unanticipated problems could stop the UPI service, leaving customers dissatisfied and the service unavailable.

**Mitigation:** To find and fix technical vulnerabilities, do extensive testing regularly. This includes penetration testing and load testing. To reduce downtime, install redundant systems and backup plans. To deal with technological issues quickly, implement a robust incident response plan.

* **Security Breaches**

**Risk:** Data breaches and illegal access to user information are security breaches that could harm the bank's reputation and cause financial losses.

**Mitigation:** To secure user data, put robust security mechanisms in place, such as encryption, authentication, and access limits. Update security procedures frequently to stay ahead of developing dangers. To find vulnerabilities, conduct security audits and penetration tests.

* **User error**

**Risk:** During the fund transfer procedure, users may make mistakes that cause frustration and could result in fraudulent transactions.

**Mitigation:** Create a user-friendly interface with clear instructions and validation tests to avoid typical user errors. Users should receive assistance and educational materials to help them comprehend the UPI system's functionality.

* **Compliance Challenges**

**Risk:** Legal problems and reputational harm could result from failing to adhere to UPI regulatory obligations.

**Mitigation:** Work closely with the legal and compliance teams to guarantee complete compliance with UPI rules. Update policies and processes frequently to suit new laws. To find and resolve any non-compliance concerns, conduct routine compliance audits.

* **Third-party Dependencies**

**Risk:** The UPI system depends on external service providers; any problems or outages with these providers could affect the bank's operations.

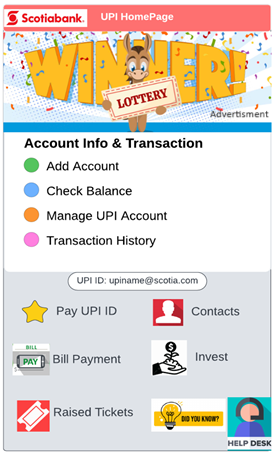
**Mitigation:** To ensure service continuity, maintain solid vendor relationships and set up service level agreements (SLAs) with outside suppliers. Determine backup service providers or backup plans in case of interruptions from third parties.

# 6. SOLUTION #2: (LAUNCHING AN INDEPENDENT UPI APPLICATION APP)

**High-Level Design for Scotia UPI Launch:**

Outlining the system's architecture, parts, and functions is part of the high-level design for launching Scotia UPI (Unified Payments Interface). The high-level invention is described as follows:

**Scotia Bank UPI “Homepage”:**



1. **User identification and registration:**
   * **Creation of User Profiles:** Upon registering, users will be asked to fill out a detailed user profile with personal details like their name, address, and birthdate. They will also supply a working email account and their cell phone number.
   * **Establishing a Secure Password:** Users will establish a robust and one-of-a-kind password that complies with security guidelines. There will be strict standards for password complexity, including using a mix of letters, numbers, and special characters.
   * **Verification of Mobile Number:** An SMS with a one-time verification code will be issued to check that the mobile number entered is accurate and belongs to the user.
   * **Email Verification:** A link for verification will be sent to users by email. Verifying their email address requires clicking the link.
   * **Multi-Factor Authentication (MFA):** An MFA will be required to access accounts. Users must input a one-time code issued to their email address or cell phone number to provide extra protection while logging in.
2. **Account Information:**
   * **Manage Account:** Access and manage account options, such as security configurations, notification preferences, and personal data, are available to users. Users may set up PINs, password management, and multi-factor authentication (MFA) inside the settings. To ensure they are kept up to date on all transaction activities, users will receive real-time alerts for each transfer. Daily transaction restrictions will be imposed to avoid abuse, and users can modify these limits within predetermined parameters. Choosing and locating a merchant for payment is made easier with our user-friendly merchant directory, which allows users to search for registered merchants by name or category.
   * **Transaction History:** Users access a comprehensive transaction history arranged by account, type, and date. The transaction history function offers robust search and filter capabilities that make it easy for users to locate transactions.
   * **Balancing Check:** In a single, handy spot, users can view the current balances of various accounts, including checking, savings, investments, and more. To assist users in adequately managing their funds, the system may provide tools for budgeting.
3. **Payment of Bills:**
   * **Pay Any Bill:** A variety of billers, including utilities, credit cards, mobile carriers, and more, may be paid by users.
   * **Recurring Payments:** The system can automatically pay regular invoices through planned recurring payments.
   * **Transaction Records:** To assist users in keeping track of previous spending, users may access a history of all bill payments.
   * **Bill Payment Reminders:** To assist users in avoiding late penalties, the system can send bill payment reminders.
4. **Contacts:**
   * **Contact Management:** This feature allows users to easily add, modify, and arrange contacts, which makes it simple to send money to friends, family, and companies.

Contacts may be quickly accessed by being grouped into personal, business, or favourite contacts.

* + **Effective Transfers:** Users don't have to enter recipient information when initiating transfers to stored contacts manually.

1. **Investments**
   * **Detailed Portfolio:** This feature allows users to view a thorough investment portfolio that includes holdings, current prices, and performance indicators.
   * **Asset Allocation:** The system may offer asset allocation analysis to assist customers in making wise investment decisions.
   * **Trading:** Real-time market data, such as stock prices, indexes, and news, is available to users. Users can place orders for stocks, bonds, and other investments.
   * **Order History:** All orders are listed, including their status and the cost of execution.
   * Investments notifications: Depending on market movements, news, or other factors, users can configure unique investing notifications.
   * **Market Analysis:** To assist users in making data-driven decisions, the system could include tools for market analysis.
2. **Ticket Raised:**
   * **Support Ticket System:** Open Tickets: Users can open tickets to report problems, ask questions, or request help.
   * **Ticket Categories:** Tickets can be divided into groups according to the kind of request, including complaints, technical difficulties, and enquiries.
   * **Updates on Status:** Users can monitor the state of their tickets, finding out if they are open, ongoing, or closed.
   * **Alerts:** Users can get automated alerts alerting them of ticket updates.
   * **Chat Support:** Users can interact with customer care agents through real-time chat support for prompt assistance.
3. **Authentication and Security:**
   * **Multi-Factor Authentication (MFA):** MFA is necessary for all critical transactions, including investing, paying bills, and changing account information.
   * **MFA Options:** One-time passwords (OTPs), biometrics, and hardware tokens are just a few of the MFA techniques that users can select from.
   * **IT protection:** To guarantee the security and privacy of user information, it is encrypted while in transit and at rest. Data is encrypted during transmission using the Secure Socket Layer (SSL) or Transport Layer Security (TLS) protocols.
   * **Session Management:** The system automatically locks users out after extended periods of inactivity to prevent illegal access.
   * **User Control:** Users can remotely log out of devices and manage current sessions when necessary.
4. **Reporting and Analytics:**
   * **Create Reports:** Account statements, transaction reports, and performance reports on investments may all be created by users.
   * **Customization:** Users can choose report settings using the system's customization options.
   * **Expense Tracking:** Sort and Examine: Users may sort and examine costs to improve their financial management.
   * **Budget Insights:** The system could offer guidance on developing and overseeing budgets based on expenditure patterns.
5. **Regulatory aspects and compliance:**
   * **KYC and AML service:** Through user identity verification, the system conforms to Know Your Customer (KYC) and Anti-Money Laundering (AML) standards. To guarantee adherence to legal standards, transactions are watched for questionable behaviour.
   * Users can limit daily and monthly transactions to curb unapproved or excessive transactions.
   * The system imposes regulatory restrictions on several transaction kinds, including foreign transfers.
6. **Offers and Promotions:** 
   * **Promotional Banners:** Notifications and banners on the platform may be used to showcase offers and promotions. Our mobile app promotes a lottery system in our UPI application as an upcoming feature.
   * **Push Notifications:** Customized Messages: Users can receive tailored push notifications alerting them to crucial updates, promotions, and account status changes.
   * **Event-Based Notifications:** Users may be notified when certain events occur, such as incoming money or account modifications.

**LOW-LEVEL DESIGN OF “MANAGE UPI ACCOUNT” FOR SCOTIA UPI APP:**

A variety of features are available in Scotia UPI's "Manage Account" tool to assist customers in maintaining and personalizing their banking and payment settings. These features are broken down for thorough implementation in this low-level design:

**SCOTIA BANK UPI “MANAGE UPI ACCOUNT”:**

1. **Info on UPI Profile:**

* Users can access and examine their Virtual Private Address (VPA) and UPI profile details.
* Create a section of the app just for users to check the details of their UPI profiles.
* Show pertinent user information, related bank accounts, and the VPA.
* Permit users to make necessary updates or edits to their profile information.

1. **Click on the Bank Icon (3 Bank accounts) - Verify and Refresh Your Multi-Bank Preferences:**

* Users can link several bank accounts and configure each one's preferences, including notification settings, transaction restrictions, and the default funding source.
* Make sure users can easily create and manage connected bank accounts by providing an intuitive user interface. Give users the ability to customize each account's preferences.
* Give consumers the option to change parameters for every bank account they've connected, including transaction limits and the default account used to finance transactions.
* Permit users to choose their choices for getting alerts about deposits and withdrawals for each connected bank account.

1. **Check Balances:**

* Within the Scotia UPI app, users may view the current balances of the bank accounts they have linked.
* Make the balances of connected bank accounts easily accessible by creating a section sorted by account name.
* Make sure that the balance details are updated instantly to reflect the most recent state of your finances.
* Pie charts and other graphical representations should be considered to give customers a clear picture of how their assets are distributed.

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1. **Cheque Deposit:**

* With the Scotia UPI app, users may deposit checks into their linked bank accounts.
* Allow consumers to scan the front and back of the check using the camera on their device.
* To guarantee the check's authenticity and stop fraud, put an automated verification procedure in place.
* Giving the user precise information about the money's availability while considering typical processing timeframes and deposit holds.

1. **QR Code:**

* Users can create and show their own QR code, which others can read to start money transactions.
* Create a feature that creates a QR code in addition to the user's VPA and other pertinent information.
* Give consumers the option to have their QR code shown on the screen so that it may be scanned.
* Make sure consumers understand how to share their QR code with others by providing clear instructions.

1. **Building and Publishing Business Page:**

* The functionality allows business users to publish and establish a business page with details about their goods, services, and payment methods.
* Give business users the option to build a profile that contains essential business data, such as the company name, description, and contact information.
* Give business users the ability to add lists of products and services, along with prices, photos, and descriptions.
* Include a space in the payment details where businesses can indicate if they take credit cards, UPI, or other payment methods.

1. **Invites and Referrals:**

* The Scotia UPI app allows users to send invitations to their friends and contacts to download and utilize it.
* Provide users the ability to view the contacts on their smartphone and choose which people to invite.
* Provide users with prewritten invitation letters that they may edit or send just as is.
* Allow users to monitor the progress of their invitations and discover who has downloaded the app because of their invites.

1. **Security:**

* Users may personalize their Scotia UPI experience by accessing several options.
* Provide a settings menu so that users may adjust their choices for security, alerts, and app functionality.
* Give consumers the ability to alter language preferences, security settings, and notification choices.
* Add options about security, such as session management, multi-factor authentication (MFA) setup, and PIN or password management.

1. **Get Help:**

* Customers may receive help with problems or questions using the available resources and customer support.
* Provide users access to an extensive resource centre with articles, guides, and frequently asked questions.
* Put a live chat function in place that lets consumers communicate with customer service agents in real-time.
* Make sure users can submit requests for help with problems, follow up on them, and get updates.

**IMPACT ANALYSIS:**

1. **Positive effects:**

* **Better Customer Experience:** The Scotia UPI system's installation will significantly improve customers' overall experiences. Faster and more secure cash transfers, real-time transaction tracking, and an intuitive user interface will all benefit users, increasing customer happiness, loyalty, and retention.
* **Competitive Advantage:** Scotia Bank will have an advantage over its competitors by providing creative and effective payment services. This will keep current clients and draw in new ones who appreciate easier and faster transactions. Additionally, the bank's profits will increase due to the UPI transactions' cost-effectiveness.
* **Market Expansion:** The bank can access new markets and facilitate cross-border transactions using the Scotia UPI system. This expansion results from a more extensive client base and more income streams.
* **Operational Efficiency:** The UPI system's real-time transaction capabilities and automated operations will improve operational efficiency. This will reduce processing times, human error, and manual intervention, saving money and increasing productivity.
* Innovation and Reputation: Scotia Bank's UPI technology enhances its standing as a forward-thinking financial organization. This favourable reputation draws in tech-savvy clients and partners searching for cutting-edge banking solutions.

1. **Negative Effects:**

* **Initial Implementation Costs:** A substantial investment in technology, infrastructure, and employee training will be needed for the UPI system's introduction. These upfront expenses impact the bank's short-term finances.
* **Security Issues:** Data security and fraud are issues with the launch of a new payment system. Scotia Bank must invest significantly in security measures to reduce these threats and keep customers' trust.
* **Regulatory Compliance:** Adherence to industry norms and financial rules is essential. There will be fines, legal repercussions, or reputational harm if specific regulations are unmet.
* **User Adoption Challenges:** Some users who are used to old methods resist introducing a new payment system. To guarantee a seamless transition, Scotia Bank must invest in user assistance and education.
* **Dependency on Technology:** Technology significantly affects the UPI system's performance. Cyberattacks, outages, or other technological issues might tarnish the bank's reputation and interfere with business.

**OUT OF SCOPE:**

* **Non-Payment Banking Services:** The functionality and features of payments are the main emphasis of the solution design document for the Scotia UPI launch. Services, including opening an account, lending, investing, and asset management that don't need payment, are deemed outside the purview of this policy.
* **No credit score is provided:** Scotia UPI does not offer credit score data or monitoring services. Comprehensive credit evaluations and credit score monitoring are not features of the app.
* **Absence of ATM Services:** ATM cash withdrawals made in person are not supported by the app because it does not offer ATM services. Users are advised to utilize actual ATMs to withdraw cash, as the app is not intended for use with ATMs.
* **No Foreign Fund Transfer:** Scotia UPI is exclusively for local Canadian transactions. The app does not support international financial transfers, including transfers to the US or other foreign nations.
* **No Tax Advisory Service:** Tax advice and assistance with filing taxes are different from what this software is meant to provide. It does not offer tax-related functions like tax computations and filing support.
* **No Investment Advisory Service:** Scotia UPI does not provide financial investment guidance. The app's scope excludes suggestions for investment strategies, portfolio management, and advice on investments.

**RISK & MITIGATION:**

1. **Regulatory Compliance:**

* **Risk:** Modifications to UPI rules or the addition of new laws affect how the UPI system is implemented. There might be legal repercussions for noncompliance.
* **Mitigation:** The project team will form a specialized task force for compliance to monitor and adjust to evolving rules. Legal professionals will be consulted to ensure all UPI guidelines are followed.

1. **Security Breach:**

* **Risk:** Unauthorized access or data theft are security breaches that might jeopardize confidential customer data and harm the bank's standing.
* **Mitigation:** Strict security protocols will be implemented, such as encryption, multi-factor authentication, and ongoing surveillance. Regular penetration tests and security audits will be carried out to find vulnerabilities.

1. **Technical Performance:**

* **Risk:** Slow response times, system delays, and performance bottlenecks can irritate customers and damage Scotia UPI's brand.
* **Mitigation:** Optimization and frequent performance testing are essential. The system architecture should be scalable to accommodate growing loads. Performance problems may be quickly identified and resolved using real-time monitoring.

1. **Market Adoption:**

* **Risk:** Customers' reluctance to use the new UPI system is low acceptance rates.
* **Mitigation:** To educate and enlighten consumers about the advantages of UPI, a thorough marketing and education effort will be initiated. To promote adoption, user-friendly interfaces and a smooth onboarding procedure will be created.

1. **Productivity Bottleneck:**

* **Risk:** During periods of high usage, the UPI system could encounter performance bottlenecks that cause transactions to process slowly.
* **Mitigation:** To ensure the UPI system can manage large transaction volumes, extensive load testing and performance optimization will be done. There will be scalability plans in place to handle more traffic.

1. **Functional Disruption:**

* **Risk:** Technical issues or faults might delay the transmission of payments or the receiver not getting the funds.
* **Mitigation:** To monitor the status of transactions, put a reliable reconciliation mechanism in place. Whenever there are differences, provide users with a way to report problems. Have a committed customer service team to investigate and quickly handle such problems.

1. **Data Privacy:**

* **Risk**: Inadequate data security procedures might allow for privacy violations involving consumer data, which could cause reputational and legal harm.
* **Mitigation**: Strict adherence to data privacy guidelines, including compliance with data protection legislation, shall be maintained. Robust encryption, data access rules, and frequent audits will protect customer data.

1. **Vendor Dependency:**

* **Risk**: Reliance on outside suppliers for UPI components might result in service interruptions or delays if these vendors have problems.
* **Mitigation**: Risks associated with vendor reliance can be reduced by diversifying vendor relationships and upholding explicit service-level agreements (SLAs). Plans will be in place to handle interruptions caused by vendors.

1. **Operational Training:**

* **Risk:** Inadequate training for bank staff members might lead to mistakes and ineffective UPI operations.
* **Mitigation:** To guarantee that bank employees know UPI operations, extensive training sessions will be held. There will be support channels and ongoing refresher courses available.

## SOLUTION #3 – DO NOTHING METHOD

**HIGH-LEVEL DESIGN**

For the "Do Nothing" method, the high-level design signifies the preservation and continued reliance on the existing system. While traditionally, design means crafting a new solution or modifying an existing one; it means understanding and delineating the current system's architectural and operational layout in this approach.

* **Operational Framework**: System Continuity: Scotiabank retains its current banking system without needing alterations, upgrades, or integrations.
* **Payment Interface**: The primary digital payment mechanism remains as Interac. There will be no exploration or implementation of newer systems like the UPI.
* **Customer Interactions**: The channels and platforms through which customers interact with the bank for digital payments remain unchanged. This encompasses mobile banking, web portals, ATMs, and in-branch systems that utilize Interac.
* **Integration with Other Services**: All of Scotiabank's existing services—lending, investment, or others—integrated with the Interac payment system will remain in their current form without any adaptations.

A screenshot of a computer

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* A screenshot of a phone

  Description automatically generatedA screenshot of a mobile banking app

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A screenshot of a phone

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Description automatically generated**LOW-LEVEL DESIGN**

* **Technological Framework**: Scotiabank's technological backbone remains untouched under this approach. All software applications, interfaces, middleware, and end-user services persist in their current state.
* **Operational Flow**: Transactional procedures, customer service modules, and digital functionalities retain existing formats. Without the addition of UPI, customers continue to rely on Interac for digital transactions.

**IMPACT ANALYSIS**

* **Customer Expectations**: Customers increasingly anticipate modern solutions like UPI as the financial sector evolves. Sticking with Interac might lead to dissatisfaction among tech-savvy clientele, resulting in a slow yet significant customer base erosion.
* **Operational Costs**: On the surface, avoiding UPI integration saves capital expenditure. However, costs may swell in the long run due to increased manual interventions, possible Interac maintenance/upgrades, and customer service demands.
* **Market Position**: By opting out of UPI, Scotiabank might gradually lose its market edge, especially if competitors leverage and advertise their UPI-integrated systems, offering a broader range of services.
* **Revenue Generation**: Without adopting newer systems, potential revenue streams associated with UPI's expansive functionalities could be missed, leading to a possible stagnation in profit growth.

**OUT OF SCOPE**

**RISK AND MITIGATION**

* **RISKS**
* **MITIGATION**

1. **EVALUATION CRITERIA**

Solution 1 presents a design approach to seamlessly integrate UPI (Unified Payments Interface) fund transfers into an application designed explicitly for Scotia Bank. Here's why this solution stands out.

* **User-Focused Design:** The system has been developed with the end user in mind. The user interface guides users through a step-by-step process, from selecting a recipient, entering transaction details, and confirming the payment. This approach prevents users. Minimizes the chances of errors.
* **Modular Architecture:** The solution employs modules for functionalities such as UI, UPI Transaction Handling, Error Handling and Backend Integration. This modular design facilitates maintenance, scalability, and troubleshooting and supports development, testing and deployment.
* **Effective Interactions:** The solution recognizes the significance of interactions with users' APIs (Application Programming Interfaces). The bank’s backend systems. By defining these interactions, the system ensures data flow while minimizing potential bottlenecks.
* **Reliable Data Flow Management:** The design efficiently separates user, transaction, and error data flow. This approach guarantees data integrity security measures implementation during processing while aiding in improved audit trails and troubleshooting.
* **External Connections:** The design ensures interoperability by specifying how the system interacts with entities, like UPI service providers, the bank's backend and other banks. This guarantees transactions. Minimizes any potential difficulties users may encounter.
* **Scalability and Performance:** The solution recognizes the importance of scalability and performance optimization from the beginning. With the increasing volume of transactions, a thinking approach in these areas ensures long-term effectiveness and user satisfaction.
* **Screens and Layouts:** The three-screen approach simplifies the user journey by focusing on one aspect of each screen. This reduces the load for users.
* **User Interactions:** Precisely defining how users interact with each screen ensures an intuitive user experience.
* **User Input Validation:** Real-time validation enhances the user experience by providing feedback, minimizing the chances of transaction failures.
* **Error Handling:** A system that offers error messages helps users resolve issues and builds trust as they feel guided throughout their journey.

## RACI MATRIX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| **Task** | **Abimbola Sanni** | **Bhupinder Singh** | **Geethu Joy** | **Yash Surti** | **Maheep Kaur** |
| Raci Matrix | **R** | A,I,C | I,C | I,C | I,C |
| Introduction | A,I,C | I,C | I,C | **R** | I,C |
| Summary of Existing Functionality | A,I,C | I,C | I,C | **R** | I,C |
| Requirement Details | A,I,C | I,C | I,C | I,C | **R** |
| Assumptions and Prerequisites | A,I,C | I,C | I,C | I,C | **R** |
| Possible Solution #1 | A,I,C | I,C | **R** | I,C | I,C |
| Possible Solution #2 | A,I,C | **R** | I,C | I,C | I,C |
| Possible Solution #3 | R | A,I,C | I,C | I,C | I,C |
| Evaluation Criteria | A,I,C | I,C | I,C | I,C | **R** |

## 

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