Case Study: Analyzing Customer Churn in a Telecom Company Using SQL

# Introduction

## Objective:

Analyze the customer churn data of a telecom company to identify key factors influencing customer retention and provide actionable insights to reduce churn rates

## Goals:

* Understand the demographics and behaviors of customers who churn
* Identify patterns and trends associated with churn
* Develop strategies to improve customer retention based on data-driven insights

# Data Overview

## Data Columns:

customerID, gender, SeniorCitizen, Partner, Dependents, tenure, PhoneService, MultipleLines, InternetService, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies, Contract, PaperlessBilling, PaymentMethod, MonthlyCharges, TotalCharges, numAdminTickets, numTechTickets, Churn

## Data Attributes:

* **Demographics:** customerID, gender, SeniorCitizen, Partner, Dependents
* **Services:** PhoneService, MultipleLines, InternetService, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies
* **Contracts and Billing:** Contract, PaperlessBilling, PaymentMethod
* **Financials:** MonthlyCharges, TotalCharges
* **Support Tickets:** numAdminTickets, numTechTickets
* **Outcome:** Churn (Yes/No)

# Key Performance Indicators (KPIs) and Metrics:

* **Churn Rate:** Percentage of customers who have churned over a specific period

*Churn Rate = (Number of churned customers/Total number of customers)\*100*

**Result:** 26.54%

**Query:**

SELECT

ROUND((SUM(CASE WHEN Churn = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \*100), 2) AS 'Churn\_rate'

FROM telecom\_churn;

* **Average tenure:** Average duration (in months) customers stay with the company

**Result:**

| **Churn** | **Average\_tenure** |
| --- | --- |
| No | 37.57 |
| Yes | 17.98 |

**Query:**

SELECT Churn, ROUND(AVG(tenure), 2) AS 'Average\_tenure'

FROM telecom\_churn

GROUP BY Churn;

* **Average Monthly revenue:** Average monthly revenue from all customers

**Result:** 64.76

**Query:**

SELECT ROUND(AVG(MonthlyCharges), 2) AS 'Average\_monthly\_charges'

FROM telecom\_churn;

* **Customer Lifetime Value (CLV):** Projected revenue a customer will generate during their relationship with the company

*CLV = ARPU \* Customer Lifetime*

*Where ARPU: Average monthly revenue from the customer*

*Customer Lifetime: The expected number of months the customer will remain a customer*

**Result:**

| **Avg\_tenure** | **Avg\_LT** | **Avg\_CLV** |
| --- | --- | --- |
| 32.3711 | 7.4919 | 573.1361 |

**Approach:**

Step 1: Calculating ARPU

Same as MonthlyRevenue for each customer

Step 2: Calculating Churn probability

SELECT ROUND(COUNT(\*)/(SELECT COUNT(\*) FROM telecom\_churn), 2) AS 'Churn\_probability'

FROM telecom\_churn

WHERE Churn = 'Yes';

Step 3: Calculating Customer lifetime, which is the reciprocal of the churn rate

SELECT 1/COUNT(\*)/(SELECT COUNT(\*) FROM telecom\_churn) AS 'Customer\_lifetime'

FROM telecom\_churn

WHERE Churn = 'Yes';

Step 4: Bringing it all together

WITH Churn\_Stats AS(SELECT ROUND(COUNT(\*)/(SELECT COUNT(\*) FROM telecom\_churn), 2) AS 'Churn\_probability'

FROM telecom\_churn

WHERE Churn = 'Yes')

SELECT customerId, MonthlyCharges, tenure,

CASE WHEN Churn = 'Yes' THEN tenure

ELSE 1.0/Churn\_probability END AS 'Estimated\_lifetime',

MonthlyCharges \* CASE WHEN Churn = 'Yes' THEN tenure

ELSE 1.0/Churn\_probability END AS 'CLV'

FROM telecom\_churn CROSS JOIN Churn\_Stats;

**Query:**

WITH Churn\_Stats AS(SELECT ROUND(COUNT(\*)/(SELECT COUNT(\*) FROM telecom\_churn), 2) AS 'Churn\_probability'

FROM telecom\_churn

WHERE Churn = 'Yes'),

CTE AS(SELECT customerId, MonthlyCharges, tenure,

CASE WHEN Churn = 'Yes' THEN tenure

ELSE 1.0/Churn\_probability END AS 'Estimated\_lifetime',

MonthlyCharges \* CASE WHEN Churn = 'Yes' THEN tenure

ELSE 1.0/Churn\_probability END AS 'CLV'

FROM telecom\_churn CROSS JOIN Churn\_Stats)

SELECT AVG(tenure) AS 'Avg\_tenure', AVG(Estimated\_lifetime) AS 'Avg\_LT', AVG(CLV) AS 'Avg\_CLV'

FROM CTE;

* **Service Utilization Metrics:**
  + **Phone Service Utilization:** Percentage of customers using phone services

**Result:** 90.32%

**Query:**

SELECT

ROUND((SUM(CASE WHEN PhoneService = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \* 100), 2) AS 'PhoneService\_utilization'

FROM telecom\_churn;

* + **Internet Service Utilization:** Distribution of different internet services

**Result:**

| **InternetService** | **distribution\_percentage** |
| --- | --- |
| FiberOptic | 43.96 |
| DSL | 34.37 |
| No | 21.67 |

**Query:**

**With CTE:**

WITH CTE AS(SELECT InternetService, COUNT(\*) AS 'distribution\_count'

FROM telecom\_churn

GROUP BY InternetService)

SELECT CTE.InternetService, ROUND(CTE.distribution\_count/COUNT(\*)\*100, 2) AS 'distribution\_percentage'

FROM CTE, telecom\_churn

GROUP BY CTE.InternetService

ORDER BY distribution\_percentage DESC;

**Without CTE:**

SELECT InternetService,

ROUND((COUNT(\*)/(SELECT COUNT(\*) FROM telecom\_churn))\*100, 2) AS 'distribution\_percentage'

FROM telecom\_churn

GROUP BY InternetService

ORDER BY distribution\_percentage DESC;

* **Support Ticket Analysis:**
  + **Average number of admin tickets**

**Result:** 0.52

**Query:**

SELECT ROUND(AVG(numAdminTickets), 2) AS 'Average\_admin\_tickets'

FROM telecom\_churn;

* + **Average number of tech tickets**

**Result:** 0.42

**Query:**

SELECT ROUND(AVG(numTechTickets), 2) AS 'Average\_tech\_tickets'

FROM telecom\_churn;

* **Demographic Breakdown:**
  + **Churn rate by gender**

**Result:**

| **Gender** | **Churn\_rate** |
| --- | --- |
| Female | 26.92 |
| Male | 26.16 |

**Query:**

SELECT gender,

ROUND((SUM(CASE WHEN Churn = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \*100), 2) AS 'Churn\_rate'

FROM telecom\_churn

GROUP BY gender

ORDER BY Churn\_rate DESC;

* + **Churn rate by senior citizen status**

**Result:**

| **SeniorCitizen** | **Churn\_rate** |
| --- | --- |
| 1 | 41.68 |
| 0 | 23.61 |

**Query:**

SELECT SeniorCitizen,

ROUND((SUM(CASE WHEN Churn = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \*100), 2) AS 'Churn\_rate'

FROM telecom\_churn

GROUP BY SeniorCitizen

ORDER BY Churn\_rate DESC;

* + **Churn rate by partnership status**

**Result:**

| **Partner** | **Churn\_rate** |
| --- | --- |
| No | 32.96 |
| Yes | 19.66 |

**Query:**

SELECT Partner,

ROUND((SUM(CASE WHEN Churn = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \*100), 2) AS 'Churn\_rate'

FROM telecom\_churn

GROUP BY Partner

ORDER BY Churn\_rate DESC;

* **Contract Analysis:**
  + **Churn rate by contract type**

**Result:**

| **Contract** | **Churn\_rate** |
| --- | --- |
| Month-to-month | 42.71 |
| One year | 11.27 |
| Two year | 2.83 |

**Query:**

SELECT Contract,

ROUND((SUM(CASE WHEN Churn = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \*100), 2) AS 'Churn\_rate'

FROM telecom\_churn

GROUP BY Contract

ORDER BY Churn\_rate DESC;

* **Payment Method Preferences:**
  + **Churn rate by payment method**

**Result:**

| **PaymentMethod** | **Churn\_rate** |
| --- | --- |
| Electronic check | 45.29 |
| Mailed check | 19.11 |
| Bank transfer (automatic) | 16.71 |
| Credit card (automatic) | 15.24 |

**Query:**

SELECT PaymentMethod,

ROUND((SUM(CASE WHEN Churn = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \*100), 2) AS 'Churn\_rate'

FROM telecom\_churn

GROUP BY PaymentMethod

ORDER BY Churn\_rate DESC;

# Business Questions

* **Is there a correlation between tenure and churn**

**Result:** Yes, it was observed that lower tenure had the highest churn rate

The top 10 values of tenure having the highest churn rate are:

| **tenure** | **Churn\_rate** | **Churn\_rank** |
| --- | --- | --- |
| 1 | 61.99 | 1 |
| 2 | 51.68 | 2 |
| 5 | 48.12 | 3 |
| 4 | 47.16 | 4 |
| 3 | 47.00 | 5 |
| 7 | 38.93 | 6 |
| 10 | 38.79 | 7 |
| 9 | 38.66 | 8 |
| 15 | 37.37 | 9 |
| 6 | 36.36 | 10 |

**Query:**

WITH CTE AS(SELECT tenure,

ROUND((SUM(CASE WHEN Churn = 'Yes' THEN 1 ELSE 0 END)/

COUNT(\*) \*100), 2) AS 'Churn\_rate'

FROM telecom\_churn

GROUP BY tenure)

SELECT tenure, Churn\_rate,

DENSE\_RANK()OVER(ORDER BY Churn\_rate DESC) AS Churn\_rank

FROM CTE;

* **Average number of tech support tickets for churned vs. retained customers**

**Result:**

| **Churn** | **Average\_tech\_tickets** |
| --- | --- |
| Yes | 1.2 |
| No | 0.2 |

**Query:**

SELECT Churn, ROUND(AVG(numTechTickets), 1) AS Average\_tech\_tickets

FROM telecom\_churn

GROUP BY Churn

ORDER BY Average\_tickets DESC;

* **Average number of admin support tickets for churned vs. retained customers**

**Result:**

| **Churn** | **Average\_admin\_tickets** |
| --- | --- |
| Yes | 0.5 |
| No | 0.5 |

**Query:**

SELECT Churn, ROUND(AVG(numAdminTickets), 1) AS Average\_admin\_tickets

FROM telecom\_churn

GROUP BY Churn

ORDER BY Average\_admin\_tickets DESC;

* **Which payment method collected the most revenue?**

**Result:** Electronic check

**Query:**

SELECT PaymentMethod, ROUND(SUM(TotalCharges), 2) AS Total\_charges

FROM telecom\_churn

GROUP BY PaymentMethod

ORDER BY Total\_charges DESC;

* What combination of services increases the likelihood of churn?

Result: The following combination has the highest likelihood of churn (approx 2%)

PhoneService = ‘Yes’, MultipleLines = ‘No’, InternetService = ‘Fibre Optic’, OnlineSecurity = ‘No’, OnlineBackup = ‘No’, DeviceProtection = ‘No’, TechSupport = ‘No’, StreamingTV = ‘No’, StreamingMovies = ‘No’

**Query:**

SELECT PhoneService, MultipleLines, InternetService, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies,

ROUND(COUNT(\*)\*1.0/(SELECT COUNT(\*) FROM telecom\_churn)\*100, 2) AS 'Churn\_probability'

FROM telecom\_churn

WHERE Churn = 'Yes'

GROUP BY PhoneService, MultipleLines, InternetService, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies

ORDER BY Churn\_probability DESC

LIMIT 1;

* What combination of services decreases the likelihood of churn?

Result: The following combinations have the highest likelihood of customer retention

* PhoneService = ‘Yes’, MultipleLines = ‘No’, InternetService = ‘No’, OnlineSecurity = ‘No internet service’, OnlineBackup = ‘No internet service’, DeviceProtection = ‘No internet service’, TechSupport = ‘No internet service’, StreamingTV = ‘No internet service’, StreamingMovies = ‘No internet service’
* PhoneService = ‘Yes’, MultipleLines = ‘Yes’, InternetService = ‘No’, OnlineSecurity = ‘No internet service’, OnlineBackup = ‘No internet service’, DeviceProtection = ‘No internet service’, TechSupport = ‘No internet service’, StreamingTV = ‘No internet service’, StreamingMovies = ‘No internet service’
* PhoneService = ‘Yes’, MultipleLines = ‘Yes’, InternetService = ‘Fibre Optic’, OnlineSecurity = ‘Yes’, OnlineBackup = ‘Yes’, DeviceProtection = ‘Yes’, TechSupport = ‘Yes’, StreamingTV = ‘Yes’, StreamingMovies = ‘Yes’

**Query:**

SELECT PhoneService, MultipleLines, InternetService, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies,

ROUND(COUNT(\*)\*1.0/(SELECT COUNT(\*) FROM telecom\_churn)\*100, 2) AS 'Non\_Churn\_probability'

FROM telecom\_churn

WHERE Churn = 'No'

GROUP BY PhoneService, MultipleLines, InternetService, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies

ORDER BY Non\_Churn\_probability DESC

LIMIT 3;

* What is the average Customer Lifetime Value (CLV) for churned vs. retained customers

**Result:**

| **Churn** | **CLV** |
| --- | --- |
| No | 2549.91 |
| Yes | 1531.8 |

**Query:**

SELECT Churn, ROUND(AVG(TotalCharges), 2) AS 'CLV'

FROM telecom\_churn

GROUP BY Churn

ORDER BY CLV DESC;

# Analysis and Insights

The following insights were observed after the analysis:

* **High churn segments:** The churn rate is higher for customers with a small duration for tenure, who have electronic and mail checks as a payment method, and who have taken month-to-month contract type instead of one or two years of contract length.
* **Service influence:** It was observed that customers who took only phone service and no internet services, customers who took only phone and multiple-line service and no internet services, and customers who took both phone and multiple-line service along with all the internet services had a very low churn rate.
* **Support interactions:** A higher number of tech support tickets is positively correlated with a higher probability of customer churn.

# Recommendations

The steps that can be taken to increase customer retention are:

* **Enhance customer engagement:** Focusing on customers who have taken month-to-month contract type with targeted strategies like loyalty programs or contract incentives.
* **Packaged services:** Develop tiered service packages, bundling multiple offerings for customers at a fixed price.
* **Improve service quality:** Address common tech issues reported in support tickets to reduce customer frustration and potential churn.