

# "ChurnQuest: Navigating the Waves of Customer Retention in Telecommunications"

## Background:

### Scenario:

You are a data analyst at Airtel, a leading telecommunications company. Recently, the company has noticed an increase in the number of customers discontinuing their services. This trend is alarming to the management as it could significantly impact the company's revenue and market share. Your task is to dive deep into the customer data to identify patterns and insights that could help understand the factors leading to customer churn. Your analysis will play a crucial role in developing strategies to improve customer retention.

## Problem Statement

The primary challenge is to analyze the factors contributing to customer churn at Airtel. Understanding why customers are leaving will enable the company to implement targeted interventions to improve retention rates.

## Data Link

<https://www.kaggle.com/competitions/customer-churn-prediction-2020/data>

## Data Dictionary

- **state**, *string*. 2-letter code of the US state of customer residence
- **account\_length**, *numerical*. Number of months the customer has been with the current telco provider
- **area\_code**, *string*="area\_code\_AAA" where AAA = 3 digit area code.
- **international\_plan**, *(yes/no)*. The customer has an international plan.
- **voice\_mail\_plan**, *(yes/no)*. The customer has a voicemail plan.
- **number\_vmail\_messages**, *numerical*. Number of voice-mail messages.
- **total\_day\_minutes**, *numerical*. Total minutes of day calls.
- **total\_day\_calls**, *numerical*. Total number of day calls.
- **total\_day\_charge**, *numerical*. Total charge of day calls.
- **total\_eve\_minutes**, *numerical*. Total minutes of evening calls.
- **total\_eve\_calls**, *numerical*. Total number of evening calls.
- **total\_eve\_charge**, *numerical*. Total charge of evening calls.
- **total\_night\_minutes**, *numerical*. Total minutes of night calls.
- **total\_night\_calls**, *numerical*. Total number of night calls.
- **total\_night\_charge**, *numerical*. Total charge of night calls.
- **total\_intl\_minutes**, *numerical*. Total minutes of international calls.
- **total\_intl\_calls**, *numerical*. Total number of international calls.
- **total\_intl\_charge**, *numerical*. The total charge of international calls
- **number\_customer\_service\_calls**, *numerical*. Number of calls to customer service
- **churn**, *(yes/no)*. Customer churn - target variable.

## Basic-Level Questions

1. How many customers have churned, and what is their proportion compared to the total customer base?
  - Hint: Calculate the count and percentage of churned vs. non-churned customers.
  - Impact: Understanding the magnitude of churn provides a baseline for measuring the effectiveness of retention strategies over time.
2. What is the average account length for churned customers compared to non-churned customers? Does the account tenure influence churn?
  - Hint: Use descriptive statistics to compare the average account length between the two groups.
  - Impact: Identifying if longer-tenured customers are less likely to churn can inform loyalty programs and targeted communications.
3. How does the subscription to international plans correlate with customer churn?
  - Hint: Compare churn rates between customers with and without international plans.
  - Impact: This can reveal if the international plan is a factor in customer satisfaction or dissatisfaction, guiding product pricing and feature enhancement.
4. Is there a significant difference in the number of customer service calls between churned and non-churned customers?
  - Hint: Analyze the average number of customer service calls for both groups.
  - Impact: High numbers of service calls may indicate dissatisfaction; addressing the reasons behind these calls can improve overall customer satisfaction.
5. Do day, evening, and night call charges significantly differ between churned and non-churned customers?
  - Hint: Compare the average charges across different times of day for both groups.
  - Impact: Insights into call charge dissatisfaction can lead to revised pricing plans to enhance customer retention.
6. What is the relationship between total day minutes and churn?
  - Hint: Compare the average total day minutes for churned vs. non-churned customers.
  - Impact: Understanding usage patterns can help tailor communication plans that match customer preferences, potentially reducing churn.
7. How does having a voice mail plan affect churn rates?
  - Hint: Compare churn rates of customers with and without a voice mail plan.
  - Impact: This could indicate whether additional features, like voice mail, add value to the customer's experience or if they are indifferent to it.
8. Analyze the total international minutes and charges for churned vs. non-churned customers. Are higher usage and charges associated with higher churn?
  - Hint: Compare the average international usage and charges between the two groups.

- Impact: Identifying if high international usage leads to churn can inform the need for more competitive international plans.
- 9. Is there a correlation between the number of total day calls and churn?
  - Hint: Use correlation analysis to explore the relationship between total day calls and churn.
  - Impact: This can help understand if the frequency of calls (possibly due to network issues or other factors) is a contributor to customer dissatisfaction.
- 10. Compare the average total evening charges for churned vs. non-churned customers.  
Is there a significant difference?
  - Hint: Calculate and compare the mean total evening charges for both groups.
  - Impact: This could reveal if pricing or service quality in the evening affects customer satisfaction and churn.

## Medium-Level Questions

1. Perform a segmented analysis of churn by area code. Is there a particular area with a significantly higher churn rate?
  - Hint: Group the data by area code and calculate the churn rate for each segment.
  - Impact: Identifying geographic areas with high churn rates can help target regional marketing efforts or address specific service quality issues.
2. Explore the relationship between the number of customer service calls and churn, considering different thresholds (e.g., more than 3 calls).
  - Hint: Segment customers based on the number of service calls and analyze churn rates within each segment.
  - Impact: This can identify a threshold beyond which customer dissatisfaction significantly increases, guiding improvements in service and support.
3. Investigate the correlation between account length and churn. Are newer customers more likely to churn?
  - Hint: Use a correlation coefficient to analyze the relationship and segment the data into quartiles based on account length to compare churn rates.
  - Impact: Insights into how customer tenure affects churn can inform onboarding and engagement strategies for new customers.
4. Analyze the impact of international call charges on churn among subscribers of international plans.
  - Hint: Focus on customers with international plans and compare the churn rates of those with high vs. low international call charges.
  - Impact: This could reveal if cost concerns are driving churn among customers who use international features, informing pricing or bundle strategies.
5. Examine how evening usage patterns (calls and charges) relate to customer churn.
  - Hint: Segment customers based on their evening usage and analyze churn rates in each segment.
  - Impact: Understanding usage patterns can help tailor offerings to customer preferences, potentially reducing churn.
6. Perform a cluster analysis to identify distinct customer groups based on service usage patterns (day, evening, night, international).

- Hint: Use clustering techniques to segment customers and analyze churn rates within each cluster.
  - Impact: Identifying distinct usage patterns can help develop targeted marketing and service strategies for different customer segments.
- 7. How does the presence of a voice mail plan interact with the number of voice mail messages in relation to churn?
  - Hint: Analyze churn rates among customers with a voice mail plan, segmented by the volume of voice mail messages.
  - Impact: This can indicate whether the value customers perceive from voice mail services correlates with their likelihood to stay with the company.
- 8. Investigate the relationship between total day minutes and total day charges with churn. Is there a point of inflection where higher usage leads to higher churn?
  - Hint: Use scatter plots to visualize the relationship and identify patterns that might indicate a tipping point.
  - Impact: Insights into how pricing or usage thresholds affect churn can guide the creation of more customer-friendly pricing plans.
- 9. Does the number of total international calls affect churn differently for customers with and without international plans?
  - Hint: Segment the data based on international plan subscription and analyze the relationship between international calls and churn within each segment.
  - Impact: This can help understand if the international calling feature meets the needs of customers or if adjustments are needed to reduce churn.
- 10. Explore the effect of different customer service call reasons on churn. Are certain types of calls more indicative of churn risk?
  - Hint: If detailed data on call reasons is available, segment customer service calls by reason and analyze churn rates for each category.
  - Impact: This could reveal specific service issues that are major contributors to customer dissatisfaction and churn, guiding targeted improvements in service quality.

## Advanced-Level Questions

1. Develop a predictive model to identify the likelihood of churn based on customer usage patterns and demographic information. Exclude machine learning models for simplicity.
  - Hint: Use logistic regression to analyze the impact of various factors on churn likelihood. Focus on interpreting the coefficients to understand the influence of each predictor.
  - Impact: A predictive model can help the company proactively identify at-risk customers and implement targeted retention strategies, potentially saving costs associated with acquiring new customers.
2. Conduct a time series analysis to identify trends and seasonality in churn rates.
  - Hint: Decompose the churn data over time to identify underlying patterns, trends, and seasonal effects.
  - Impact: Understanding how churn rates vary over time can inform timing for promotional campaigns, service improvements, and customer engagement strategies to preemptively address churn risks.

3. Use cluster analysis to segment customers into distinct groups based on their service usage and demographic profiles. Identify which segments are more prone to churn.
  - Hint: Apply k-means clustering or hierarchical clustering to segment the customer base, then analyze churn rates within each segment.
  - Impact: Customer segmentation allows for more personalized marketing and service offerings, improving customer satisfaction and retention in segments identified as high risk.
4. Analyze the interaction effects between various customer attributes (e.g., international plan and total international minutes) on churn.
  - Hint: Use multivariate analysis techniques to explore interaction effects among variables and their joint impact on churn.
  - Impact: Understanding how different factors interact to influence churn can guide more nuanced and effective retention strategies, addressing the compound effects of customer preferences and behaviors.
5. Evaluate the economic impact of churn by calculating the potential revenue loss associated with churned customers. Consider factors such as average revenue per user (ARPU) and customer lifetime value (CLV).
  - Hint: Combine churn data with revenue information to estimate the financial impact of churn on the company's bottom line.
  - Impact: Quantifying the economic loss due to churn emphasizes the importance of retention strategies and helps prioritize initiatives based on their potential return on investment.

## Deliverables

- Case Study Document: Includes problem statement, data dictionary, and questions.
- Solution Guide: Detailed answers and explanations for each question.
- Additional Resources: References for further exploration.

## Desired Outcome

The trainees will develop an analytical and logical mindset, understanding the importance of various factors in loan analysis. They will learn to apply different data analysis techniques to uncover insights and make data-driven decisions.