Innovation & Entrepreneurship Hub for Educated Rural Youth (SURE Trust – IERY)

BANK LOAN PERFORMANCE ANALYSIS

The domain of the Project: Power Bi Dashboard, Data Modelling And Analysis Of Loan

Team Mentors (and their designation): Siddhika Shah (Software Engineer)

By

Ms. Bhawna Bhoyar B.Tech, 4th year pursuing ---- Team Leader

Period of the project

April 2025 to August 2025

Declaration

The project titled “Bank Loan Performance analysis Dashboard” has been mentored by Ms. Siddhika Shah , organised by SURE Trust, from April 2023 to August 2023, for the benefit of the educated unemployed rural youth for gaining hands-on experience in working on industry relevant projects that would take them closer to the prospective employer. I declare that to the best of my knowledge the members of the team mentioned below, have worked on it successfully and enhanced their practical knowledge in the domain.

Name : Bhawna Bhoyar

Mentor’s Name : Siddhika Shah
Designation—Company Name : Software Engineer at HCL Tech

Prof. Radhakumari
Executive Director & Founder
SURE Trust

Table of contents

Executive Summary

- The **Loan Portfolio Analytics Dashboard** project was developed to provide interactive financial insights and improve portfolio management for lending institutions. The primary objective of the project was to analyze customer loan data, repayment trends, and portfolio risk in order to support data-driven decision-making.
- Using business intelligence and visualization techniques, the dashboard consolidates multiple financial metrics, including loan disbursement, repayment status, customer demographics, and home ownership distribution. The analysis was carried out by processing loan datasets and applying data visualization methods to identify patterns, growth trends, and risk indicators.

- Background

The financial services industry relies heavily on data-driven insights to manage risks, optimize lending strategies, and ensure portfolio growth. With increasing loan volumes, institutions face challenges in tracking repayment patterns, customer segments, and credit risks effectively. Traditional reporting methods often lack interactivity and fail to provide real-time insights.

To address this, the **Loan Portfolio Analytics Dashboard** was developed. It serves as a centralized, interactive tool that provides executives and analysts with a clear overview of loan disbursement, repayment performance, customer demographics, and portfolio health across time and regions.

- Problem statement

Financial institutions struggle with:

1. Monitoring loan performance across states and customer segments.
2. Identifying repayment trends, defaults, and risk patterns.
3. Managing large volumes of customer and loan data in a meaningful way.

Project Goals:

1. Build an interactive dashboard to visualize loan portfolio performance.
2. Provide insights on repayment status (fully paid, current, charged-off).
3. Analyze loan distribution by geography, credit grade, and home ownership.
4. Support executives in making data-driven lending and risk management decisions.

- Scope and limitations of the Project

Scope:

1. Covers analysis of loan amounts, repayments, defaults, and customer segments.
2. Provides year-wise, month-wise, and state-wise insights into loan growth.
3. Includes breakdown by credit grades and home ownership status.
4. Focuses on financial performance indicators useful for management decisions.

Limitations:

1. Data used is historical and may not reflect future portfolio performance.
2. Dashboard insights depend on the quality and completeness of the dataset.
3. External economic factors (e.g., inflation, unemployment, market downturns) are not accounted for in the current model.
4. The project is limited to **descriptive analytics** and does not yet include predictive modeling.

- Innovation component in the project

The innovation lies in the **integration of interactive data visualization techniques** to convert static loan data into meaningful, real-time business insights. Unlike traditional financial reports, this dashboard allows stakeholders to:

1. Filter by **year, grade, and loan status** dynamically.
2. Compare **state-wise loan distribution** with repayment trends.
3. Evaluate **customer segments** based on home ownership and verification status.
4. Identify high-risk categories using loan status and grade analysis.

By combining financial data with **visual storytelling**, the project introduces an efficient way to support **strategic planning, portfolio optimization, and risk management**.

Project Objectives

- Clearly defined objectives and goals of the project

The main objective of the project is to design and develop an **interactive loan portfolio analytics dashboard** that enables financial institutions to monitor, evaluate, and manage their lending operations effectively.

Specific Goals:

1. To consolidate customer and loan data into a single, interactive platform.
2. To provide **state-wise, year-wise, and grade-wise analysis** of loan amounts and repayment behavior.
3. To track **loan status categories** such as Fully Paid, Current, and Charged Off.
4. To analyze **customer demographics** including income, home ownership, and verification status.
5. To identify **risk areas** within the portfolio, such as defaults and non-verified loans.
6. To support **decision-making** for executives by providing clear financial insights.

- Expected outcomes and deliverables.

A **comprehensive understanding** of loan distribution, repayment patterns, and portfolio risk.
Insights into **customer behavior** based on income, home ownership, and credit grades.
Identification of **high-performing states and customer segments** contributing to loan growth.
Detection of **potential risks** in terms of defaults and unverified borrowers.

Deliverables:

1. An **interactive dashboard** showcasing:
    - Loan Amount State-wise
    - Loan Status Distribution (Fully Paid, Current, Charged Off)
    - Loan Amount by Year and Month-wise Trends
    - Revolving Balance by Credit Grade/Sub-Grade
    - Home Ownership vs. Last Payment Stats
2. A **detailed analytical report** summarizing findings, insights, and recommendations.
3. A **framework** that can be extended in the future for predictive analytics (e.g., default prediction).

- Methods/Technology used

The project followed a structured **data analytics and visualization approach** to transform raw loan data into meaningful insights. The methodology included:

1. **Data Preprocessing** – Cleaning, handling missing values, and preparing datasets for analysis.
2. **Exploratory Data Analysis (EDA)** – Identifying trends, patterns, and anomalies in loan performance.
3. **Data Aggregation** – Grouping by year, state, grade, loan status, and home ownership categories.
4. **Visualization & Dashboard Development** – Designing interactive visuals to present insights for decision-making.

The approach combines **descriptive analytics** with **interactive visual storytelling**, making it easier for financial stakeholders to interpret complex datasets.

- Tools/Software used

1. **Microsoft Power BI** – For dashboard creation, interactive filters, and data visualization.
2. **Excel / CSV Data Files** – Used for raw data storage and initial cleaning.
3. **SQL** – Applied for querying, aggregating, and extracting structured loan data.
4. **Python (Pandas, Matplotlib/Seaborn)** *(optional if you used)* – For deeper data analysis and preprocessing.

- Data collection approach (if applicable)

1. The dataset used contained historical records of **loan customers, disbursement amounts, repayments, and borrower details**.
2. Data fields included: loan amount, state, grade, income, verification status, payment history, and home ownership.
3. Data was imported into **Power BI** after cleaning and preprocessing, ensuring consistency and accuracy.
4. Aggregations were performed by **time period (year/month)**, **geography (state)**, and **customer segment (income, ownership, verification)**.

- Project Architecture

The architecture of the project can be explained in **four layers**:

1. **Data Source Layer**
   - Loan dataset in **Excel/CSV format**.
   - SQL database for structured queries.
2. **Data Processing Layer**
   - Preprocessing and cleaning using **Python/Excel**.
   - Aggregation and transformation of data for analysis.
3. **Analytics & Visualization Layer**
   - Power BI dashboard created with:
     - **KPIs** (Total Loan, Total Payment, Avg Income, Customers).
     - **Visuals** (Bar charts, Line charts, Donut charts, Tables).
     - **Interactive Filters** (Year, Loan Status, Grade).
4. **Insights & Results Layer**
   - Executives and analysts interact with the dashboard.
   - Ability to drill down into **loan status, repayment trends, and customer segments**.
   - Supports **decision-making for lending strategies and risk management**.

Data Source → Data Processing → Dashboard → Insights

- Final project working screenshots along with supporting explanation

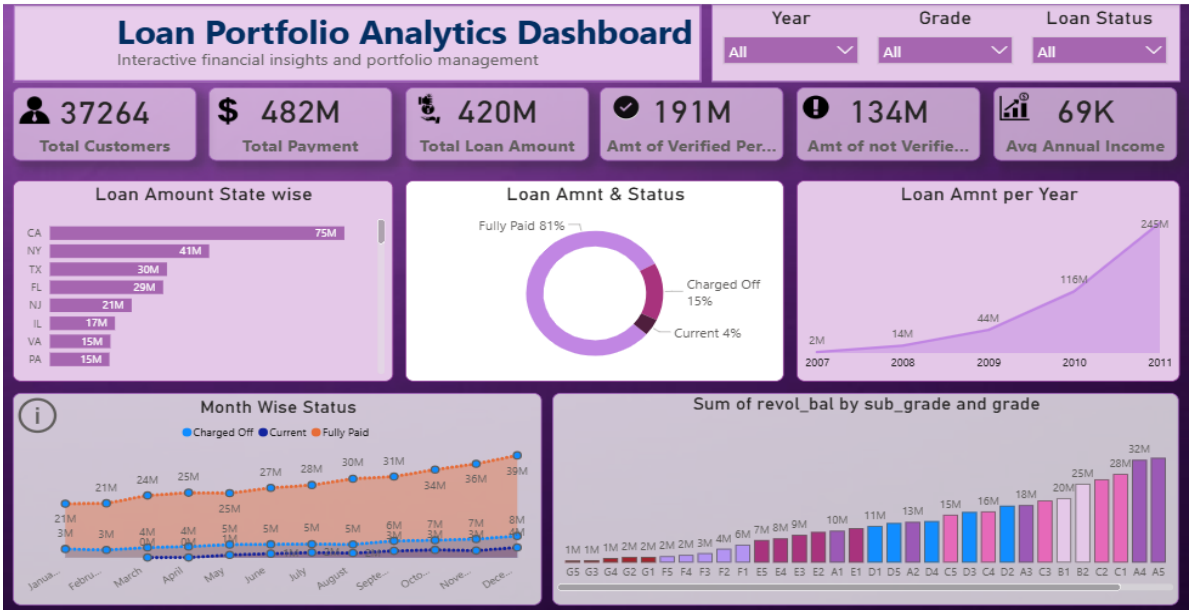
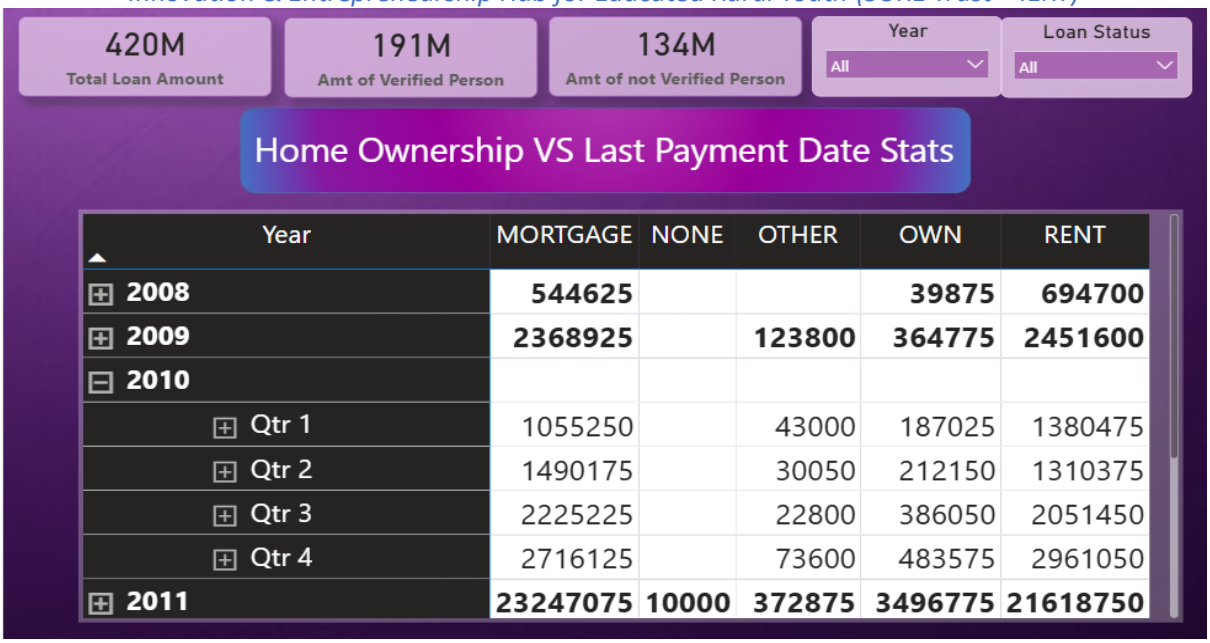


Figure 1: Loan Portfolio Analytics Dashboard

This figure presents the **Loan Portfolio Analytics Dashboard**, which provides a consolidated view of loan distribution, repayments, and portfolio health.

- **Key Performance Indicators (KPIs):**
  The top section displays important metrics such as **total customers (37,264)**, **total payments ($482M)**, **total loan amount ($420M)**, **verified loan amount ($191M)**, **non-verified loan amount ($134M)**, and **average annual income ($69K)**.
- **Loan Amount State-wise:**
  California leads with **$75M**, followed by New York (**$41M**) and Texas (**$30M**). This highlights the concentration of loans in economically active states.
- **Loan Amount and Status:**
  A donut chart shows that **81% of loans are fully paid**, **15% charged off**, and **4% currently active**, indicating a healthy repayment trend with controlled defaults.
- **Loan Amount per Year:**
  A line chart highlights exponential growth from **$2M in 2007** to **$245M in 2011**, reflecting rapid expansion of lending activities.
- **Month-wise Status:**
  Monthly trends reveal steady growth in loan activity from **$21M in January** to **$36M in December**, with fully paid loans dominating over charged-off and active loans.
- **Revolving Balance by Grade:**
  Analysis shows higher balances in **mid-grade customers (B and C categories)**, with sub-grades like B3, C3, and A5 peaking above **$25M–$32M**, signifying profitable yet moderately risky segments.

This dashboard offers executives a **360° overview** of customer distribution, repayment performance, and loan growth trends.



Year	MORTGAGE	NONE	OTHER	OWN	RENT
2008	**544625**			**39875**	**694700**
2009	**2368925**		**123800**	**364775**	**2451600**
2010					
Qtr 1	1055250		43000	187025	1380475
Qtr 2	1490175		30050	212150	1310375
Qtr 3	2225225		22800	386050	2051450
Qtr 4	2716125		73600	483575	2961050
2011	**23247075**	**10000**	**372875**	**3496775**	**21618750**

Figure 2: Home Ownership vs. Last Payment Date Stats

This figure provides a **tabular analysis of loan distribution based on home ownership status** across different years.

- **2008:** Majority of loans were given to **mortgage holders (544,625)** and **renters (694,700)**, while a smaller proportion went to owners (39,875).
- **2009:** Loan disbursements increased significantly, with **mortgage borrowers (2.36M)** and **renters (2.45M)** being the largest groups.
- **2010:** The quarterly breakdown shows consistent growth, with Q3 and Q4 having the highest activity, especially among **mortgage holders (2.7M in Q4)**.
- **2011:** Loans to mortgage holders peaked at **2.32M**, while **renters (2.16M)** and **owners (349,675)** also formed significant segments.

The table highlights that **mortgage holders and renters account for the largest share of loan repayments**, demonstrating their reliance on credit, while outright homeowners contribute a smaller share.

- Project GitHub Link
  https://github.com/Bhawna-04-dob/Major-Project-of-Sure-Trust-Internship

- New learnings (in terms of technology, management, etc)

During the course of this project, each team member gained valuable knowledge and hands-on experience in both technical and professional aspects:

1. **Technical Learning:**
    - Gained practical exposure to **Power BI** for building interactive dashboards.
    - Improved skills in **data cleaning, preprocessing, and visualization**.
    - Learned how to use **SQL queries** to extract and aggregate financial data.
    - Developed an understanding of **financial analytics concepts** such as loan status, repayment patterns, and credit risk assessment.
    - Acquired knowledge of **data storytelling techniques**, where complex datasets were converted into simple, meaningful insights.
2. **Management and Soft Skills Learning:**
    - Improved **team collaboration and communication** while dividing tasks.
    - Learned **time management** by working within deadlines.
    - Understood the importance of **documentation and reporting** for project clarity.
    - Enhanced **problem-solving ability** by overcoming data inconsistencies and visualization challenges.

- overall experience

The project provided a valuable opportunity to combine classroom learning with real-world application. Team members experienced how raw data can be transformed into actionable insights for business decision-making.

The project enhanced **confidence in using analytics tools** like Power BI and SQL. Members enjoyed the process of **visualizing financial data**, as it made technical concepts more practical and impactful. Working on a real-time dashboard gave the team exposure to **industry-relevant practices**, preparing them for professional roles in analytics. The internship experience strengthened not only **technical expertise** but also **professional work ethics** such as collaboration, adaptability, and presentation skills.

Overall, this project was a **transformative experience** where technical knowledge, teamwork, and analytical thinking came together to deliver a meaningful solution.

Conclusion and Future Scope

- Recap objectives and achievements

The **Loan Portfolio Analytics Dashboard** project successfully met its objectives of consolidating loan data and providing clear, interactive insights into portfolio performance. Through the use of **Power BI, SQL, and data visualization techniques**, the project achieved the following:

- Created a **centralized platform** displaying key performance indicators such as total loans, repayments, average income, and customer segments.
- Analyzed loan distribution **state-wise, year-wise, and grade-wise**, identifying regions and credit categories with the highest loan activity.
- Evaluated **loan repayment behavior**, showing that **81% of loans were fully paid**, with only **15% defaults**.
- Highlighted **growth trends**, with loan disbursements rising significantly from 2007 to 2011.
- Provided insights into **customer demographics**, emphasizing that mortgage holders and renters were the dominant borrower categories.

Overall, the dashboard served as an effective **decision-support tool**, enabling financial institutions to optimize lending strategies, monitor risks, and understand customer behavior better.

- Future scope of this project

While the project provides strong descriptive insights, it can be expanded further to enhance its usefulness for financial decision-making:

Predictive Analytics:

Implement **machine learning models** to forecast loan defaults, repayment likelihood, and customer risk scores.

Real-Time Data Integration:

Connect the dashboard with **live financial databases** to provide real-time monitoring instead of static historical data.

Enhanced Customer Segmentation:

Incorporate more variables (e.g., age, occupation, credit history) for deeper segmentation of borrowers.

Geographical Expansion:

Extend the analysis beyond state-level data to include **regional and city-level trends** for more targeted decision-making.

Automation and Alerts:

Set up automated alerts in the dashboard to notify stakeholders about **high-risk accounts, overdue payments, or abnormal portfolio activity**.

Scalability:

The framework can be scaled for **other financial products** like credit cards, mortgages, and insurance portfolios.