# Business Analysis Report: Improving Loan Product Uptake through Data-Driven Personalization in Mobile Banking

01. Executive Summary

This report outlines a comprehensive solution to address the low uptake of loan products through the bank's mobile banking app, despite high customer engagement with other app features. The objective is to leverage available customer data to personalize and recommend suitable loan products, thereby increasing conversions and enhancing customer engagement. This document provides a detailed plan covering stakeholder analysis, process flows, business and functional requirements, use cases, data requirements, project scope, and key performance indicators to ensure a successful implementation.
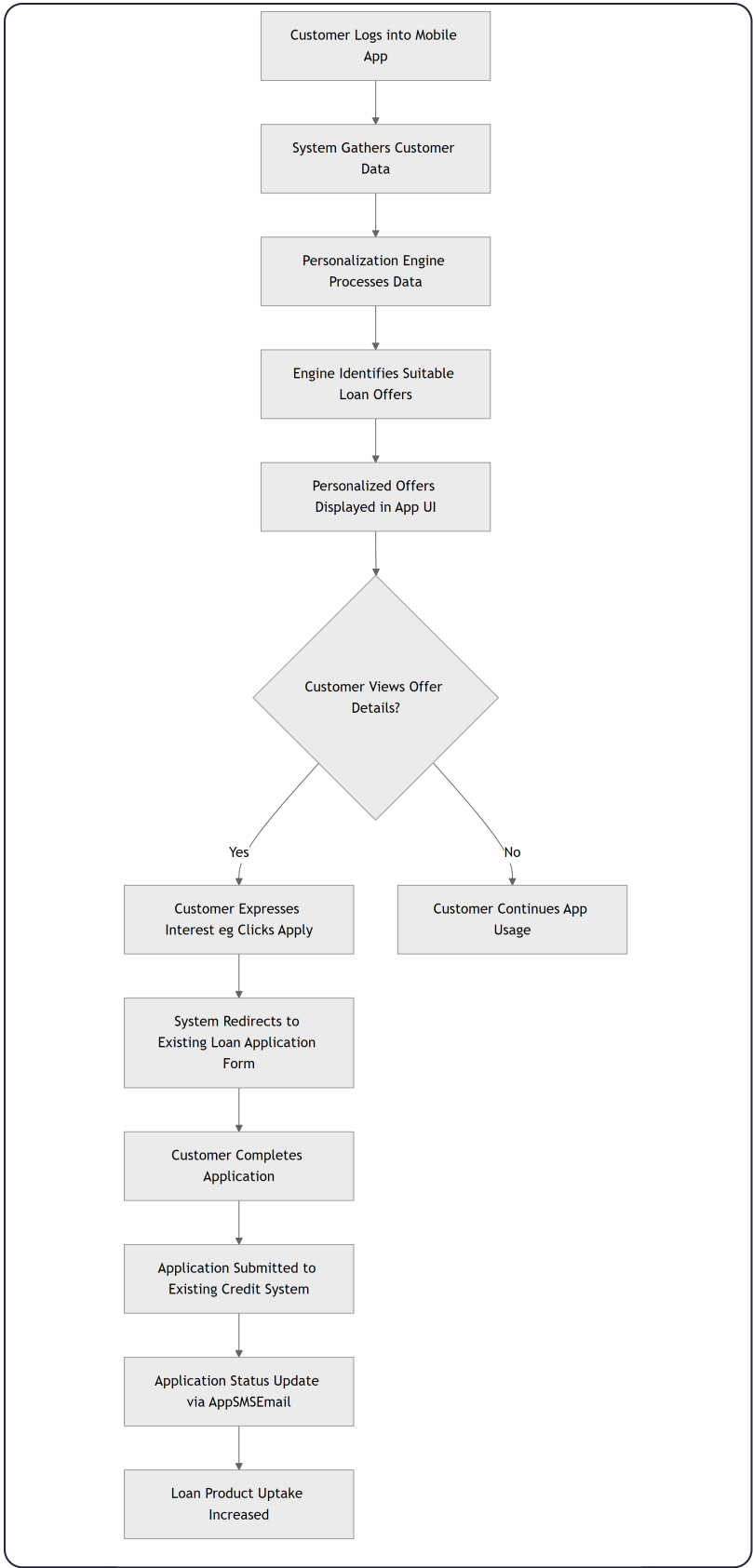
02. Stakeholder Map

The following Mermaid diagram illustrates the key stakeholders involved in the project to personalize loan recommendations in the mobile banking app.
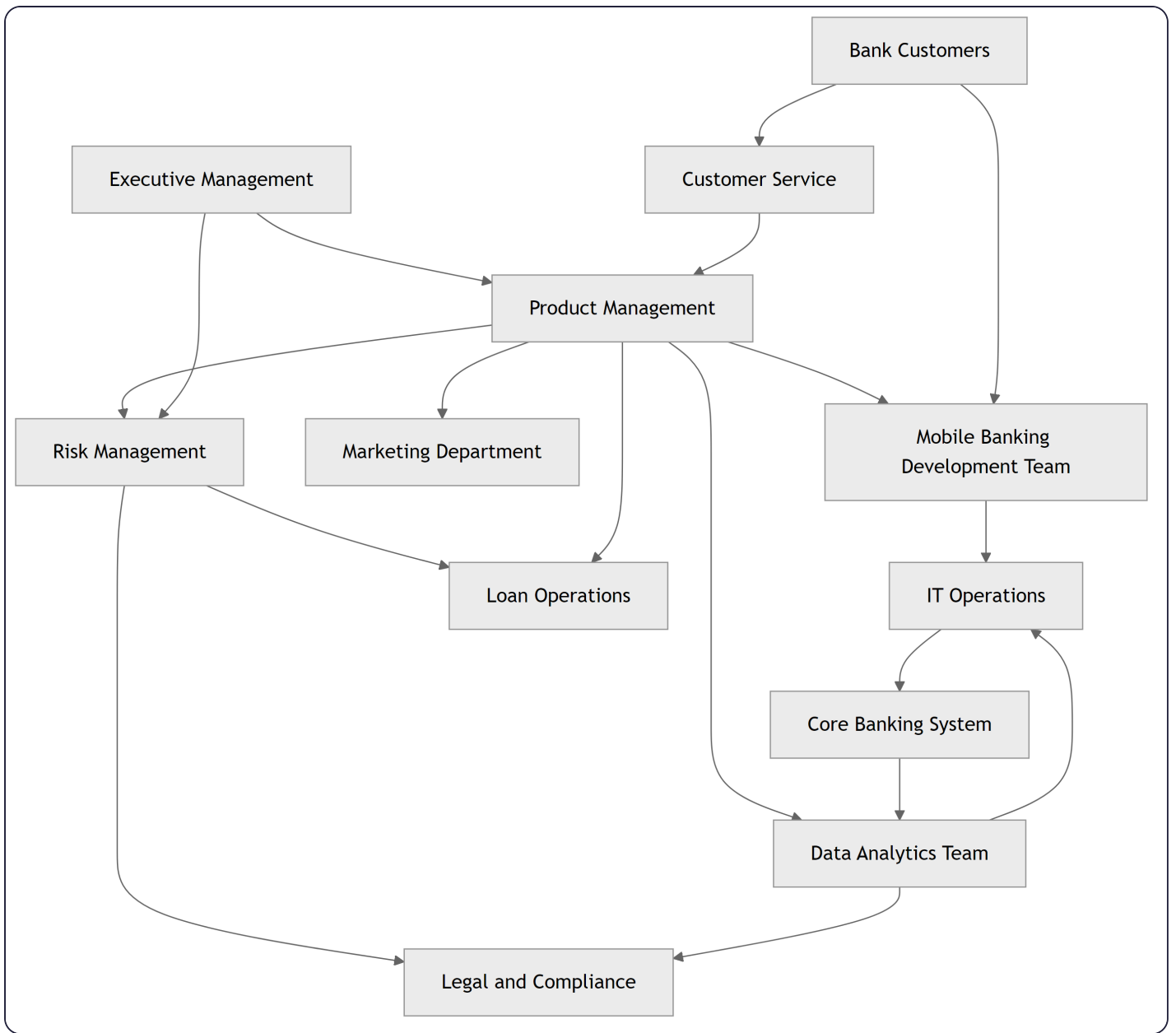
03. Process Flow for Personalized Loan Uptake

This Mermaid diagram illustrates the end-to-end process flow for a customer experiencing personalized loan offers and applying through the mobile banking app.

```
┌─────────────────────────────────────────────────────────────────────┐
│                      ┌──────────────────────┐                         │
│                      │ Customer Logs into   │                         │
│                      │      Mobile App      │                         │
│                      └──────────┬───────────┘                         │
│                                 ▼                                     │
│                      ┌──────────────────────┐                         │
│                      │ System Gathers       │                         │
│                      │ Customer Data        │                         │
│                      └──────────┬───────────┘                         │
│                                 ▼                                     │
│                      ┌──────────────────────┐                         │
│                      │ Personalization      │                         │
│                      │ Engine Processes Data│                         │
│                      └──────────┬───────────┘                         │
│                                 ▼                                     │
│                      ┌──────────────────────┐                         │
│                      │ Engine Identifies    │                         │
│                      │ Suitable Loan Offers │                         │
│                      └──────────┬───────────┘                         │
│                                 ▼                                     │
│                      ┌──────────────────────┐                         │
│                      │ Personalized Offers  │                         │
│                      │ Displayed in App UI  │                         │
│                      └──────────┬───────────┘                         │
│                                 ▼                                     │
│                            ◇───────────◇                              │
│                           ╱             ╲                             │
│                          ╱ Customer Views ╲                           │
│                          ╲ Offer Details?  ╱                          │
│                           ╲               ╱                           │
│                    Yes ◄────◇───────────◇────► No                     │
│              ┌──────────────────────┐   ┌──────────────────────┐      │
│              │ Customer Expresses   │   │ Customer Continues   │      │
│              │ Interest eg Clicks   │   │ App Usage            │      │
│              │ Apply                │   └──────────────────────┘      │
│              └──────────┬───────────┘                                 │
│                         ▼                                             │
│              ┌──────────────────────┐                                 │
│              │ System Redirects to  │                                 │
│              │ Existing Loan        │                                 │
│              │ Application Form     │                                 │
│              └──────────┬───────────┘                                 │
│                         ▼                                             │
│              ┌──────────────────────┐                                 │
│              │ Customer Completes   │                                 │
│              │ Application          │                                 │
│              └──────────┬───────────┘                                 │
│                         ▼                                             │
│              ┌──────────────────────┐                                 │
│              │ Application Submitted │                                │
│              │ to Existing Credit   │                                 │
│              │ System               │                                 │
│              └──────────┬───────────┘                                 │
│                         ▼                                             │
│              ┌──────────────────────┐                                 │
│              │ Application Status   │                                 │
│              │ Update via AppSMSEmail│                                │
│              └──────────┬───────────┘                                 │
│                         ▼                                             │
│              ┌──────────────────────┐                                 │
│              │ Loan Product Uptake  │                                 │
│              │ Increased            │                                 │
│              └──────────────────────┘                                 │
└─────────────────────────────────────────────────────────────────────┘
```

04. Business Requirement Document (BRD)

4.1. Project Title

Improving Loan Product Uptake through Data-Driven Personalization in Mobile Banking

4.2. Problem Statement

Despite high mobile app engagement for non-loan features, customer uptake of various loan products (e.g., home, personal, auto, educational, foneloan) through the mobile banking app remains low. This indicates a gap in effectively presenting relevant loan opportunities to customers when they are most engaged with the bank's digital channels.

4.3. Business Objectives

1. **Increase Loan Application Volume:** Achieve an increase in loan application volume via the mobile banking app by at least 20% within 12 months post-launch.
2. **Improve Conversion Rate:** Enhance the conversion rate from personalized loan offer views to completed applications by 15%.
3. **Enhance Customer Engagement:** Increase customer interaction (click-throughs, time spent on loan product pages) with loan products presented through personalization by 25%.
4. **Optimize Data Utilization:** Leverage existing customer data sources effectively to deliver highly relevant and timely loan recommendations.

4.4. High-Level Scope

The project focuses on designing and implementing a data-driven personalization solution within the existing mobile banking application to recommend suitable loan products to customers.

4.5. Key Business Requirements

- **BR1: Personalized Offer Delivery:** The mobile banking app must be capable of displaying personalized loan offers tailored to individual customer profiles and behaviors.
- **BR2: Data-Driven Personalization Logic:** The personalization engine must utilize various customer data attributes (e.g., income, transaction history, demographic data, app engagement) to identify and present the most relevant loan products.
- **BR3: Seamless User Journey:** Customers must be able to seamlessly navigate from a personalized loan offer to detailed product information and initiate an application within the mobile app.
- **BR4: Regulatory Compliance:** The solution must adhere to all applicable banking regulations and data privacy laws (e.g., KYC, AML, GDPR, local data protection acts).
- **BR5: Business Rule Configurability:** Bank staff (e.g., Product Managers, Marketing) must be able to define and adjust business rules for loan eligibility and recommendation logic.
- **BR6: Performance Tracking:** The system must provide capabilities to track and report on the performance of personalized loan offers, including views, clicks, and application conversions.

4.6. Success Metrics (High-Level)

- Percentage increase in mobile app-initiated loan applications.
- Improved conversion rates from offer display to application submission.
- Uplift in customer engagement metrics related to loan products.

4.7. Assumptions

- Existing customer data (KYC, income, transaction history, app usage) is accessible and of sufficient quality for personalization.
- The current mobile banking app architecture supports integration of a personalization engine and displaying dynamic content.

- The existing loan application and credit approval processes are stable and can handle increased application volume.
- Necessary internal approvals for data usage and privacy are secured.

4.8. Constraints

- **Data Privacy & Security:** Strict adherence to banking data privacy regulations and security standards is paramount.
- **Performance:** The personalization engine and mobile app must maintain high performance and responsiveness.
- **Integration Complexity:** Integration with diverse, potentially legacy, data sources and existing loan systems.
- **Resource Availability:** Availability of skilled development, data science, and business resources.

05. Functional Requirement Specification (FRS)

5.1. Functional Requirements (FRs)

- **FR1: Personalized Offer Display**
  - FR1.1: The mobile app shall display a dedicated section or dynamic cards for personalized loan recommendations on the customer's dashboard or a specific "Loans" tab.
  - FR1.2: Recommendations shall be presented clearly with a compelling title, a brief description, and a call-to-action (e.g., "Learn More," "Apply Now").
  - FR1.3: The system shall support displaying a maximum of 3-5 personalized offers at any given time to avoid overwhelming the user.

- **FR2: Personalization Engine Logic**
  - FR2.1: The personalization engine shall analyze customer data attributes (e.g., income bracket, transaction behavior, account balances, existing products, app engagement) against predefined business rules to identify relevant loan products.
  - FR2.2: The engine shall support rule-based targeting for specific loan products (e.g., education loan promotions for customers with education-related expenses).
  - FR2.3: The engine shall be capable of identifying customers eligible for pre-approved personal loans based on consistent salary inflow and internal credit policies.
  - FR2.4: The engine shall prioritize recommendations based on potential customer eligibility and predicted interest.

- **FR3: Offer Interaction & Redirection**
  - FR3.1: Clicking a personalized loan offer shall navigate the customer to a detailed product information page within the mobile app.
  - FR3.2: The product information page shall include an obvious "Apply Now" button that initiates the existing loan application workflow.

- **FR4: Proactive Notifications**
  - FR4.1: The system shall be able to send targeted push notifications or in-app alerts for highly relevant or time-sensitive personalized loan offers (e.g., pre-approved loan alerts).
  - FR4.2: Customers shall have the option to manage notification preferences for loan offers within the app settings.

- **FR5: Interaction Tracking**
  - FR5.1: The system shall track and log all customer interactions with personalized loan offers, including views, clicks, and initiation of applications.

- FR5.2: This data shall be available for analytics and reporting purposes.
- **FR6: Opt-Out Mechanism**
    - FR6.1: The mobile app shall provide a clear and easily accessible option for customers to opt-out of personalized loan recommendations.

5.2. Non-Functional Requirements (NFRs)

- **NFR1: Performance**
    - NFR1.1: Personalized loan offers must load and be visible on the mobile app dashboard within 2 seconds of app launch or screen navigation.
    - NFR1.2: The personalization engine must generate recommendations for an individual customer within 500 milliseconds upon request.
    - NFR1.3: The system must support processing personalized recommendations for up to 50,000 concurrent active users.

- **NFR2: Security**
    - NFR2.1: All customer data used for personalization (in transit and at rest) must be encrypted using industry-standard protocols (e.g., TLS 1.2+, AES-256).
    - NFR2.2: Access to the personalization engine and underlying customer data must be strictly role-based and secured with multi-factor authentication for bank personnel.
    - NFR2.3: The solution must undergo regular security audits and penetration testing to identify and mitigate vulnerabilities.

- **NFR3: Data Privacy & Compliance**
    - NFR3.1: The solution must fully comply with relevant data privacy regulations (e.g., GDPR, CCPA, local banking secrecy acts) regarding the collection, processing, and storage of personal data for personalization.
    - NFR3.2: User consent mechanisms (if required by law or bank policy) for data usage in personalization must be respected and auditable.
    - NFR3.3: A clear privacy policy detailing the use of customer data for personalization must be accessible within the mobile app.

- **NFR4: Usability**
    - NFR4.1: The user interface for personalized recommendations must be intuitive, consistent with the existing mobile app design, and easily discoverable.
    - NFR4.2: The language used in offers must be clear, concise, and avoid jargon.

- **NFR5: Scalability**
    - NFR5.1: The personalization engine and associated infrastructure must be horizontally scalable to accommodate growth in customer base and data volume.
    - NFR5.2: The system should be able to integrate new data sources and introduce new personalization rules with minimal disruption.

- **NFR6: Reliability**
    - NFR6.1: The personalization service must maintain an uptime of 99.9% during operational hours.
    - NFR6.2: In the event of primary data source unavailability, the system should gracefully degrade, either by displaying default loan information or temporarily disabling personalization, with appropriate error logging.

06. Use Case Diagrams and Detailed Scenarios

6.1. Use Case 1: Recommending loan offers based on income bracket and transaction behavior.

Use Case Diagram:
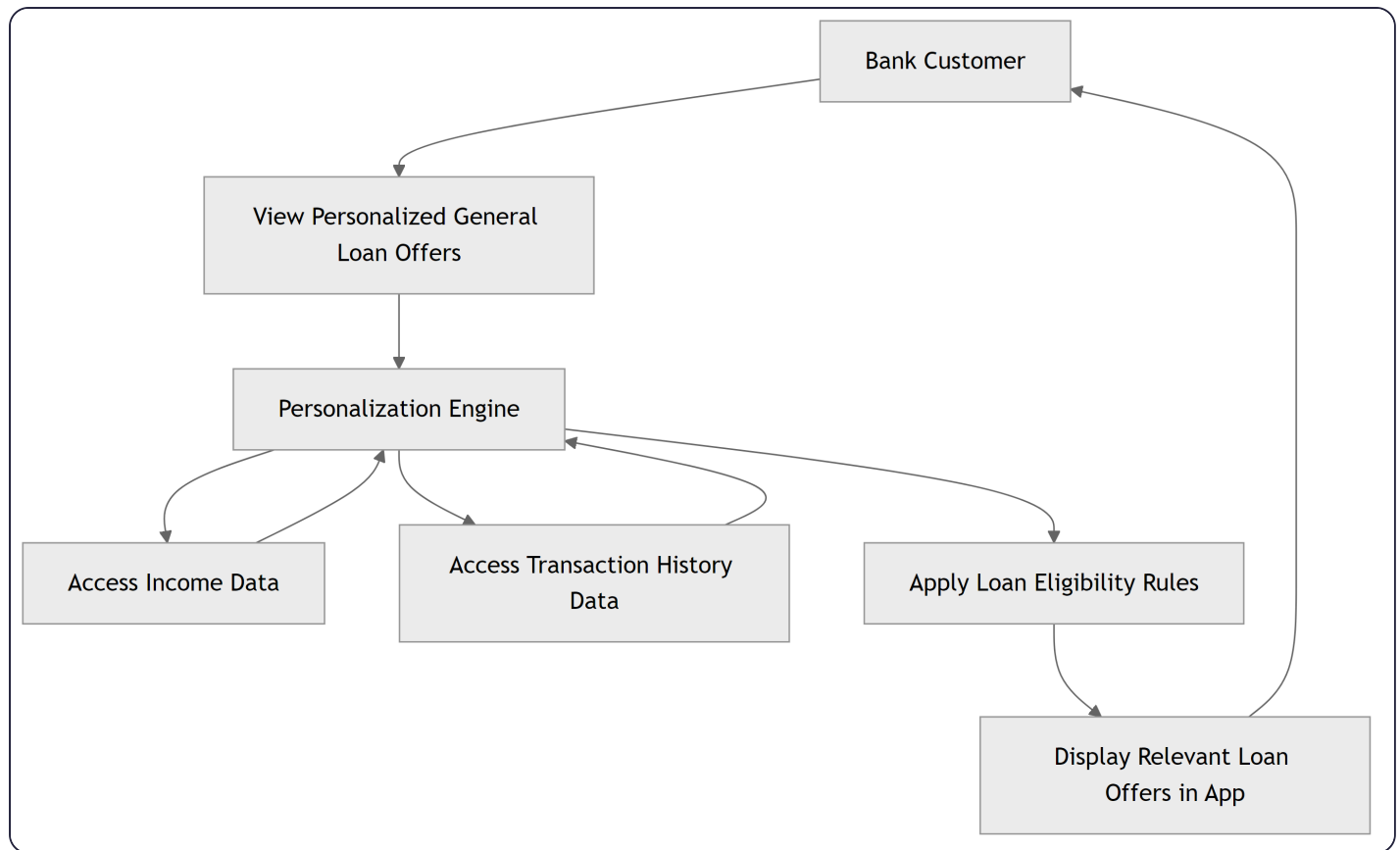
Scenario Description:

- **Use Case Name:** Recommending General Loan Offers
- **Goal:** Present relevant loan offers (e.g., personal loans, auto loans) to customers based on their income and spending patterns.
- **Actors:** Bank Customer, Personalization Engine, Data Sources (Core Banking, Data Warehouse)
- **Pre-conditions:**
    - Customer is logged into the mobile banking app.
    - Customer income and transaction data are available to the Personalization Engine.
    - Business rules for general loan eligibility are configured in the Personalization Engine.

- **Trigger:** Customer logs into the mobile app or navigates to the 'Loans' section.
- **Main Flow:**
    1. Bank Customer logs into the mobile banking app.
    2. The Mobile App requests personalized loan offers from the Personalization Engine.
    3. The Personalization Engine accesses the customer's income data (e.g., average monthly salary credits, other verified income sources) from Core Banking/Data Warehouse.
    4. The Personalization Engine analyzes the customer's transaction history (e.g., frequent high-value purchases, regular bill payments, merchant categories like auto dealerships) from the Data Warehouse.
    5. Based on predefined business rules (e.g., minimum income for a specific personal loan, recent car-related spending for an auto loan), the engine identifies suitable general loan products.
    6. The Personalization Engine prioritizes and formats the top 2-3 relevant loan offers.
    7. The Mobile App displays these personalized general loan offers prominently on the dashboard or a dedicated loan section.
    8. The Bank Customer views the displayed offers.

- **Post-conditions:** Personalized general loan offers are presented to the customer.
- **Alternative Flow:**
    - If no relevant offers are found, default promotional offers or a generic "Explore Loans" option is displayed.
    - If data sources are temporarily unavailable, the system displays cached offers or a message indicating temporary unavailability.

6.2. Use Case 2: Targeting customers with education expenses for educational loan promotions.

Use Case Diagram:
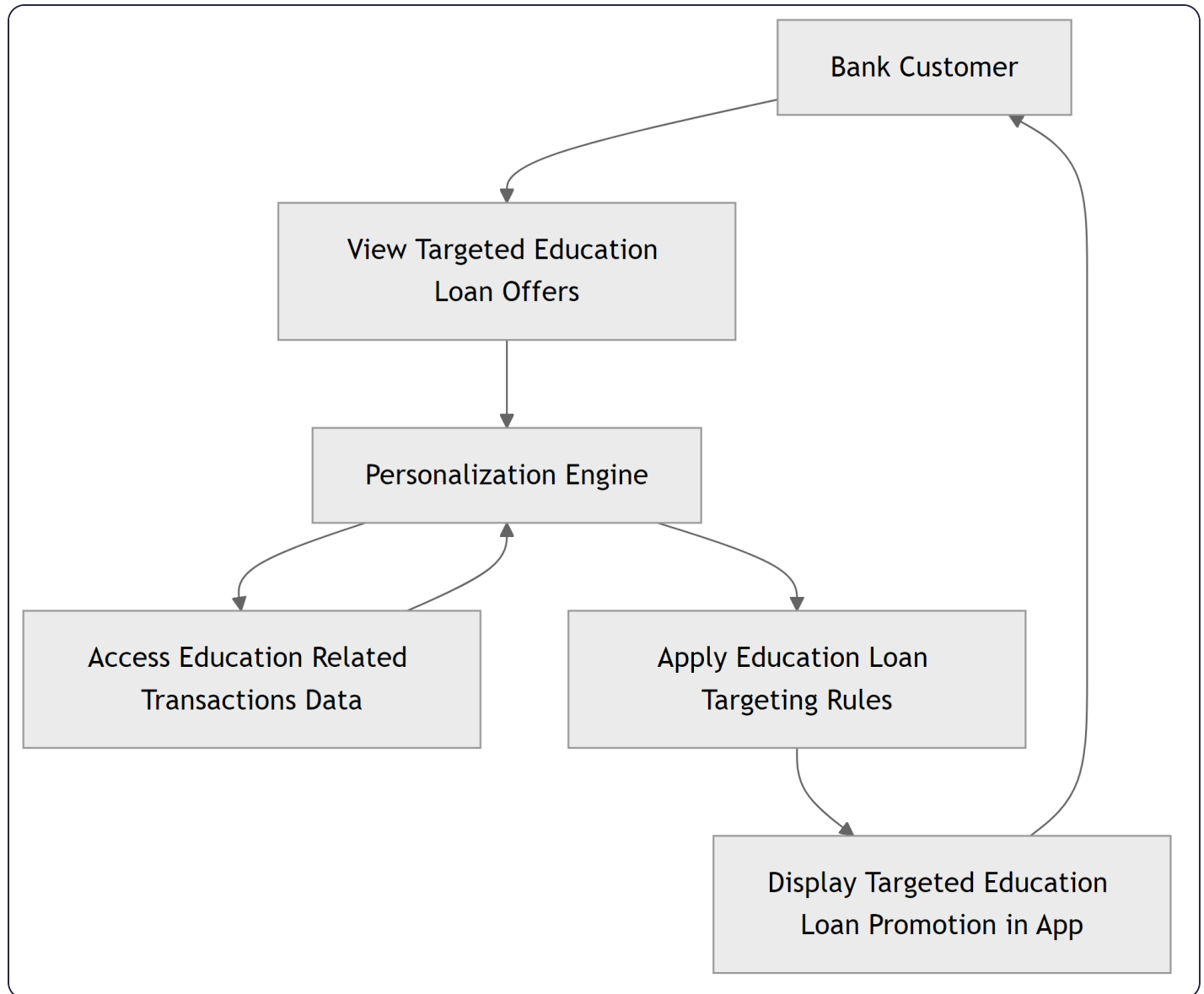
Scenario Description:

- **Use Case Name:** Targeting Education Loan Promotions
- **Goal:** Proactively offer educational loans to customers who show signs of incurring education-related expenses.
- **Actors:** Bank Customer, Personalization Engine, Data Sources (Transaction History)
- **Pre-conditions:**
    - Customer is logged into the mobile banking app.
    - Customer's transaction history is available to the Personalization Engine.

- - Business rules for identifying education-related expenses and education loan eligibility are configured.
- **Trigger:** Customer logs into the mobile app.
- **Main Flow:**
    1. Bank Customer logs into the mobile banking app.
    2. The Mobile App requests personalized loan offers.
    3. The Personalization Engine analyzes the customer's transaction history for patterns indicative of education expenses (e.g., recurring payments to educational institutions, large transfers to a student account, purchases of textbooks, payments for entrance exams).
    4. Based on predefined rules, the engine identifies the customer as a potential candidate for an educational loan.
    5. The Personalization Engine prioritizes and formats a targeted educational loan promotion.
    6. The Mobile App displays this promotion prominently, potentially as a pop-up, banner, or card on the dashboard.
    7. The Bank Customer views the targeted offer.

- **Post-conditions:** A relevant education loan promotion is displayed to the customer.
- **Alternative Flow:**
    - If no education-related transactions are identified, this specific promotion is not displayed.

6.3. Use Case 3: Pre-approval and alerting customers with consistent salary inflow for personal loans.

Use Case Diagram:
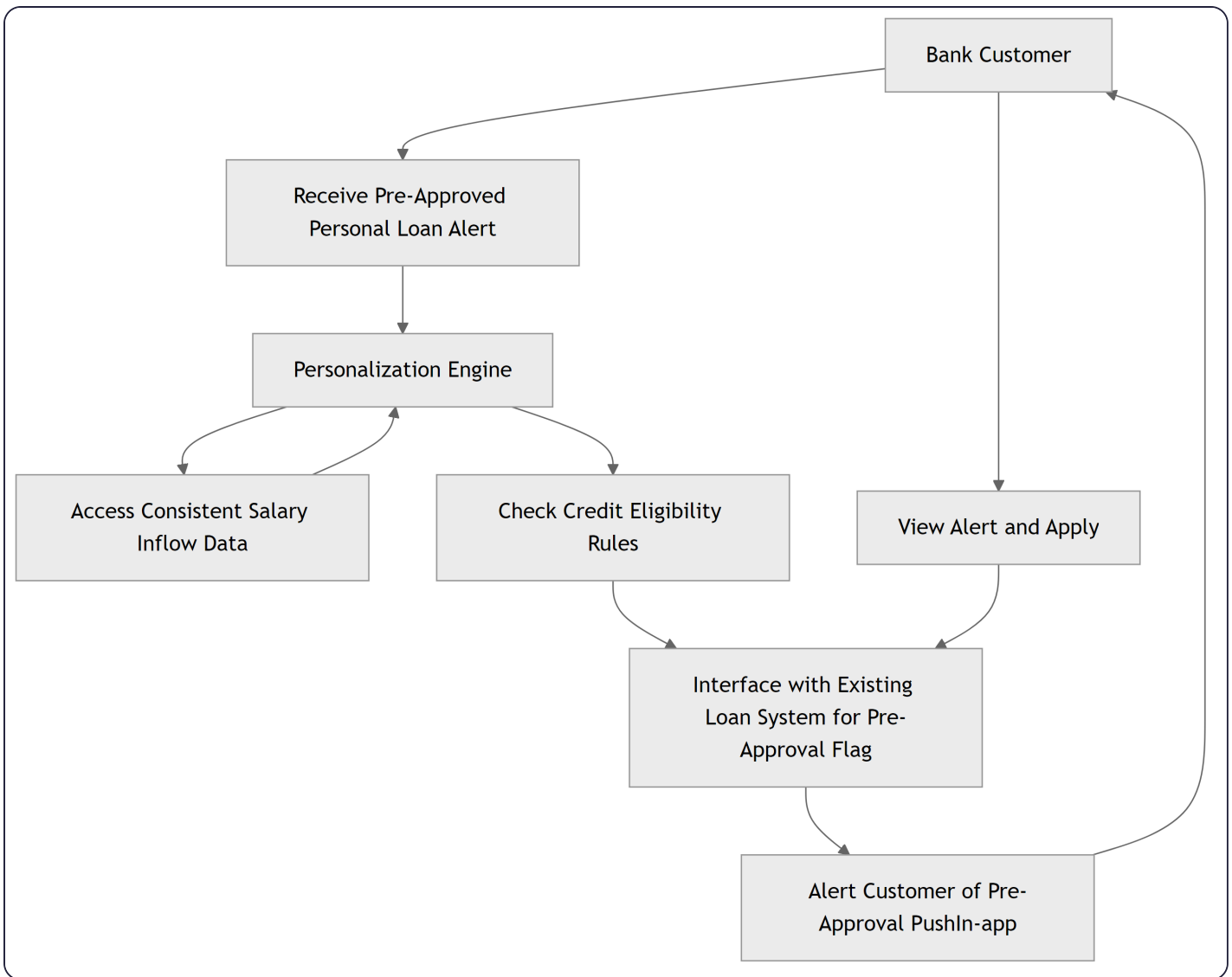
Scenario Description:

- **Use Case Name:** Personal Loan Pre-Approval and Alerting
- **Goal:** Proactively notify customers of pre-approved personal loan offers based on their consistent salary inflow and good financial standing.
- **Actors:** Bank Customer, Personalization Engine, Data Sources (Core Banking - Salary Data), Existing Loan System
- **Pre-conditions:**
  - Customer has a bank account with consistent salary credits.
  - Internal credit policy rules for pre-approval are defined in the Personalization Engine and integrated with the Existing Loan System.

- **Trigger:** Periodic (e.g., daily/weekly) batch processing by the Personalization Engine or a real-time check upon login.
- **Main Flow:**
  1. The Personalization Engine periodically queries the Core Banking System for customer accounts exhibiting consistent salary inflow over a specified duration (e.g., 6-12 months).
  2. For identified customers, the Personalization Engine performs an initial check against pre-defined internal credit eligibility rules (e.g., low debt-to-income ratio, good payment history).
  3. If eligible for pre-approval, the Personalization Engine interfaces with the Existing Loan System to flag the customer for a pre-approved personal loan offer and potentially reserve a pre-approved amount.
  4. The Personalization Engine then triggers an alert to the Mobile Banking App.
  5. The Mobile Banking App sends a push notification to the Bank Customer (e.g., "Good News! You're pre-approved for a Personal Loan up to $X."). An in-app message or prominent card is

also displayed.

6. The Bank Customer receives and views the alert.
7. The Bank Customer clicks on the alert, which takes them directly to the pre-approved offer details and a streamlined application initiation within the app.

- **Post-conditions:** Customer is alerted to a pre-approved personal loan offer, simplifying the application process.
- **Alternative Flow:**
  - If a customer previously opted out of push notifications, only an in-app alert/card is displayed.
  - If pre-approval cannot be granted, no alert is sent, and the customer may still receive general loan offers based on other criteria.

07. Data Mapping Sheet and Data Requirements Analysis

This table details the key data elements required for the personalization engine, their sources, characteristics, and considerations.

Data Element	Source System(s)	Data Type	Frequency/Freshness	Purpose for Personalization	Availability (Y/N)	PII/Sensitivity	Data Owner	Transformation/Processing	Remarks/Privacy Concerns
Customer ID	Core Banking	String/Int	Real-time	Unique identification of customer	Y	PII	Customer Operations	N/A	Essential for all data linkages; maintain strict access control.
KYC Data (Name, DOB, Address, Gender)	Core Banking, KYC System	String/Date	As-of-capture, Static	Demographic targeting, compliance	Y	PII	KYC Operations	N/A	Required for regulatory compliance and basic segmentation.
Income (Salary Credits)	Core Banking	Decimal	Daily	Loan eligibility, offer sizing, pre-approval	Y	Sensitive	Loan Operations	Aggregate monthly/quarterly income, identify consistency.	Highly sensitive; anonymization for broader analytics.

Data Element	Source System(s)	Data Type	Frequency/Freshness	Purpose for Personalization	Availability (Y/N)	PII/Sensitivity	Data Owner	Transformation/Processing	Remarks/Privacy Concerns
Transaction History (Spending Categories, Merchant Types)	Core Banking, Data Warehouse	Categorical, Decimal	Daily/Near Real-time	Behavior analysis (e.g., education, auto, home), lifestyle indicators	Y	Sensitive	Data Analytics	Categorization (e.g., education, travel, retail), aggregations.	Granular data, potential for re-identification.
Account Balances (Savings, Current)	Core Banking	Decimal	Real-time	Financial health, buffer for loan repayment	Y	Sensitive	Account Operations	N/A	Indicator of financial stability.
Existing Loan Status (Type, Outstanding Balance, Payment History)	Loan Origination System, LOS	String, Decimal, Bool	Daily	Cross-selling, debt consolidation offers, risk assessment	Y	Sensitive	Loan Operations	Identify repayment behavior, remaining tenure.	Avoid recommending loans if customer is over-leveraged.
Credit Score (Internal/External)	Credit Bureau, Internal Scoring	Integer	Monthly/Quarterly	Loan eligibility, pre-approval, risk assessment	Y	Sensitive	Risk Management	N/A (Consumed as-is)	Critical for loan eligibility; adhere to credit regulations.
Mobile App Engagement Data (Feature Usage, Session	Mobile App Analytics, Data Lake	Integer, String, Timestamp	Real-time/Hourly	App usage patterns, interest indicators, channel	Y	Public/Sensitive (behavioral)	Digital Channels	Aggregation of frequently used features, time spent.	Can indicate intent; anonymize for trend analysis.

Data Element	Source System(s)	Data Type	Frequency/Freshness	Purpose for Personalization	Availability (Y/N)	PII/Sensitivity	Data Owner	Transformation/Processing	Remarks/Privacy Concerns
Duration, Clicks)				preference					
Educational Payments (Tuition, Books)	Core Banking, Data Warehouse	Decimal	Daily	Education loan targeting	Y	Sensitive	Data Analytics	Identify specific transaction types/merchants for education.	Direct indicator for specific loan type.
Employment Status	KYC System, Self-Declared	String	As-of-capture/Updates	Loan eligibility	Y	PII	KYC Operations	N/A	Essential for income stability assessment.

08. Functional Scope Summary (In/Out of Scope)

This section clearly defines the boundaries of the project to manage expectations and focus efforts.

8.1. In Scope

- **Personalization Engine Development:** Design, development, and implementation of a new module or service responsible for generating personalized loan recommendations.
- **Mobile App Integration:** Integration of the personalization engine with the existing mobile banking application to display dynamic loan offers.
- **UI/UX Enhancements:** Design and implementation of user interface components within the mobile app to effectively present personalized loan recommendations (e.g., dashboard cards, dedicated loan sections, push notifications).
- **Data Consumption & Processing:** Consumption of customer data from existing internal systems (e.g., Core Banking, Data Warehouse, Mobile App Analytics) for personalization logic.
- **Business Rule Configuration:** Development of tools or interfaces to allow business users (Product, Marketing) to define and manage rules for loan eligibility and targeting criteria.
- **User Interaction Tracking:** Implementation of logging and tracking mechanisms for customer views, clicks, and application initiation from personalized offers.
- **Reporting & Analytics:** Provision of data and dashboards to measure the performance and effectiveness of personalized recommendations (e.g., CTR, conversion rates).

8.2. Out of Scope

- **Core Banking System Modifications:** Any changes or upgrades to the bank's core banking system beyond standard data extraction interfaces.
- **Loan Origination System (LOS) / Credit Approval System Changes:** Modifications to the existing back-end loan application, credit scoring, underwriting, or approval processes. The project will only initiate the existing application flow.
- **New Loan Product Development:** Creation or introduction of new loan products not currently offered by the bank.
- **Customer Onboarding Process:** Changes to the new customer onboarding or account opening procedures.
- **Mobile App Replatforming:** A complete overhaul or replatforming of the existing mobile banking application.
- **Loan Disbursement & Servicing:** Any processes related to loan disbursement, repayment, or post-approval customer servicing.
- **Data Cleansing & Master Data Management:** Extensive data quality initiatives or the establishment of a new Master Data Management (MDM) solution, beyond what is necessary for personalization.

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09. Suggested KPIs for Success Measurement

Key Performance Indicators (KPIs) will be used to monitor the success and effectiveness of the personalized loan recommendation solution.

9.1. Business Impact KPIs

1. **Mobile App Loan Application Volume (MAV):**
   - **Definition:** Total number of loan applications initiated via the mobile banking app.
   - **Target:** Increase by X% (e.g., 20%) within the first 6-12 months.

2. **Conversion Rate from Personalization (CRP):**
   - **Definition:** (Number of completed loan applications originating from personalized offers / Number of unique views of personalized offers) * 100.
   - **Target:** Increase by Y% (e.g., 15%).

3. **Overall Loan Product Uptake (OLPU):**
   - **Definition:** Total number of approved loans where the application originated from the mobile app's personalized recommendations.
   - **Target:** Increase by Z% (e.g., 10%) month-over-month.

4. **Revenue Uplift from New Loans (RU):**
   - **Definition:** Estimated additional revenue generated from new loans directly attributed to personalized recommendations.
   - **Target:** Quantifiable financial target based on projected loan volumes.

9.2. Customer Engagement KPIs

1. **Click-Through Rate (CTR) on Personalized Offers:**
   - **Definition:** (Number of clicks on personalized loan offers / Number of personalized loan offer impressions) * 100.
   - **Target:** Maintain or improve CTR, e.g., >5% for general offers, >10% for highly targeted offers.

2. **Interaction Rate with Loan Section:**
   - **Definition:** Percentage of active mobile app users who navigate to or interact with the personalized loan offer section.

- ○ **Target:** Increase by X% (e.g., 25%).
3. **Time Spent on Loan Product Pages (TSLPP):**
    - ○ **Definition:** Average time users spend on detailed loan product pages accessed via personalized offers.
    - ○ **Target:** Increase average session duration on these pages.

4. **Personalization Opt-Out Rate:**
    - ○ **Definition:** Percentage of users who choose to opt-out of personalized loan recommendations.
    - ○ **Target:** Keep below a threshold (e.g., <1%).

9.3. Operational/Technical KPIs

1. **Recommendation Accuracy Score:**
    - ○ **Definition:** Internal metric measuring the relevance of recommendations based on business rules and potentially A/B testing/user feedback.
    - ○ **Target:** Achieve an accuracy score of 80% or higher.

2. **Personalization Service Uptime:**
    - ○ **Definition:** Percentage of time the personalization engine is fully operational and available.
    - ○ **Target:** 99.9% uptime.

3. **Data Latency for Personalization:**
    - ○ **Definition:** Time taken for new customer data to be available for the personalization engine after source system updates.
    - ○ **Target:** Near real-time for critical data (e.g., <1 hour), daily for batch data.