**1 Identify & Gather Data**

**Customer Demographics Table:**

The Customer Demographics table provides background information on customers, including attributes such as age, gender, marital status, and income level. These demographic factors often correlate with customer retention or churn behaviour. By analysing this data, we can identify segments that are more likely to churn, enabling the bank to design targeted retention strategies and personalized services.

**Transaction History Table:**

This table provides a record of transactions made by each customer. Transaction data serves as an important indicator of customer engagement and financial activity. Patterns such as declining transaction frequency or reduced spending could signal dissatisfaction or disengagement, both of which are closely linked to churn. Aggregating this data allows us to derive key features like total spend, average transaction value, and changes in behaviour over time.

**Customer Service Table:**

Data from this table captures interactions between customers and the bank’s support team. This data is critical, as frequent or unresolved service issues often correlate with a higher likelihood of churn. By analysing interaction frequency, resolution status, and the types of interactions (e.g., complaints vs. inquiries), we can quantify customer satisfaction levels and identify at-risk individuals.

**Online Activity Table:**

This table reflects customers’ engagement with digital services, including metrics like last login date, login frequency, and overall service usage. A decline in digital activity is a common behavioural signal of disengagement. These features serve as strong predictors in churn modelling, helping to detect when a customer is becoming inactive or losing interest.

**Churn Status Table:**

The Churn Status table indicates whether a customer has churned (1) or remained active (0). This is the target variable for our supervised learning model. It allows us to train, validate, and evaluate predictive models that aim to forecast future churn based on the behavioural and demographic characteristics derived from the other tables.

**2 Exploratory Data Analysis**

Exploratory data analysis began by merging all the tables into a single dataset using ‘CustomerID’ as the join key. This allowed for easier comparison of the features and identification of trends.

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AI-generated content may be incorrect.**Handling Missing Values:**

After the merge, missing values were assessed. The results initially indicated many missing values in columns from the customer service table. However, upon closer inspection, it was evident that these values are not truly missing. Instead, they reflect customers who have had no recorded interactions with customer service. Because these customers do not appear in the customer service table, the merge operation filled in these fields as missing (NaN). This is an acceptable outcome of the outer join used during merging.

Since there are no actual missing values in the original customer service data, we can proceed with the analysis without additional data cleaning for this issue.

**Numerical Outliers & Distribution:**

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AI-generated content may be incorrect.Next, to gain an initial understanding of the data distribution, histograms and boxplots were created for the numerical columns. Histograms provide a clear view of the spread and shape of the data, helping to identify any skewness or irregular patterns. Boxplots are useful for detecting outliers and understanding the overall variation within each feature.

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AI-generated content may be incorrect.The resulting histograms indicate a relatively even distribution of data points across the dataset. While there are some noticeable peaks in variables such as **Age** and **Login Frequency**, these appear to be natural variations rather than anomalies. The boxplots support these observations, showing no significant outliers and indicating that most values are clustered around the centre of the distribution. Overall, there are no immediate concerns with the distribution or spread of the numerical data.