

**Predicting Customer Churn in Telecom Industry using Power BI and SQL**

**PROJECT OBJECTIVES:**

The Project objectives is to find Business Use Cases such as,

**Customer Retention**: Identify at-risk customers and proactively implement retention strategies.

**Marketing Campaigns**: Tailor marketing efforts towards customers who are more likely to churn.

**Service Improvement**: Analyze churn patterns to improve service offerings and customer support.

**Revenue Optimization**: Reduce churn rates to maintain a steady revenue stream.

**Customer Segmentation**: Segment customers based on churn probability to offer personalized experiences.

**1. DATA COLLECTION AND PREPARATION**

**Objective:**

The primary objective of data collection was to gather, organize, and structure customer data to analyze churn behavior, identify patterns, and provide actionable insights that can assist in retention strategies, revenue optimization, and targeted marketing efforts.

**Process:**

**Dataset Source and Acquisition:**

* The dataset was provided as a CSV file, containing customer-related details and their service usage behaviour.
* The dataset was extracted from a customer relationship management (CRM) system or other organizational databases where customer interaction and billing data are stored.

**Importing Data:**

* The dataset was first loaded into **MySQL Workbench**, a relational database management tool, to perform querying and initial preprocessing.
* Using SQL, the dataset was structured, cleaned, and prepared for exploratory data analysis (EDA) and visualization.
* Later, the dataset was imported into **Power BI** for advanced visual analytics and dashboard creation.

**Dataset Overview:**

**Total Records:**

* The dataset contains **7,044 records**, each representing a unique customer.

The dataset contains **7043 entries** and **38 columns**. Key observations:

**Target Variable**: Customer Status and Churn Category.

There are some missing values in key columns like:

* Avg Monthly Long Distance Charges
* Multiple Lines
* Internet Type
* Avg Monthly GB Download
* Online Security, etc.

Certain columns like Monthly Charge and Total Charges contain negative or unexpected values (e.g., -4, -10).

Categorical columns like Gender, Married, Contract, and Payment Method need encoding for analysis.

Columns like Churn Category and Churn Reason are populated only for churned customers, introducing imbalance.

**Key Columns and Attributes:**

* **Customer ID:** A unique identifier for each customer.
* **Age:** The age of the customer.
* **Contract Type:** The type of subscription contract (e.g., Month-to-Month, One Year, Two Year).
* **Online Services:** Details about additional services subscribed to, such as Online Backup, Online Security, and Streaming Services.
* **Tenure:** The duration (in months) a customer has been with the company.
* **Monthly Charges:** The amount billed to the customer on a monthly basis.
* **Total Charges:** The cumulative amount billed to the customer over their tenure.
* **Customer Status:** The current status of the customer (e.g., Churned, Stayed, or Joined).
* **Demographics:** Additional fields like gender, marital status, city, and state to assist in segmentation.
* **Service Type:** Information on services such as Internet Service, Streaming TV, and Streaming Movies.

**Purpose of Key Columns:**

* Columns such as **Customer Status**, **Tenure**, and **Contract Type** are crucial for identifying churn trends.
* Financial fields like **Monthly Charges** and **Total Charges** provide insights into revenue impact due to churn.
* Behavioral fields like **Online Services** reveal preferences and gaps in customer offerings.

**Purpose of the Dataset:**

To analyze **customer behavior** and segment customers into meaningful categories (e.g., high-value churned customers, long-term loyal customers).

To uncover **churn patterns** using various attributes such as contract type, service usage, and demographic factors.

To design **predictive models** to forecast future churn risks and the factors influencing customer attrition.

To provide **actionable insights** that enable the organization to:

* Proactively retain customers through targeted interventions.
* Optimize pricing models and service offerings.
* Increase revenue and enhance overall customer satisfaction.

**Challenges Addressed:**

* **Data Integrity Issues:** Ensured there were no duplicate or missing records, as these could skew churn analysis.
* **Data Variety:** Unified diverse fields like numeric, categorical, and geographic data into a structured format.
* **Handling Outliers:** Identified and addressed anomalies in charges, tenure, or other behavioral patterns.

**2. UNDERSTANDING THE DATASET**

**Key Features of the Dataset:**

The dataset is composed of a combination of **demographic, behavioral, financial, and service-related data** that provides comprehensive insights into customer interactions with the organization. These features are classified as follows:

**Customer Demographics:**

* **Age:** Represents the age of the customers, which is crucial for segmentation and understanding preferences across age groups.
* **Gender:** Indicates whether the customer is Male or Female, providing insights into gender-based usage trends and churn patterns.
* **Marital Status:** Captures whether the customer is married or not, which may influence their service usage behavior or subscription preferences.

**Behavioral Data:**

* **Tenure:** The duration (in months) a customer has been associated with the company. It helps in analyzing loyalty and identifying at-risk customers based on their lifecycle.
* **Contract Type:** Specifies the type of subscription (e.g., Month-to-Month, One Year, Two Year). This is a critical field for understanding churn rates by contract length.
* **Monthly Charges:** The amount charged to the customer on a monthly basis. This helps identify pricing-related dissatisfaction among churned customers.
* **Total Charges:** Represents the cumulative revenue generated from each customer during their tenure. It is essential for revenue impact analysis.

**Service Details:**

* **Internet Service:** Captures whether the customer subscribes to an internet service and its type (e.g., Fiber Optic, DSL).
* **Online Security:** Indicates whether the customer has subscribed to online security services.
* **Online Backup:** Shows whether customers have opted for cloud backup solutions.
* **Streaming Services:** Includes details about streaming TV and streaming movies subscriptions, which contribute to customer preferences for entertainment services.

**Customer Status:**

**Customer Status:** The current state of the customer relationship with the organization. It contains three distinct categories:

* **Churned:** Customers who have left the company.
* **Stayed:** Customers who continue to use the services.
* **Joined:** Customers who are new to the organization.

This field is pivotal for segmenting customers based on their engagement and attrition levels.

**Initial Observations from the Dataset:**

**Missing Values:**

* Certain columns, such as demographics and service-related attributes, had missing values. For instance, some customers had no recorded information for Online Backup or Online Security services.
* These missing values were addressed during the preprocessing stage using techniques like imputation or data exclusion based on their significance.

**Anomalies in Data:**

* **Negative Values:** Some numeric fields, particularly Monthly Charges or Total Charges, had incorrect negative values. These were identified and corrected by validating against expected ranges and averages.
* **Outliers:** Significant variations in tenure or charges were observed, requiring normalization or segmentation to ensure meaningful analysis.

**Customer Distribution:**

* A disproportionate number of customers were observed to have a **Month-to-Month contract type**, correlating with a higher churn rate during preliminary analysis.
* A significant number of churned customers were identified in younger age groups or customers with lower tenures.

**Purpose of Understanding the Dataset:**

By analyzing these features and observations, we aimed to:

* Identify the most influential factors contributing to customer churn.
* Classify customers into meaningful segments for targeted retention strategies.
* Uncover potential revenue gaps caused by churned customers.
* Prepare the dataset for advanced analytical techniques and visualizations to derive actionable insights.

**3. DATA PREPROCESSING**

Data preprocessing was a critical step in ensuring the dataset was clean, consistent, and ready for meaningful analysis. Below are the detailed steps undertaken during the preprocessing phase:

**Handling Missing Values**

**Objective:** Missing values can distort analysis, so they were carefully handled to retain the integrity of the dataset.

**Approach:**

* **Numeric Columns:** Missing values were replaced with 0 to maintain consistency in calculations.
* **Categorical Columns:** Missing values were replaced with "Unknown" to avoid loss of data while ensuring meaningful segmentation.

**SQL Implementation:**

UPDATE customer\_churn

SET column\_name = 0

WHERE column\_name IS NULL;

**Example:** For columns like Online Backup or Online Security, missing values were replaced with "Unknown" in categorical fields and 0 in numerical fields.

**Correcting Invalid Values**

**Objective:** Ensure the accuracy of the data by rectifying anomalies like negative values.

**Identified Anomalies:**

* Negative values in Monthly Charges and Total Charges were flagged during exploratory analysis.

**Approach:**

* Rows with negative values were identified using a query.
* These invalid entries were corrected using the absolute value of the charges.

**SQL Implementation:**

SELECT \* FROM customer\_churn

WHERE `Monthly Charge` < 0 OR `Total Charges` < 0;

UPDATE customer\_churn

SET `Monthly Charge` = ABS(`Monthly Charge`);

**Normalizing Numerical Features**

**Objective:** Normalize numeric data to ensure all variables are on the same scale, allowing for effective comparisons and insights.

**Approach:**

* Columns like Monthly Charges and Total Charges were normalized to a range between 0 and 1.
* This normalization ensured fair comparisons across customers with widely varying charges.

**SQL Implementation:**

UPDATE customer\_churn

SET Normalized\_Monthly\_Charge = (`Monthly Charge` - Min\_Charge) / (Max\_Charge - Min\_Charge);

**Example:**

Customers with higher charges were scaled proportionately to allow for better segmentation.

**Encoding Categorical Variables**

**Objective:** Transform categorical fields into numerical formats for easier analysis in tools like Power BI and machine learning models.

**Columns Encoded:**

* Contract Type: Encoded values like 1 (Month-to-Month), 2 (One Year), 3 (Two Year).
* Online Services: Transformed values like "Yes" to 1 and "No" to 0.

**Approach:**

* Categorical columns were mapped to numerical values using SQL CASE statements.

**SQL Example:**

UPDATE customer\_churn

SET `Contract Type` = CASE

WHEN `Contract Type` = 'Month-to-Month' THEN 1

WHEN `Contract Type` = 'One Year' THEN 2

WHEN `Contract Type` = 'Two Year' THEN 3

END;

**Splitting Data into Subsets**

**Objective:** Create focused datasets for more targeted analysis of customer segments.

**Subsets Created:**

* Churned Customers: Customers who have left the service.
* Stayed Customers: Customers who continue to use the service.
* Joined Customers: Newly acquired customers.

**SQL Implementation:**

CREATE TABLE churned\_customers AS

SELECT \* FROM customer\_churn

WHERE `Customer Status` = 'Churned';

CREATE TABLE stayed\_customers AS

SELECT \* FROM customer\_churn

WHERE `Customer Status` = 'Stayed';

CREATE TABLE joined\_customers AS

SELECT \* FROM customer\_churn

WHERE `Customer Status` = 'Joined';

**Example:** The churned\_customers table enabled focused analysis on identifying the characteristics and patterns contributing to churn.

**Summary of Preprocessing Results**

1. **Cleaned Data:** Missing and invalid values were resolved, ensuring high data quality.
2. **Normalized Features:** Numerical fields were scaled for consistent comparisons.
3. **Encoded Categorical Fields:** Ensured compatibility with analytical tools.
4. **Segmented Data:** Separate datasets allowed for targeted analysis of different customer groups.

**4. Query Analysis**

**Objective:**

Execute SQL queries to answer 15 key business questions among the 28 provided.

**Why These 15 Questions?**

**High Priority Questions**:

Focused on actionable insights like churn rate, customer segmentation, and revenue impact.

**Alignment with Business Use Cases**:

Address customer retention, revenue optimization, and service improvement.

**Resource Efficiency**:

Covered the most critical aspects without redundancy.

**Key Insights using SQL Queries: General Metrics**

**Question 1: Identify the total number of customers and the churn rate**

**SQL Query**:

SELECT

COUNT(\*) AS Total\_Customers,

SUM(CASE WHEN `Customer Status` = 'Churned' THEN 1 ELSE 0 END) AS Churned\_Customers,

(SUM(CASE WHEN `Customer Status` = 'Churned' THEN 1 ELSE 0 END) / COUNT(\*)) \* 100 AS Churn\_Rate

FROM customer\_churn;

**Key Findings**:

Total Customers: 7,043

Churned Customers: 1,862

Churn Rate: 26.45%

**Insights**:

The churn rate is relatively high, indicating a need for retention strategies.

**Question 2: Find the average age of churned customers**

**SQL Query**:

SELECT AVG(Age) AS Avg\_Churned\_Age

FROM churned\_customers;

**Key Findings**:

Average Age of Churned Customers: 45.2 years

**Insights**:

The age distribution shows that middle-aged customers are more likely to churn.

**Contract Analysis**

**Question 3: Discover the most common contract types among churned customers**

**SQL Query**:

SELECT

Contract,

COUNT(\*) AS Churned\_Count

FROM churned\_customers

GROUP BY Contract

ORDER BY Churned\_Count DESC;

**Key Findings**:

Month-to-Month: 1,506 churned customers (most common)

One Year: 194 churned customers

Two Year: 162 churned customers

**Insights**:

Month-to-month contracts are significantly more prone to churn compared to longer-term contracts.

**Spending Patterns**

**Question 4: Analyze the distribution of monthly charges among churned customers**

**SQL Query**:

SELECT

MIN(`Monthly Charge`) AS Min\_Monthly\_Charge,

MAX(`Monthly Charge`) AS Max\_Monthly\_Charge,

AVG(`Monthly Charge`) AS Avg\_Monthly\_Charge

FROM churned\_customers;

**Key Findings**:

* Minimum Monthly Charge: $18.25
* Maximum Monthly Charge: $118.75
* Average Monthly Charge: $74.20

**Insights**:

Customers paying higher monthly charges are more likely to churn, suggesting dissatisfaction with value for money.

**Question 5: Identify the contract types that are most prone to churn**

**SQL Query**:

SELECT

Contract,

(COUNT(\*) / (SELECT COUNT(\*) FROM customer\_churn WHERE Contract = churned\_customers.Contract)) \* 100 AS Churn\_Rate

FROM churned\_customers

GROUP BY Contract

ORDER BY Churn\_Rate DESC;

**Key Findings**:

Month-to-Month contracts have the highest churn rate: 42%.

**Insights**:

Customers on short-term contracts may feel less committed and are more likely to leave.

**Question 6: Identify customers with high total charges who have churned**

**SQL Query**:

SELECT \*

FROM churned\_high\_value\_customers

ORDER BY `Total Charges` DESC

LIMIT 10;

**Key Findings**:

Top churned customers had total charges exceeding $5,000.

**Insights**:

High-value customers represent a significant revenue loss and should be prioritized for retention efforts.

**Service Usage**

**Question 9: Identify customers who have both online security and online backup services and have not churned**

**SQL Query**:

SELECT \*

FROM stayed\_customers

WHERE `Online Security` = 'Yes' AND `Online Backup` = 'Yes';

**Key Findings**:

Customers with both services show higher retention rates.

**Insights**:

Bundling online security and backup services can increase customer satisfaction and reduce churn.

**Question 10: Determine the most common combinations of services among churned customers**

**SQL Query**:

SELECT

`Internet Service`,

`Streaming TV`,

`Streaming Movies`,

COUNT(\*) AS Churned\_Count

FROM churned\_customers

GROUP BY `Internet Service`, `Streaming TV`, `Streaming Movies`

ORDER BY Churned\_Count DESC

LIMIT 10;

**Key Findings**:

Most common combination: Fiber Internet with Streaming TV but no Streaming Movies.

**Insights**:

Specific service combinations may lead to dissatisfaction, prompting targeted interventions.

**Demographics**

**Question 14: Identify the contract types with the highest churn rate among senior citizens (age 65 and over)**

**SQL Query**:

SELECT

Contract,

COUNT(\*) AS Churned\_Senior\_Customers,

(COUNT(\*) / (SELECT COUNT(\*) FROM churned\_senior\_citizens)) \* 100 AS Senior\_Churn\_Rate

FROM churned\_senior\_citizens

GROUP BY Contract

ORDER BY Senior\_Churn\_Rate DESC;

**Key Findings**:

Month-to-Month contracts dominate churn among senior citizens.

**Insights**:

Seniors may prefer stability, suggesting the need for tailored long-term plans.

**Automation**

**Question 27: Stored Procedure to Calculate Churn Rate**

**SQL Query**:

CREATE PROCEDURE Calculate\_Churn\_Rate()

BEGIN

SELECT

COUNT(\*) AS Total\_Customers,

SUM(CASE WHEN `Customer Status` = 'Churned' THEN 1 ELSE 0 END) AS Churned\_Customers,

(SUM(CASE WHEN `Customer Status` = 'Churned' THEN 1 ELSE 0 END) / COUNT(\*)) \* 100 AS Churn\_Rate

FROM customer\_churn;

END //

DELIMITER ;

**Usage**:

Call the procedure to quickly calculate churn rate for future updates:

CALL Calculate\_Churn\_Rate();

**Insights**:

Automates churn rate calculation, saving time for repeated analyses.

**Overall Recommendations**

1. Focus retention efforts on **month-to-month contract customers**, as they have the highest churn rate.
2. Target **high-value customers** with loyalty rewards to reduce revenue loss.
3. Promote bundling of **online security and backup services** to improve retention.
4. Offer tailored plans for **senior citizens** to address their preference for stability.
5. Address dissatisfaction among customers with high monthly charges by improving value propositions.

**4. VISUALIZATION AND ANALYSIS BASED ON BUSINESS USE CASES:**

**1. Business Use Case: Customer Retention**

**Objective:** Identify at-risk customers and proactively implement retention strategies.

**Analysis 1: Churn Rate by Contract Type**

**Actions Taken:**

**Selected Chart Type**: A **Clustered Column Chart** was chosen from the visualizations pane to display churn rates for each contract type clearly.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Relevant columns: Contract and Customer Status.

**Measure Used**:

**Churn Rate Calculation**:

Churn Rate = DIVIDE(COUNTROWS(FILTER('customer\_churn\_analysis customer\_churn', [Customer Status] = "Churned")), COUNTROWS('customer\_churn\_analysis customer\_churn')) \* 100

The measure calculates the percentage of churned customers for each contract type.

**Fields Added**:

**X-Axis**: Contract column to represent different types of contracts (Month-to-Month, One Year, Two Year).

**Y-Axis**: Churn Rate measure to show churn percentages.

**Legend**: Customer Status to focus on churned customers only.

**Insights from Analysis**

**Key Observation**:

**Month-to-Month contracts** have the highest churn rate at 88.55%, indicating instability and customer dissatisfaction with shorter-term contracts.

**One Year and Two Year contracts** show significantly lower churn rates (8.88% and 2.57%, respectively), implying more commitment and satisfaction among long-term customers.

**Behavioral Patterns**:

Customers on short-term contracts might be exploring or uncertain about the services, leading to higher churn.

Long-term contracts indicate customer retention due to trust or promotional offers tied to these contracts.

**Strategic Recommendations**

**Retention Strategies**:

**Target Month-to-Month Customers**:

* Offer personalized discounts or loyalty rewards to convert them into annual or biennial plans.
* Provide flexible plans with added benefits for staying longer.

**Enhance Onboarding for New Customers**:

Focus on onboarding processes for month-to-month customers, ensuring they understand the value of the services.

**Marketing Campaigns**:

* Highlight benefits of long-term contracts, such as cost savings and premium features, through targeted email or SMS campaigns.
* Provide limited-time offers on one-year and two-year contracts to attract month-to-month customers.

**Service Improvement**:

* Conduct surveys to identify the specific dissatisfaction factors among short-term customers.
* Improve customer support and proactive engagement for month-to-month customers.

By implementing these strategies, the company can lower the churn rate, increase customer retention, and optimize revenue.

**Analysis 2: Top 10 High-Value Churned Customers**

Selected Chart Type: A Table Visual was used to display detailed information about the top 10 high-value churned customers.

**Data Source:**

Table: customer\_churn\_analysis churned\_customers.

Relevant columns: Customer ID, Total Charges, Tenure in Months, and Customer Status.

Measure Used:

Total Charges:

A simple SUM aggregation was applied to identify customers with the highest total charges among churned customers.

Ranking:

The customers were ranked based on their total charges in descending order using a DAX measure:

High Value Customers =

RANKX( FILTER(

'customer\_churn\_analysis churned\_customers',

'customer\_churn\_analysis churned\_customers'[Customer Status] = "Churned" ), 'customer\_churn\_analysis churned\_customers'[Total Charges],,DESC)

**Key Observation:**

The customers contributing the highest revenue before churning are identified. For instance, the highest total charge is ₹8,684.80 from a single customer.

**Behavioral Patterns:**

High-value customers tend to have longer tenures (67-72 months), indicating that even loyal customers churn.

**Financial Impact:**

These customers represent a significant revenue loss, highlighting the importance of retaining high-value customers.

**Strategic Recommendations**

Retention Strategies for High-Value Customers:

**Personalized Offers:** Provide tailored discounts or exclusive loyalty programs for high-value customers nearing the end of their contract.

**Proactive Engagement:** Assign dedicated account managers to maintain regular communication and address issues promptly.

**Improve Customer Experience:**

* Collect feedback from high-value churned customers to identify pain points that led to their decision to leave.
* Enhance service offerings and provide add-ons or perks for high-paying customers.

**Predictive Analysis:** Use machine learning models to predict churn risk for high-value customers based on historical data and intervene early.

By focusing on retaining high-value customers, the company can significantly reduce revenue loss and improve profitability**.**

**Analysis 3: Age Distribution of Churned Customers**

**Selected Chart Type**: A **Column Chart** was used to represent the age distribution of churned customers.

**Data Source**:

Table: customer\_churn\_analysis churned\_customers.

Relevant columns: Age and Customer ID.

**Data Preparation**:

**Grouping Ages**:

Age groups were created using binning to classify customers into ranges (e.g., 10-20, 20-30).

**Values and Axes**:

X-Axis: Age Group (created as bins).

Y-Axis: Count of Customer ID.

**Insights from Analysis**

**Key Observation**:

The majority of churned customers fall within the 30-40 and 40-50 age groups, with a notable peak of 166 customers in the 30-40 age group.

**Patterns**:

Young customers (10-20 age group) and older customers (70-80 age group) have significantly lower churn rates compared to middle-aged customers.

**Customer Behavior**:

Middle-aged customers, typically in their prime earning years, are the most likely to churn. This may be due to dissatisfaction with pricing, service offerings, or competition.

**Strategic Recommendations**

**Targeted Retention Programs**:

Focus retention efforts on middle-aged customers by offering personalized plans, loyalty rewards, or additional perks.

**Customized Marketing**:

Develop marketing campaigns emphasizing flexibility, better pricing, or bundled services tailored to the preferences of the 30-50 age group.

**Feedback Collection**:

Conduct surveys or focus groups for the 30-50 age segment to identify pain points leading to churn. Use these insights to improve offerings and customer satisfaction.

**Service Improvements**: Offer value-added services like faster internet, better customer support, or exclusive access to entertainment content to attract and retain this demographic.

This visual provides actionable insights into age-based churn patterns, enabling more targeted and effective retention strategies.

**2. Business Use Case: Marketing Campaigns**

**Objective:** Tailor marketing efforts towards customers more likely to churn.

**Analysis 4: Most Common Services Used by Churned Customers**

**Selected Chart Type**: Used **Bar Charts** to represent the churn count for Internet Service, Streaming TV, and Streaming Movies.

**Data Source**:

Table: customer\_churn\_analysis churned\_customers.

Relevant columns:

Internet Service (Yes/No).

Streaming TV (Yes/No).

Streaming Movies (Yes/No).

Customer ID.

**Data Preparation**:

Filtered the dataset to include only churned customers to focus on services used by customers who left.

Aggregated churn counts for each service category:

Counted the number of churned customers using Internet Service, Streaming TV, and Streaming Movies.

**Values and Axes**:

X-Axis: Count of Churned Customers (Customer ID grouped by service type).

Y-Axis: Service categories (Internet Service, Streaming TV, Streaming Movies).

**Insights from Analysis**

**Key Observations**:

A significant number of churned customers had Internet Service, indicating dissatisfaction with the service quality, pricing, or competition.

Streaming TV and Streaming Movies also show substantial churn counts, suggesting a gap in content offerings or user experience.

**Patterns**: Customers who churned and used streaming services may have higher expectations for bundled packages or superior streaming quality.

**Service Usage Behavior**:

* The high churn count for Internet Service implies it is a core service affecting customer retention.
* Streaming TV and Streaming Movies churn may correlate with the quality and availability of entertainment content.

**Strategic Recommendations**

**Enhanced Internet Service Quality**: Improve internet speeds and reliability to reduce churn among Internet Service users.

**Bundling Services**: Offer attractive packages bundling Internet Service with Streaming TV and Streaming Movies to create a competitive edge.

**Content Expansion**: Enhance the variety and exclusivity of streaming content to attract and retain customers.

**Personalized Plans**: Use customer segmentation to tailor service plans based on preferences for internet and streaming services.

**Proactive Engagement**: Engage churned customers through surveys and feedback to understand specific reasons for dissatisfaction and implement targeted improvements.

This visual highlight key service usage patterns among churned customers, enabling targeted marketing and service improvement strategies.

**Analysis 5: Churn Rate by Region**

**Selected Chart Type**: Used the **Map** visualization available in Power BI to represent churn rates geographically.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Relevant columns:

Latitude and Longitude (geographical coordinates).

City or Region.

Churn Rate (calculated as a measure).

**Data Preparation**:

Created a **calculated measure** for Churn Rate:

Churn Rate =

DIVIDE(COUNTROWS(FILTER('customer\_churn\_analysis customer\_churn', 'customer\_churn\_analysis customer\_churn'[Customer Status] = "Churned")),COUNTROWS('customer\_churn\_analysis customer\_churn')) \* 100

Aggregated churn rates by region to display on the map.

**Values and Formatting**:

Added:

Latitude and Longitude in the **Location** field.

Region Churn Rate in the **Tooltips** to display precise percentages.

**Insights from Analysis**

**Key Observations**:

Certain regions show a significantly higher churn rate, suggesting localized issues such as poor service quality, competitive market pressures, or unmet customer expectations.

Metropolitan and urban areas tend to have higher churn rates, possibly due to increased competition and higher customer expectations.

**Geographical Patterns**:

Coastal regions often exhibit higher churn rates, highlighting the importance of focusing on these high-density areas.

**Localized Analysis**:

Regions with low churn rates could be studied for best practices to replicate in high-churn areas.

**Strategic Recommendations**

**Targeted Marketing Campaigns**:

* Focus on high-churn regions with specialized offers and promotions to retain customers.
* Launch geo-specific marketing campaigns to address local competitors' offerings.

**Regional Service Improvements**:

* Conduct localized surveys to understand customer pain points in high-churn regions.
* Enhance infrastructure and service reliability in identified areas.

**Best Practice Sharing**: Analyze successful strategies from low-churn regions and implement them in areas with higher churn rates.

**Regional Customer Support**: Establish region-specific customer service centers to address concerns promptly.

This visual provides a clear geographic representation of churn patterns, enabling a strategic approach to address region-specific customer concerns and optimize retention efforts.

**3. Business Use Case: Service Improvement**

**Objective:** Analyze churn patterns to improve service offerings and customer support.

**Analysis 6: Most Common Services Used by Churned Customers**

**Selected Chart Type**:

Used the **Pie Chart** visualization in Power BI to represent the distribution of online services usage.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Relevant columns:

Online Services (categorized as None, Online Security Only, Online Backup Only, and Both Services).

Customer ID for count aggregation.

**Data Preparation**:

Created a calculated column for grouping Online Services:

Online Services = SWITCH(TRUE(),

'customer\_churn\_analysis customer\_churn'[Online Security] = "Yes"

&& 'customer\_churn\_analysis customer\_churn'[Online Backup] = "Yes", "Both Services",

'customer\_churn\_analysis customer\_churn'[Online Security] = "Yes", "Online Security Only",

'customer\_churn\_analysis customer\_churn'[Online Backup] = "Yes", "Online Backup Only",

"None")

**Values and Formatting**:

Added:

Count of Customer ID as the **Values** field.

Online Services as the **Legend** to categorize slices.

**Insights from Analysis**

**Key Observations**:

* A balanced distribution of customers among the four categories: None, Online Security Only, Online Backup Only, and Both Services.
* Customers using **Both Services** constitute a significant portion, indicating the popularity of bundled services.

**Service Utilization Trends**:

* Customers with no online services might represent a segment with limited digital engagement or preference for basic plans.
* "Online Backup Only" and "Online Security Only" customers may require targeted upselling strategies.

**Potential Target Groups**: Customers with "None" or "Only One Service" could be potential targets for cross-selling bundled services.

**Strategic Recommendations**

**Customer Retention**:

* Offer loyalty discounts or promotions to customers using both services to retain this high-value segment.
* Focus retention strategies on customers using only one service, as they are more likely to churn due to incomplete utilization of service offerings.

**Marketing Campaigns**:

* Design targeted campaigns for customers with no online services, highlighting the benefits of online security and backup.
* Upsell bundled services to "Only One Service" users with discounts or added benefits.

**Service Development**: Conduct surveys among customers using no services to identify barriers and design services catering to their needs.

**Revenue Optimization**: Increase subscription revenue by encouraging customers with one service to opt for both through value-driven offers.

This visual highlight the customer segmentation based on online services, providing insights into usage patterns and identifying opportunities for service improvement and revenue growth.

**Analysis 7: Monthly Charges Distribution for Churned Customers**

**Selected Chart Type**: Used a **Line and Clustered Column Chart** in Power BI to visualize the distribution of monthly charges for churned customers alongside their median monthly charges.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Relevant columns:

Customer Status (filtered to include only "Churned").

Monthly Charges (grouped into bins).

Customer ID (used for counting).

**Data Preparation**:

Created bins for the Monthly Charges column:

Bin Size: 10 to group monthly charges into ranges.

Added a calculated measure for Median Monthly Charges:

Median Monthly Charges = MEDIANX( FILTER('customer\_churn\_analysis customer\_churn', 'customer\_churn\_analysis customer\_churn'[Customer Status] = "Churned"),'customer\_churn\_analysis customer\_churn'[Monthly Charges])

**Chart Configuration**:

**X-axis**: Monthly Charge bins.

**Column Y-axis**: Count of Customer ID to show the number of churned customers per bin.

**Line Y-axis**: Median Monthly Charges.

**Column Legend**: Customer Status to ensure the analysis focuses only on churned customers.

Data labels and axis titles were added for better readability.

**Insights from Analysis**

**Key Observations**:

* The majority of churned customers fall within the monthly charge range of $60-$80.
* A significant decline in churned customers is observed beyond the $100 monthly charge range.
* The median monthly charge for churned customers aligns closely with the peak churn range, highlighting potential dissatisfaction with charges in this range.

**Behavioral Patterns**:

* Customers paying higher monthly charges ($80-$120) are less likely to churn, indicating they may be receiving premium services that meet their expectations.
* The spike in churn for customers in the $60-$80 range suggests dissatisfaction or lack of perceived value.

**Potential At-Risk Groups**: Customers with monthly charges between $50-$90 could be considered at higher risk of churn and warrant further investigation into the reasons behind dissatisfaction.

**Strategic Recommendations**

**Customer Retention**:

* Provide tailored retention offers (e.g., discounts or additional benefits) for customers in the $60-$80 range to address dissatisfaction.
* Introduce tiered loyalty programs to retain customers with higher monthly charges by emphasizing the value of premium services.

**Pricing Strategy**:

* Review the pricing structure for plans in the $60-$80 range to ensure competitive pricing and value delivery.
* Offer flexible payment plans or incentives to customers transitioning from mid-range to higher-range pricing tiers.

**Service Enhancement**:

* Conduct targeted surveys to understand the specific concerns of customers in the $60-$80 range and implement service improvements accordingly.
* Provide add-on features or bundled services for customers in lower tiers to enhance their experience and prevent churn.

**Marketing Campaigns**:

* Develop marketing campaigns highlighting the benefits and value of premium plans to encourage upgrades from mid-tier customers.
* Focus on educating customers about the additional benefits of higher-tier plans through webinars, emails, or targeted advertisements.
* This visual effectively highlights the pricing-related concerns among churned customers, providing actionable insights to address dissatisfaction and optimize pricing strategies.

**4. Business Use Case: Revenue Optimization**

**Objective:** Reduce churn rates to maintain a steady revenue stream.

**Analysis 8: Churned Customers’ Contribution to Revenue**

**Selected Chart Type**: A **Donut Chart** was selected to visualize the contribution of churned customers to overall revenue.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Relevant measures:

Churned Revenue: Total revenue from churned customers.

Non-Churned Revenue: Total revenue from customers who stayed.

**Data Preparation**:

Created the following calculated measures in DAX:

**Total Revenue**:

Total Revenue = SUM('customer\_churn\_analysis customer\_churn'[Total Charges])

**Churned Revenue**:

Churned Revenue = CALCULATE(

SUM('customer\_churn\_analysis customer\_churn'[Total Charges]),

'customer\_churn\_analysis customer\_churn'[Customer Status] = "Churned")

**Non-Churned Revenue**:

Non-Churned Revenue = [Total Revenue] - [Churned Revenue]

**Chart Configuration**:

**Legend**: Used to distinguish between Churned Revenue and Non-Churned Revenue.

**Values**: Dragged Churned Revenue and Non-Churned Revenue to compare their respective proportions.

**Insights from Analysis**

**Key Observations**:

**Churned Revenue** accounts for 17.83% of the total revenue, amounting to $2.86M.

**Non-Churned Revenue** makes up the remaining 82.17%, showcasing the significant impact of churn on overall revenue.

**Impact Analysis**:

* A substantial portion of the revenue is lost due to churned customers, highlighting a critical area for intervention.
* Reducing churn by even a small percentage could recover significant revenue.

**Behavioral Trends**: Customers contributing to churned revenue may indicate dissatisfaction with services or pricing.

**Strategic Recommendations**

**Revenue Recovery**:

* Implement win-back campaigns targeting churned customers to encourage re-engagement and regain lost revenue.
* Offer tailored retention packages or incentives for high-value customers nearing churn.

**Customer Retention Programs**:

* Develop loyalty programs focusing on long-term customers to prevent future churn.
* Provide financial perks or added benefits to customers identified in high-risk segments.

**Pricing Adjustments**:

* Reevaluate pricing strategies to address dissatisfaction among mid-tier customers who are more prone to churn.
* Introduce flexible pricing or bundled services to increase perceived value.

**Predictive Analytics**:

* Use churn prediction models to identify at-risk customers early and proactively address their concerns.
* Focus efforts on retaining customers with the highest revenue contribution.

This visual effectively communicates the financial implications of customer churn and provides a foundation for targeted revenue optimization strategies.

**Analysis 9: Average Monthly Charges by Customer Status**

**Selected Chart Type**: A **Treemap Chart** was used to visually represent the average monthly charges by customer status.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Relevant measure:

Average Monthly Charges.

**Data Preparation**:

Created a calculated measure in DAX for Average Monthly Charges:

Average Monthly Charges = AVERAGE('customer\_churn\_analysis customer\_churn'[Monthly Charges])

Segregated the data by customer status (Churned, Stayed, Joined) using the Customer Status column.

**Chart Configuration**:

**Legend**: Not used as the segmentation was clear within the Treemap.

**Values**: Dragged Average Monthly Charges.

**Details**: Segmented by Customer Status.

**Insights from Analysis**

**Key Observations**:

**Churned Customers**:

* Average monthly charges: $73.35.
* This is higher compared to other segments, indicating potential dissatisfaction with pricing.

**Stayed Customers**:

* Average monthly charges: $61.74.
* Indicates a lower pricing tier may be more favorable for customer retention.

**Joined Customers**:

* Average monthly charges: $42.78.
* Represents the lowest pricing, potentially as an entry-level offer or incentive.

**Impact Analysis**:

* Higher charges among churned customers highlight pricing as a possible driver of churn.
* Stayed customers' charges indicate a balance between pricing and value, leading to retention.

**Behavioral Trends**: New customers (Joined) are entering at lower pricing tiers, possibly due to promotional offers.

**Strategic Recommendations**

**Customer Retention**:

* Introduce **tiered pricing strategies** that provide additional benefits for higher charges, ensuring perceived value aligns with the cost.
* Offer discounts or incentives to churned customers during the re-engagement process.

**Marketing Strategies**:

* Promote mid-tier pricing plans (aligned with Stayed customers) to target both new and at-risk customers.
* Leverage the insights to design campaigns that highlight value-added services for higher pricing tiers.

**Service Enhancement**:

* Conduct further analysis to understand dissatisfaction among churned customers and implement corrective actions.
* Ensure transparency in pricing structures and communicate benefits effectively.

**Pricing Optimization**:

* Continuously monitor the impact of pricing adjustments on churn rates and revenue.
* Evaluate if additional pricing adjustments for churned customers could improve retention metrics.

This visual provides actionable insights into the relationship between pricing and customer behavior, supporting efforts in customer retention, marketing, and pricing optimization.

**5. Business Use Case: Customer Segmentation**

**Objective:** Segment customers based on churn probability to offer personalized experiences.

**Analysis 10: Customer Segmentation by Tenure**

**Selected Chart Type**:

Used a **Stacked Bar Chart** to segment customers based on their tenure groups and customer status.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Key columns used:

Tenure in Months.

Customer Status.

**Data Preparation**:

Created a calculated column for **Tenure Group** to classify customers into short-term, medium-term, and long-term segments:

Tenure Group = SWITCH(TRUE(),

'customer\_churn\_analysis customer\_churn'[Tenure in Months] <= 12, "Short-Term",

'customer\_churn\_analysis customer\_churn'[Tenure in Months] > 12 && 'customer\_churn\_analysis customer\_churn'[Tenure in Months] <= 36, "Medium-Term",

'customer\_churn\_analysis customer\_churn'[Tenure in Months] > 36, "Long-Term")

**Chart Configuration**:

**X-Axis**: Count of Customer IDs.

**Y-Axis**: Tenure Groups (Short-Term, Medium-Term, Long-Term).

**Legend**: Customer Status (Churned, Stayed, Joined).

**Insights from Analysis**

**Key Observations**:

**Long-Term Customers**: Higher representation among Stayed customers, indicating loyalty over time.

**Short-Term Customers**: Higher churn rate, suggesting challenges in retaining new customers.

**Medium-Term Customers**: Moderate distribution across all customer statuses.

**Impact Analysis**:

* Short-term customers have a significant churn rate, which highlights the need for improved onboarding and initial engagement.
* Long-term customers appear more stable, indicating the effectiveness of strategies for retaining them.

**Behavioral Trends**: Customer status is directly influenced by tenure, with churn being highest among newer customers.

**Strategic Recommendations**

**Customer Retention**:

* Develop **new customer onboarding programs** with personalized engagement strategies.
* Offer loyalty rewards or incentives for short-term customers to encourage longer tenure.

**Marketing Strategies**:

* Target short-term customers with promotional offers or discounts to reduce churn.
* Highlight the benefits of extended contracts to encourage customers to move from short-term to medium or long-term segments.

**Service Enhancement**:

* Identify pain points in the customer journey for short-term customers and address them with tailored solutions.
* Regularly survey short-term and medium-term customers to understand their needs and satisfaction levels.

**Data-Driven Actions**: Continuously monitor churn rates within tenure groups and refine retention strategies based on real-time data insights.

This visual provides a clear breakdown of customer tenure and behavior, offering actionable insights for improving customer retention and targeting marketing efforts effectively.

**Analysis 11: Customer Segmentation by Demographics**

**Selected Chart Type**: Utilized a **Stacked Bar Chart** to segment customers by demographic groups, focusing on **age groups** and marital status.

**Data Source**:

Table: customer\_churn\_analysis customer\_churn.

Key columns used:

Age Group: Created as a calculated column by categorizing Age.

Marital Status.

**Data Preparation**:

Created bin for Age Group

**Chart Configuration**:

**X-Axis**: Count of Customer IDs.

**Y-Axis**: Age Groups.

**Legend**: Marital Status (Yes/No).

Applied consistent color coding for better differentiation between marital status categories.

**Insights from Analysis**

**Key Observations**:

* Younger customers (aged 21–40) have a balanced distribution of marital status and contribute significantly to the customer base.
* Married customers dominate in middle age groups (41–60), indicating stability in behavior.
* Older customers (above 70) are mostly married, but their overall count is relatively low.

**Impact Analysis**:

* Younger customers might be more adaptable to promotional campaigns and new services.
* Married customers could have stronger retention but might require family-oriented service bundles to maintain satisfaction.

**Behavioral Trends**: Marital status influences customer behavior, with married individuals more likely to maintain long-term contracts.

**Strategic Recommendations**

**Customer Retention**:

* Create **family-oriented bundles** and discounts targeting married customers, especially in middle-age groups.
* Develop special programs for older customers to retain their loyalty despite lower engagement levels.

**Marketing Campaigns**: Tailor promotional campaigns for younger demographics focusing on flexibility and modern services like streaming or gaming bundles.

**Service Improvement**:

* Analyze churn data further within each marital and age group to identify service gaps and address them with targeted improvements.
* Implement feedback systems specific to demographic groups to continuously refine offerings.

**Data-Driven Actions**: Continuously track engagement and churn rates across demographic segments to adjust retention and marketing strategies dynamically.

This visualization provides a clear demographic segmentation, enabling targeted strategies for both retention and growth across different age and marital status groups.

**5. DASHBOARD VISUALIZATION:**

**Dashboard Title Section**

**Title**:

Added a large, visually appealing title: **"Customer Churn Prediction and Insights Dashboard"**.

Used a custom background color and font styling for emphasis.

**Data**: Data sourced from the **customer\_churn\_analysis** table in Power BI.

**Overview Cards**

**KPI Visuals**:

Total Customers, Churned Customers, Churn Rate, Total Revenue Churned,

Average Monthly Charges Churned

**Purpose**:

High-level KPIs provide an instant snapshot of the dataset's core metrics.

**Key Insights Visuals**

**Churn Rate by Contract Type**:

**Insights**:

Month-to-Month contracts have the highest churn rate, indicating a need for retention efforts targeting short-term customers.

**Strategy**:

Incentivize long-term contracts through discounts or additional benefits.

**Monthly Charges Distribution by Customer Status**:

**Insights**: Higher churn among customers with mid-range charges.

**Strategy**: Revise pricing strategies to align value with cost.

**Revenue Insights**

**Churned vs. Non-Churned Revenue**:

**Insights**: Churned customers account for a significant portion of lost revenue.

**Strategy**: Implement loyalty programs to reduce revenue leakage.

**Demographics and Segmentation**

**Customer Segmentation by Tenure**:

**Insights**:

Long-term customers show a higher tendency to stay.

**Strategy**:

Reward long-term loyalty with exclusive benefits.

**Customer Segmentation by Demographics**:

**Insights**:

Middle-aged married customers contribute significantly to the customer base.

**Strategy**:

Design family-oriented service bundles for better retention.

**Final Strategic Recommendations**

1. **Customer Retention**:
   * Focus on short-term contract customers with personalized offers.
   * Implement loyalty rewards for long-term customers.
2. **Marketing Campaigns**:
   * Run regional campaigns based on churn density insights.
   * Promote family-friendly or demographic-specific bundles.
3. **Service Optimization**:
   * Address dissatisfaction with mid-range pricing.
   * Expand on services favored by churned customers like internet and streaming services.
4. **Revenue Optimization**:
   * Reduce revenue churn with retention strategies targeting at-risk groups.

This dashboard provides a holistic view of customer behavior, enabling actionable insights for churn prediction and management.

**Overall Summary**

**Project Overview**

The Customer Churn Analysis project aimed to address the critical business challenge of predicting and managing customer churn. By leveraging a comprehensive dataset, analytical tools, and visualization techniques, the project focused on identifying churn patterns, uncovering key drivers, and offering actionable strategies to improve customer retention, revenue, and service optimization.

**Data Journey**

**Data Collection and Preprocessing**:

* A dataset of 7,044 customer records was collected and preprocessed to address missing values, correct invalid entries, normalize numerical features, and encode categorical variables.
* Subsets of the dataset (churned, stayed, and joined customers) were created to enable focused analysis.

**Exploratory Data Analysis**:

* The data was examined for trends across customer demographics, service usage, and revenue contributions.
* Patterns such as high churn rates among month-to-month contracts and mid-range monthly charges were identified.

**Key Insights**

**Churn Drivers**:

* Customers with month-to-month contracts exhibited the highest churn rate.
* Online services like streaming TV and internet service were commonly used by churned customers, highlighting potential service dissatisfaction.
* Revenue churn was significant, indicating the financial impact of churn on the organization.

**Customer Segmentation**:

* Long-term customers showed greater loyalty, while short-term customers were at higher churn risk.
* Demographic segmentation revealed that middle-aged, married customers form a core segment of the customer base.

**Revenue Insights**:

* Churned customers contributed to 17.83% of total revenue, emphasizing the need for proactive retention strategies.
* Average monthly charges for churned customers were higher than those who stayed, suggesting dissatisfaction with pricing.

**Actionable Strategies**

**Customer Retention**:

* Personalize retention strategies for short-term contract customers, such as discounts or value-added services.
* Introduce loyalty programs for long-term customers to reward their commitment.

**Service and Pricing Optimization**:

* Reassess mid-range pricing to align with customer expectations and perceived value.
* Address service quality concerns, particularly for streaming and internet services.

**Targeted Marketing**:

* Use regional churn patterns to design geographically targeted marketing campaigns.
* Offer demographic-specific bundles to cater to middle-aged, married customers.

**Revenue Optimization**:

* Focus on high-value churned customers and implement strategies to re-engage them.
* Develop predictive models to identify at-risk customers before they churn.

**Conclusion**

The project successfully delivered actionable insights into customer churn behavior, enabling the organization to take proactive measures to mitigate churn and optimize revenue. The use of a dynamic dashboard provided a user-friendly and real-time overview of customer behavior, empowering stakeholders to make data-driven decisions.

By addressing key business use cases, including customer retention, marketing campaigns, and service optimization, the analysis lays a strong foundation for enhancing customer satisfaction and organizational profitability. The insights gained from this project can be further expanded with predictive modeling to anticipate future churn risks, ensuring continuous improvement in customer management strategies.

This project highlights the importance of data-driven approaches in tackling customer churn and underscores the value of integrating analytics into strategic decision-making processes.