

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

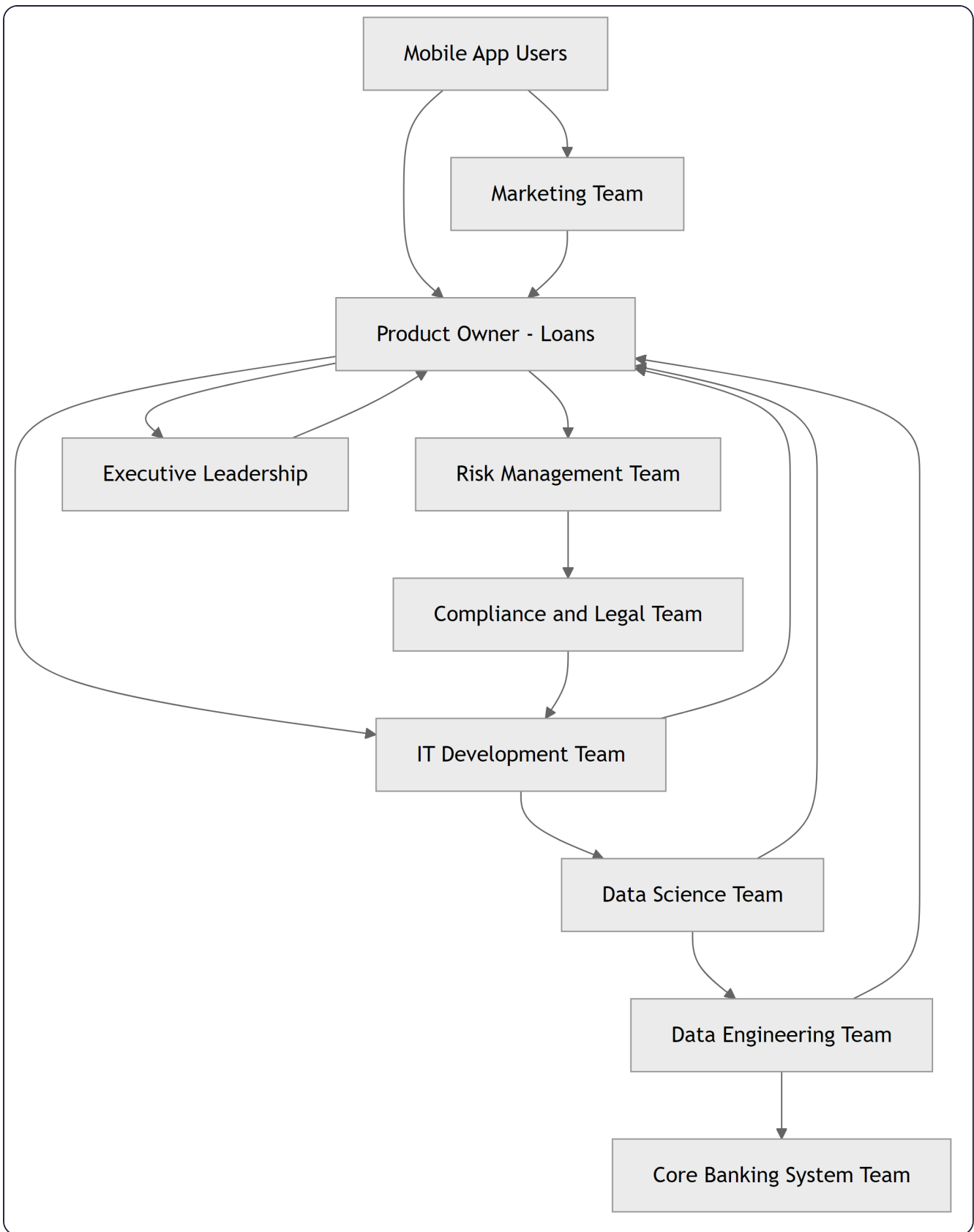
## Executive Summary

This report outlines a comprehensive solution to address the low uptake of loan products via the mobile banking app, despite high overall app engagement. The core objective is to leverage existing customer data to deliver personalized, relevant, and timely loan product recommendations within the mobile banking application. By doing so, the bank aims to increase loan application conversions, enhance customer engagement, and optimize the utilization of its digital channels. This document covers stakeholder analysis, process flows, detailed requirements, use cases, data mapping, and success metrics crucial for the successful implementation of the personalization engine.

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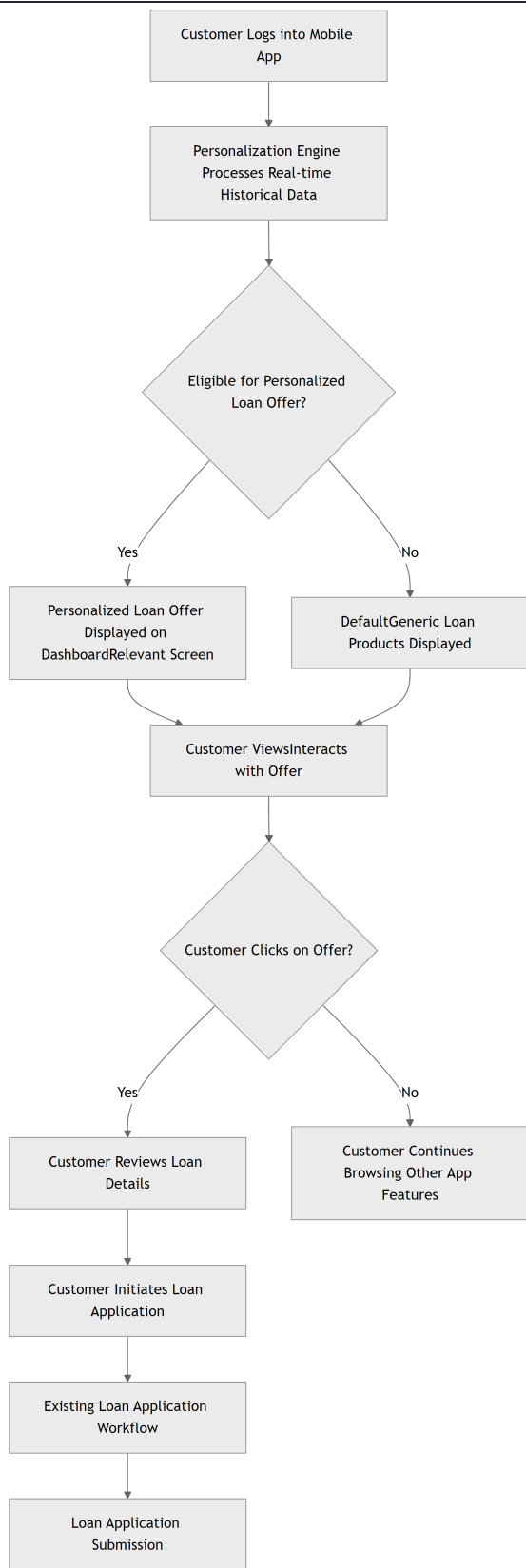
## 01. Stakeholder Map

This diagram illustrates the key stakeholders involved in the project to personalize loan product recommendations within the mobile banking app.



## 02. Process Flow: Personalized Loan Uptake

This flow describes the enhanced user journey for loan product discovery and application, incorporating data-driven personalization.



## 03. Business Requirement Document (BRD)

### 3.1. Business Problem Statement

Despite high mobile app engagement for features like utility payments and fund transfers, customer uptake of existing loan products (home, personal, auto, educational, foneloan) through the mobile banking app remains low. The bank possesses rich customer data but is not effectively leveraging it to personalize and recommend suitable loan products, leading to missed conversion opportunities and suboptimal customer engagement within the digital channel.

### 3.2. Business Objectives

- Increase the volume of loan applications initiated via the mobile banking app.
- Improve the conversion rate of loan offer views to completed applications.
- Enhance customer engagement with loan-related features within the mobile app.
- Optimize the relevance and visibility of loan products for individual customers.
- Leverage existing customer data to drive data-driven decision-making for product promotion.

### 3.3. Scope (High-Level)

- **In Scope:** Development and integration of a personalization engine to deliver targeted loan product recommendations within the mobile banking app. This includes data ingestion, processing, recommendation logic, and UI integration.
- **Out of Scope:** Changes to the core loan origination system, credit risk scoring models, manual underwriting processes, or other back-end loan approval workflows.

### 3.4. Key Stakeholders

- Mobile App Users
- Product Owner (Loans)
- Marketing Team
- IT / Development Team
- Data Science Team
- Risk Management Team
- Compliance and Legal Team
- Executive Leadership

### 3.5. Business Rules

- Personalized loan offers must always be subject to the customer's eligibility criteria as defined by bank policy and regulatory guidelines.
- Customers must be able to opt-out of personalized recommendations if desired (where applicable by privacy regulations).
- All data usage for personalization must adhere to strict data privacy (e.g., GDPR, local banking regulations) and security standards.
- Offers must be dynamic and update based on the latest available customer data.
- The system must prioritize displaying the most relevant offer, with fallback to generic offers if no personalized offers are suitable.

### 3.6. Success Metrics (High-Level)

- X% increase in loan application submissions via the mobile app within 3 months of launch.
  - Y% improvement in click-through rate (CTR) on personalized loan offers.
  - Z% increase in customer engagement time on loan product pages.
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# 04. Functional Requirement Specification (FRS)

## 4.1. Functional Requirements (FRs)

- **FR-001: Personalized Loan Offer Display:** The mobile banking app shall display personalized loan product recommendations on the user's dashboard or a dedicated 'Offers' section.
- **FR-002: Data Ingestion for Personalization:** The personalization engine shall ingest real-time and historical customer data from specified source systems (e.g., Core Banking System, Mobile App Analytics, CRM, Data Warehouse).
- **FR-003: Recommendation Logic Execution:** The personalization engine shall apply predefined algorithms and business rules (e.g., income bracket, transaction behavior, age, occupation, existing product holdings) to generate relevant loan recommendations.
- **FR-004: Loan Offer Click-Through:** Users shall be able to click on a personalized loan offer to view detailed information about the loan product (e.g., interest rates, terms, eligibility).
- **FR-005: Seamless Application Initiation:** From the detailed loan offer view, users shall be able to seamlessly initiate the existing loan application process within the mobile app.
- **FR-006: Offer Categorization/Highlighting:** The system shall categorize or highlight different types of personalized offers (e.g., "Pre-Approved", "Recommended for You", "Education Loan").
- **FR-007: Offer Refresh Mechanism:** Personalized offers shall refresh periodically (e.g., daily, weekly) or upon significant data changes (e.g., new salary credit, large transaction).
- **FR-008: Opt-Out/Preference Management (Future):** (Future Phase) Users shall have the option to manage their personalization preferences or opt-out of receiving personalized recommendations.
- **FR-009: A/B Testing Capability (Future):** (Future Phase) The system shall support A/B testing of different personalization algorithms and UI layouts to optimize conversion.

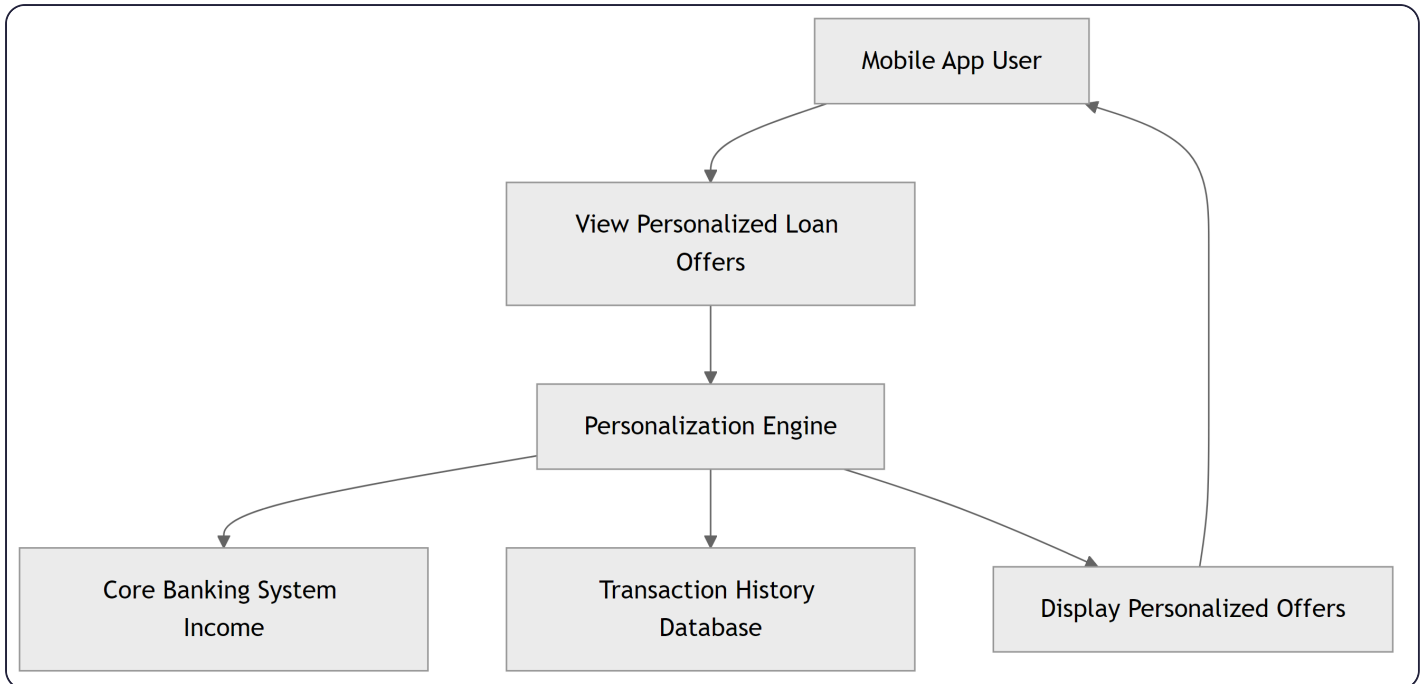
## 4.2. Non-Functional Requirements (NFRs)

- **NFR-001: Performance - Response Time:** Personalized loan offers shall load and display within 2 seconds of the user logging into the mobile app, for 95% of requests.
  - **NFR-002: Performance - Scalability:** The personalization engine shall be capable of handling recommendations for 10 million active users concurrently without degradation in performance.
  - **NFR-003: Security - Data Encryption:** All customer data transmitted between source systems, the personalization engine, and the mobile app shall be encrypted using industry-standard protocols (e.g., TLS 1.2+).
  - **NFR-004: Security - Access Control:** Access to the personalization engine and its underlying data shall be restricted based on the principle of least privilege, with robust authentication mechanisms.
  - **NFR-005: Security - Penetration Testing:** The personalization solution shall undergo regular penetration testing to identify and remediate vulnerabilities.
  - **NFR-006: Data Privacy - Compliance:** The system shall be compliant with all relevant data privacy regulations (e.g., GDPR, CCPA, local banking privacy laws) regarding the collection, processing, and storage of customer data.
  - **NFR-007: Data Privacy - Consent:** Where required by regulation, explicit customer consent shall be obtained for data usage for personalization.
  - **NFR-008: Data Privacy - Anonymization:** Sensitive customer data used for model training or aggregate reporting shall be appropriately anonymized or pseudonymized.
  - **NFR-009: Reliability - Availability:** The personalization engine and its associated APIs shall have an uptime of 99.9% during peak hours.
  - **NFR-010: Usability - Intuitive UI:** The presentation of personalized offers within the mobile app shall be intuitive, clear, and consistent with existing app UI/UX guidelines.
  - **NFR-011: Maintainability:** The system shall be designed with modular architecture to facilitate future enhancements and maintenance.
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# 05. Use Case Diagrams and Detailed Scenarios

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

### Use Case Diagram:



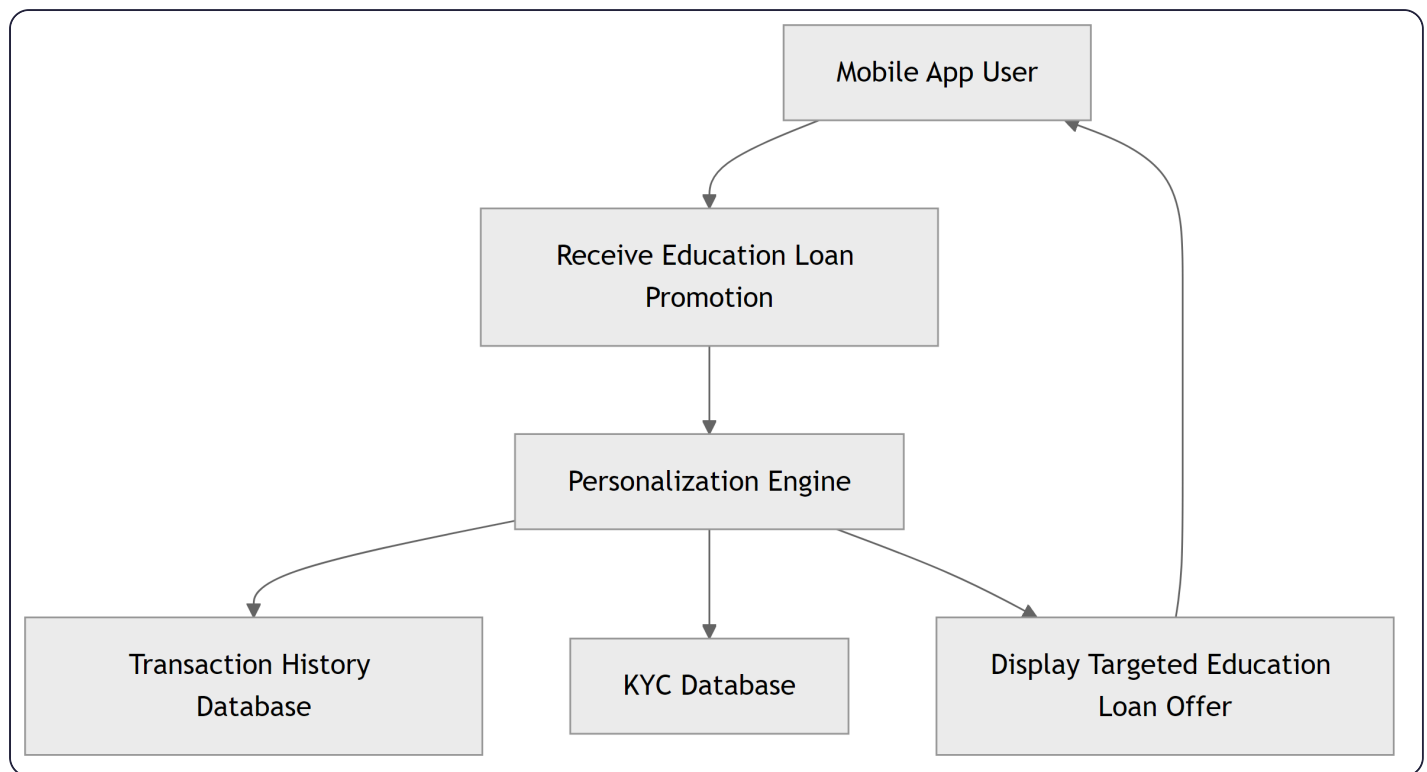
### Detailed Scenario:

- **Use Case Name:** Recommend Loan Offers Based on Income & Transaction Behavior
- **Actors:** Mobile App User, Personalization Engine, Core Banking System, Transaction History Database.
- **Pre-conditions:**
  - User is a registered mobile banking customer.
  - User has logged into the mobile banking app.
  - Personalization Engine has access to up-to-date income and transaction data for the user.
- **Trigger:** User logs in or navigates to the app dashboard/offers section.
- **Main Flow:**
  1. Mobile App User logs into the mobile banking app.
  2. The Mobile App sends a request for personalized offers to the Personalization Engine.
  3. The Personalization Engine queries the Core Banking System for the user's income bracket (e.g., salary, average balance).
  4. The Personalization Engine queries the Transaction History Database for recent spending patterns (e.g., large purchases for home goods, frequent travel expenses).
  5. Based on predefined rules (e.g., High Income + Recent Large Home Purchases = Home Loan; Consistent Income + Frequent Travel = Personal Loan for Travel), the Personalization Engine identifies the most relevant loan products.
  6. The Personalization Engine generates and sends the recommended loan offers back to the Mobile App.
  7. The Mobile App displays the personalized loan offers prominently on the user's dashboard or a dedicated offers screen.
  8. Mobile App User views the personalized offers.

- **Alternative Flows:**
  - **AF1.1 - No Relevant Offer:** If no personalized offer matches based on income/transaction, the system displays general loan products or popular offers.
  - **AF1.2 - Data Unavailable:** If income or transaction data is incomplete/unavailable, the system defaults to general offers or prompts the user to update their profile (future).
- **Post-conditions:**
  - User has viewed personalized loan offers.
  - User may click on an offer to view details or initiate an application.
- **Success Criteria:** User sees relevant loan offers tailored to their financial profile and spending habits.

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

### Use Case Diagram:



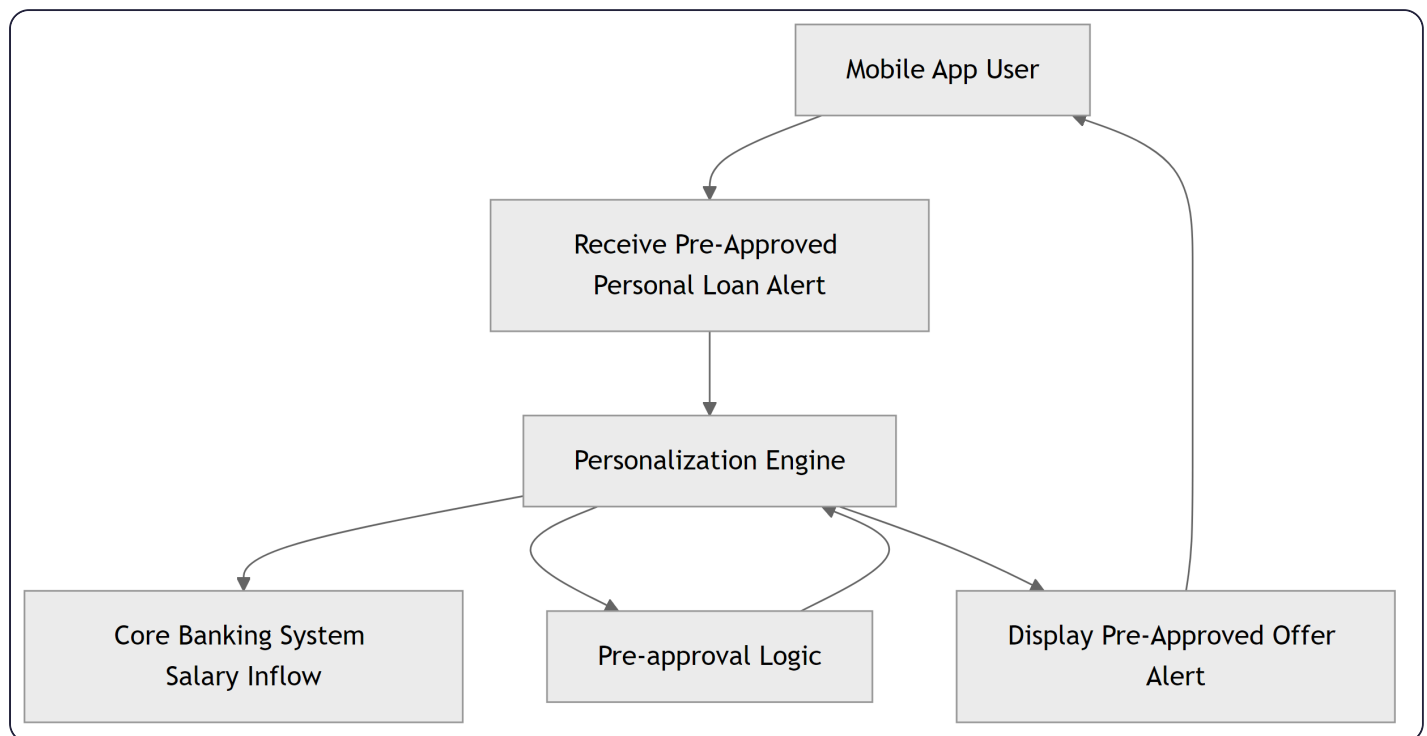
### Detailed Scenario:

- **Use Case Name:** Target Customers with Education Expenses for Educational Loan Promotions
- **Actors:** Mobile App User, Personalization Engine, Transaction History Database, KYC Database.
- **Pre-conditions:**
  - User is a registered mobile banking customer.
  - User has logged into the mobile banking app.
  - Personalization Engine has access to transaction history and KYC data for the user.
- **Trigger:** User logs in or the Personalization Engine's scheduled analysis runs.
- **Main Flow:**
  1. The Personalization Engine continuously analyzes transaction history from the Transaction History Database for patterns indicating education expenses (e.g., payments to schools/universities, recurring tuition fees, large book purchases).
  2. The Personalization Engine may also cross-reference with KYC data (e.g., dependents' age, stated occupation 'student' for younger customers).

3. If education-related patterns or indicators are detected, the Personalization Engine identifies the user as a candidate for an educational loan.
  4. The Personalization Engine generates a targeted educational loan promotion for the identified user.
  5. When the Mobile App User logs in, the Mobile App requests personalized offers.
  6. The Personalization Engine sends the targeted educational loan offer to the Mobile App.
  7. The Mobile App displays the educational loan promotion prominently (e.g., banner, dedicated card) to the user.
  8. Mobile App User views the targeted promotion.
- **Alternative Flows:**
    - **AF2.1 - No Education Expense Detected:** If no relevant patterns are found, no specific education loan promotion is displayed, or generic offers apply.
    - **AF2.2 - User Already Has Education Loan:** System checks if the user already holds an education loan with the bank and avoids displaying the offer if so (or offers top-up if applicable, future).
  - **Post-conditions:**
    - User has viewed a targeted educational loan promotion.
    - User may click on the promotion to learn more.
  - **Success Criteria:** Increased click-through and application rates for educational loans among identified target segments.

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

#### Use Case Diagram:



#### Detailed Scenario:

- **Use Case Name:** Pre-approval Alert for Personal Loans Based on Salary Inflow
- **Actors:** Mobile App User, Personalization Engine, Core Banking System.
- **Pre-conditions:**
  - User is a registered mobile banking customer.



- User has enabled push notifications for the mobile app (optional but beneficial for alerts).
  - Personalization Engine has access to consistent salary inflow data from the Core Banking System.
- **Trigger:** Regular scheduled analysis by the Personalization Engine of customer salary accounts.
- **Main Flow:**
  1. The Personalization Engine monitors customer accounts in the Core Banking System for consistent monthly salary inflows over a predefined period (e.g., 6-12 months).
  2. The Personalization Engine applies pre-approval logic (e.g., salary consistency, debt-to-income ratio based on internal data) to determine eligibility for a personal loan and calculate a potential pre-approved amount.
  3. If a user qualifies, the Personalization Engine flags them for a pre-approved personal loan offer.
  4. The Personalization Engine sends a notification (e.g., push notification) to the Mobile App indicating a pre-approved personal loan offer is available.
  5. When the Mobile App User logs in, the pre-approved offer is prominently displayed on the dashboard, often with a special "Pre-Approved" tag.
  6. Mobile App User views the pre-approved offer and can immediately proceed to review or apply with minimal additional steps.
- **Alternative Flows:**
  - **AF3.1 - Salary Inconsistency:** If salary inflow becomes inconsistent, the pre-approval status is revoked, and the offer is removed/not displayed.
  - **AF3.2 - User Decline:** User declines the offer or ignores it; the system might re-evaluate after a cooling-off period or based on new data.
- **Post-conditions:**
  - User has been alerted about and viewed a pre-approved personal loan offer.
  - The offer is readily available for immediate application.
- **Success Criteria:** High conversion rate for pre-approved personal loans due to reduced friction in the application process.

## 06. Data Mapping Sheet and Data Requirements Analysis

This table outlines the essential data elements required for the personalization engine, their sources, characteristics, and purpose.

Data Element	Source System(s)	Data Type	Frequency/Freshness	Purpose for Personalization	Availability (Y/N)	PII/Sensitivity	Data Owner	Transformation/Processing	Remarks/Privacy Concerns
CustomerID	Core Banking System, CRM	Alphanumeric	Real-time	Unique identifier	Y	PII	Core Banking	None	Essential for linking all data
IncomeAmount	Core Banking System	Numeric	Monthly/Real-time	Loan eligibility, offer sizing	Y	Sensitive	Core Banking	Aggregation (e.g., avg.	High sensitivity; require

Data Element	Source System(s)	Data Type	Frequency/Freshness	Purpose for Personalization	Availability (Y/N)	PII/Sensitivity	Data Owner	Transformation/Processing	Remarks/Privacy Concerns
								monthly income)	consent/anonymization
Transaction History	Core Banking System, Mobile App	Structured (Type, Amt, Merchant)	Real-time	Spending patterns, expense detection (e.g., education)	Y	Sensitive	Core Banking	Categorization, aggregation	Detailed ; potential privacy implications
Account Balance	Core Banking System	Numeric	Real-time	Financial stability indicator	Y	Sensitive	Core Banking	Current snapshot	Can indicate liquidity for loans
Loan Product Holdings	Core Banking System	Alphanumeric	Daily	Avoid recommending existing loans, cross-sell	Y	PII	Core Banking	Filter out existing products	Avoid redundant offers
KYC_Age	Core Banking System, CRM	Numeric	On-enrollment/Update	Demographic targeting (e.g., education loan for young adults)	Y	PII	Core Banking	Calculation (e.g., age bands)	Important for demographic segmentation
KYC Occupation	Core Banking System, CRM	Text	On-enrollment/Update	Income stability, loan purpose inference	Y	PII	Core Banking	Categorization	Indicates employment status
KYC Family Status	CRM	Text	On-enrollment/Update	Family needs (e.g., home loan for families)	N (Partial)	PII	CRM	Standardize categories	Often self-declared , may need to be collected

Data Element	Source System(s)	Data Type	Frequency/Freshness	Purpose for Personalization	Availability (Y/N)	PII/Sensitivity	Data Owner	Transformation/Processing	Remarks/Privacy Concerns
MobileAppEngagement	Mobile App Analytics	Numeric	Real-time	User activity, feature preference	Y	Public	Mobile App Team	Clickstream analysis, session duration	Indication of app usage habits
LocationData	Mobile App	Geo-coordinate	Real-time (if enabled)	Regional loan offers (e.g., property)	Y (Opt-in)	PII	Mobile App Team	Geo-fencing, clustering	Requires explicit user consent
CreditScoreInternal	Risk Management System	Numeric	Monthly/Quarterly	Pre-approval eligibility	Y	Sensitive	Risk Mgmt	N/A	Highly sensitive; internal use only
LoanApplicationHistory	Loan Origination System	Structured	Real-time	Previous interest, application success/failure	Y	Sensitive	Loan Origination	Status tracking	Understand user's past loan seeking behavior

## 07. Functional Scope Summary (In/Out of Scope)

This section clearly defines the boundaries of the project, detailing what will and will not be delivered as part of this initiative.

### 7.1. In Scope

- Development of a Personalization Engine:** Design, build, and deploy a system capable of processing customer data to generate relevant loan recommendations.
- Data Integration:** Establish connections and data pipelines to pull customer data from various internal source systems (Core Banking System, CRM, Transaction History, Mobile App Analytics) into the personalization engine.
- Recommendation Logic Implementation:** Encode business rules, algorithms, and machine learning models within the personalization engine to generate targeted loan offers based on specified use cases (income/transaction, education expenses, salary inflow).
- Mobile App UI Integration:** Develop and integrate UI components within the existing mobile banking application to prominently display personalized loan offers (e.g., dashboard cards, dedicated offer screens, banners).

- **Real-time Offer Display:** Ensure that personalized offers are presented dynamically and updated based on the latest available data.
- **Click-through and Application Initiation:** Enable users to seamlessly navigate from a personalized offer display to detailed loan information and initiate the existing loan application process within the mobile app.
- **Performance Monitoring and Analytics:** Implement mechanisms to track user interactions with personalized offers (views, clicks, applications) to measure success and gather insights.
- **Data Privacy & Security Adherence:** Ensure all data processing and storage within the personalization solution comply with banking industry security standards and relevant data privacy regulations (e.g., consent management where applicable).

## 7.2. Out of Scope

- **Changes to Core Loan Origination System (LOS):** Modifications to the existing back-end systems responsible for loan application processing, underwriting, credit decisioning, and disbursement are not part of this project.
  - **Development of New Loan Products:** This initiative focuses on increasing uptake of *existing* loan products; creation of new loan types is outside this scope.
  - **Changes to Credit Risk Models:** The project will consume existing credit score data or use existing pre-approval logic but will not alter the underlying credit risk assessment models.
  - **Manual Underwriting Process Automation:** Any manual steps in the loan approval process that occur after application submission are not being automated or changed.
  - **Cross-Channel Personalization:** Personalization outside of the mobile banking app (e.g., ATM, branch, website, email) is not included.
  - **Offline Data Collection:** The project relies on existing digital data sources; new methods for offline data collection are out of scope.
  - **Direct Marketing Campaigns (SMS/Email):** While insights from personalization may inform marketing, the direct execution of SMS or email campaigns for loan offers is outside the mobile app scope.
  - **User Preference Management (Advanced):** While basic opt-out might be considered, a comprehensive user preference center for fine-grained control over all personalization is for a future phase.
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# 08. Suggested KPIs for Success Measurement

To effectively measure the success of the data-driven personalization initiative, the following Key Performance Indicators (KPIs) are suggested:

1. **Mobile App Loan Application Volume:**
  - **Definition:** Total number of unique loan applications initiated through the mobile banking app.
  - **Target:** Increase by X% (e.g., 20%) within 3 months post-launch.
2. **Conversion Rate (Offer View to Application):**
  - **Definition:** (Number of applications initiated from personalized offers / Number of personalized offers viewed) \* 100%.
  - **Target:** Achieve Y% (e.g., 5%) conversion rate for personalized offers.
3. **Click-Through Rate (CTR) on Personalized Offers:**
  - **Definition:** (Number of clicks on personalized loan offers / Number of personalized loan offers displayed) \* 100%.
  - **Target:** Improve CTR by Z% (e.g., 15%) compared to generic loan offer displays.
4. **Engagement Uplift (Time Spent):**

- **Definition:** Average time spent by users on loan product detail pages or sections showing personalized offers.
  - **Target:** Increase average session duration on loan-related pages by W% (e.g., 10%).
- 5. Personalized Offer Acceptance Rate (Pre-approved Loans):**
- **Definition:** (Number of pre-approved loan offers accepted / Number of pre-approved loan offers displayed) \* 100%.
  - **Target:** Achieve an acceptance rate of V% (e.g., 10-15%) for pre-approved loans.
- 6. Feature Adoption Rate:**
- **Definition:** Percentage of active mobile app users who are exposed to and interact with the personalized loan recommendation feature.
  - **Target:** 70% of active users engage with the feature at least once a month.
- 7. Customer Feedback/Satisfaction Score (CSAT):**
- **Definition:** Surveys or in-app feedback mechanisms to gauge customer perception of the relevance and helpfulness of personalized offers.
  - **Target:** Maintain or improve overall CSAT scores related to mobile app experience.

These KPIs will provide a robust framework for evaluating the project's impact on business objectives and user experience.