**Customer Churn Analysis Procedure**

**Step 1: Understand Churn and Its Impact**

* **Define Churn**: Churn refers to customers who discontinue using a company's product or service within a specific period.
* **Business Impact**: Churn rate directly affects revenue and customer retention strategies. A high churn rate indicates potential issues in customer satisfaction, product offerings, or service quality.
* **Churn Rate Calculation**: Churn Rate=Number of Churned CustomersTotal Customers×100\text{Churn Rate} = \frac{\text{Number of Churned Customers}}{\text{Total Customers}} \times 100 This metric is crucial for businesses to track and reduce to ensure growth and profitability.

**Step 2: Dataset Exploration and Cleaning**

* **Explore the Dataset**:
  + Understand key features like demographics (age, gender), services, contract types, tenure, and geographic details.
* **Data Cleaning**:
  + **Handle Null Values**: Check for missing or incomplete data and either remove or impute values.
    - Example:
    - SELECT SUM(CASE WHEN CUSTOMER\_ID IS NULL THEN 1 ELSE 0 END) AS CUSTOMER\_ID\_NULL\_VALUE\_COUNT FROM CUSTOMER\_DATA;
  + **Distinct Values**:
    - Check for distinct values to understand the spread of data across categories.
    - Example:
    - SELECT DISTINCT INTERNET\_TYPE FROM CUSTOMER\_DATA;

**Step 3: Data Transformation in SQL (ETL Process)**

1. **Data Exploration**:
   * Explore distinct values in key columns and identify any inconsistencies.
2. **Clean and Load Data**:
   * Remove null values and clean the dataset to ensure data quality before inserting into the production table.
   * Example SQL:
   * CREATE TABLE PROD\_CHURN AS SELECT
   * Customer\_ID, Gender, Age, State, Tenure\_in\_Months, Customer\_Status, Monthly\_Charge
   * FROM CUSTOMER\_DATA
   * WHERE Customer\_Status IS NOT NULL;
3. **Create SQL Views for Power BI**:
   * Prepare simplified views that allow easy access to essential data for Power BI.
   * Example:
   * CREATE VIEW VW\_CHURNDATA AS SELECT \* FROM PROD\_CHURN WHERE CUSTOMER\_STATUS IN ('CHURNED', 'STAYED');

**Step 4: Data Transformation in Power Query**

1. **Optimize Performance with References**:
   * Use **reference tables** in Power Query to avoid redundant data and improve performance.
2. **Add Calculated Columns**:
   * **Churn Status**: Mark customers as "Churned" (1) or "Active" (0).  
     Example in Power Query:
   * Churn Status = if [Customer\_Status] = "Churned" then 1 else 0
   * **Monthly Charge Range**: Categorize monthly charges into ranges like < $20, $20-$50, etc.  
     Example in Power Query:
   * Monthly Charge Range = if [Monthly\_Charge] < 20 then "< 20" else if [Monthly\_Charge] < 50 then "20-50" else if [Monthly\_Charge] < 100 then "50-100" else "> 100"
3. **Unpivot Service Columns**:
   * Convert service-related columns (e.g., Online\_Backup, Streaming\_TV) into a vertical format to create more flexible charts.

**Step 5: Calculate Metrics Using Dummy Table**

* **Create Reference Tables**:
  + Create dummy tables for churn analysis to calculate totals for churned and active customers.
  + **Example Churn Metrics**:
    - Churned customers.
    - Active customers.
    - Total customers.
    - New joiners.

**Step 6: Blueprint and Dashboard Development**

1. **Dashboard Layout Planning**:
   * Identify KPIs and key metrics to track and visualize.
2. **Key Visualizations**:
   * **KPIs**:
     + Churn rate, total customers, churned customers, new joiners.
   * **Charts**:
     + **Demographics**: Age, gender distribution.
     + **Payment & Contracts**: Payment method, contract type, tenure distribution.
     + **Geographic Details**: State-wise churn and customer distribution.
     + **Churn Analysis**: Breakdown by service type (e.g., Internet Type, Streaming TV).
     + **Service Insights**: Matrix chart to visualize churn by service category.
   * **Example Visualizations**:
     + **Customer ID by Gender**: 64.1% Female, 35.9% Male.
     + **Churn Rate by Payment Method**: Mailed (37.8%), Bank (34.4%), Credit (14.8%).
     + **Churn Rate by Service**: Unlimited Data (85.46% churn).

**Step 7: Final Validation and Testing**

* **Validation**:
  + Ensure all metrics are correct, and visualizations accurately represent the underlying data.
* **Testing Interactivity**:
  + Verify that filters, slicers, and relationships between visuals work as expected.

**Key Notes for Presentation**

* **Optimize Performance**:
  + Use references in Power Query to optimize performance and reduce server load.
* **Aggregate Data**:
  + Focus on aggregating churn totals instead of rates for more meaningful insights.
* **Interactive Data**:
  + Leverage unpivoted data for consolidated and interactive charts in Power BI.

**Conclusion**

* This process has provided a deep dive into customer churn analysis, incorporating data extraction, transformation, and visualization techniques. By leveraging SQL for data manipulation and Power BI for interactive visualization, businesses can make data-driven decisions to reduce churn rates and improve customer retention strategies.

### ****Key Insights from the Power BI Dashboard****

1. **Overall Metrics**:
   * **Total Customers**: 6,418
   * **New Joiners**: 411
   * **Total Churned Customers**: 1,732
   * **Churn Rate**: 27.0%
2. **Demographic Insights**:
   * **Gender Distribution**:
     + Female: 64.1%
     + Male: 35.9%
3. **Churn Rate by Payment Method**:
   * Mailed Payment: 37.8%
   * Bank Transfer: 34.4%
   * Credit Card: 14.8%
4. **Churn by Contract Type**:
   * Month-to-Month: 46.5% churn rate
   * One Year: 11.0% churn rate
   * Two Years: 2.7% churn rate
5. **Geographical Insights**:
   * States with Highest Churn Rates:
     + Jammu: 57.2%
     + Assam: 38.1%
     + Jharkhand: 34.5%
6. **Churn by Internet Type**:
   * Fiber Optic: 41.1%
   * Cable: 25.7%
   * DSL: 19.4%
7. **Churn by Services**:
   * Customers using **Unlimited Data** have the highest churn (85.46%).
   * **Streaming TV** customers also show significant churn (53.85%).

**SQL**

USE CUSTOMER\_DATA;  
  
--- CUSTOMER\_DATA -----  
SELECT \* FROM CUSTOMER\_DATA;  
  
SELECT COUNT(\*) IS NULL FROM CUSTOMER\_DATA;  
  
---  1.GENDER --------  
SELECT GENDER,COUNT(GENDER) AS TOTAL\_COUNT\_GENDER,  
COUNT(GENDER) \* 100/ (SELECT COUNT(\*) FROM CUSTOMER\_DATA) AS PERCENTAGE\_OF\_GENDER  
FROM CUSTOMER\_DATA  
GROUP BY GENDER ;  
  
  
---  2.STATE --------  
SELECT STATE,COUNT(STATE) AS TOTAL\_COUNT\_STATE,  
ROUND((COUNT(STATE) \* 100),2) / (SELECT COUNT(\*) FROM CUSTOMER\_DATA) AS PERCENTAGE\_OF\_STATE  
FROM CUSTOMER\_DATA  
GROUP BY STATE  
ORDER BY PERCENTAGE\_OF\_STATE DESC ;  
  
  
  
---  3.CONTRACT --------  
SELECT CONTRACT,COUNT(CONTRACT) AS TOTAL\_COUNT\_CONTRACT,  
ROUND(COUNT(CONTRACT),2) \* 100 / (SELECT COUNT(\*) FROM CUSTOMER\_DATA) AS PERCENTAGE\_OF\_CONTRACT  
FROM CUSTOMER\_DATA  
GROUP BY CONTRACT ;  
  
  
---  4.CUSTOMER\_STATUS ----  
SELECT CUSTOMER\_STATUS,COUNT(CUSTOMER\_STATUS) AS TOTAL\_COUNT\_CUSTOMER\_STATUS,  
COUNT(CUSTOMER\_STATUS) \* 100 / (SELECT COUNT(\*) FROM CUSTOMER\_DATA) AS PERCENTAGE\_OF\_CUSTOMER\_STATUS  
FROM CUSTOMER\_DATA  
GROUP BY CUSTOMER\_STATUS  
;  
  
--------------------------------------------- DISTINCT VALUES ----------------------------------------------------  
----- HOW MANY ITEMS ARE PRESENT IN THE INTERNET\_TYPE -----  
SELECT DISTINCT INTERNET\_TYPE FROM CUSTOMER\_DATA ;  
  
  
------------------------------------------------  CHECK NULL VALUES ------------------------------------  
  
-- IDENTIFYING THE NULL VALUES PRESENT IN THE DATASET ---  
SELECT SUM( CASE WHEN CUSTOMER\_ID IS NULL THEN 1 ELSE 0 END) AS CUSTOMER\_ID\_NULL\_VALUE\_COUNT,  
SUM(CASE WHEN GENDER IS NULL THEN 1 ELSE 0 END) AS GENDER\_NULL\_VALUE\_COUNT,  
SUM(CASE WHEN AGE IS NULL THEN 1 ELSE 0 END) AS AGE\_NULL\_VALUE\_COUNT,  
SUM(CASE WHEN MARRIED IS NULL THEN 1 ELSE 0 END) AS MARRIED\_NULL\_VALUE\_COUNT,  
SUM(CASE WHEN STATE IS NULL THEN 1 ELSE 0 END) AS MARRIED\_NULL\_VALUE\_COUNT,  
SUM(CASE WHEN NUMBER\_OF\_REFERRALS IS NULL THEN 1 ELSE 0 END ) AS  NUMBER\_OF\_REFERRALS\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN TENURE\_IN\_MONTHS IS NULL THEN 1 ELSE 0 END ) AS TENURE\_IN\_MONTHS\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN VALUE\_DEAL IS NULL THEN 1 ELSE 0 END ) AS VALUE\_DEAL\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN PHONE\_SERVICE IS NULL THEN 1 ELSE 0 END ) AS PHONE\_SERVICE\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN MULTIPLE\_LINES IS NULL THEN 1 ELSE 0 END ) AS MULTIPLE\_LINES\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN INTERNET\_SERVICE IS NULL THEN 1 ELSE 0 END ) AS INTERNET\_SERVICE\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN INTERNET\_TYPE IS NULL THEN 1 ELSE 0 END ) AS INTERNET\_TYPE\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN ONLINE\_SECURITY IS NULL THEN 1 ELSE 0 END ) AS ONLINE\_SECURITY\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN ONLINE\_BACKUP IS NULL THEN 1 ELSE 0 END ) AS ONLINE\_BACKUP\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN DEVICE\_PROTECTION\_PLAN IS NULL THEN 1 ELSE 0 END ) AS DEVICE\_PROTECTION\_PLAN\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN PREMIUM\_SUPPORT IS NULL THEN 1 ELSE 0 END ) AS PREMIUM\_SUPPORT\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN STREAMING\_TV IS NULL THEN 1 ELSE 0 END ) AS STREAMING\_TV\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN STREAMING\_MOVIES IS NULL THEN 1 ELSE 0 END ) AS STREAMING\_MOVIES\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN STREAMING\_MUSIC IS NULL THEN 1 ELSE 0 END ) AS STREAMING\_MUSIC\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN UNLIMITED\_DATA IS NULL THEN 1 ELSE 0 END ) AS UNLIMITED\_DATA\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN CONTRACT IS NULL THEN 1 ELSE 0 END ) AS CONTRACT\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN PAPERLESS\_BILLING IS NULL THEN 1 ELSE 0 END ) AS PAPERLESS\_BILLING\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN PAYMENT\_METHOD IS NULL THEN 1 ELSE 0 END ) AS PAYMENT\_METHOD\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN TOTAL\_CHARGES IS NULL THEN 1 ELSE 0 END ) AS TOTAL\_CHARGES\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN TOTAL\_EXTRA\_DATA\_CHARGES IS NULL THEN 1 ELSE 0 END ) AS TOTAL\_EXTRA\_DATA\_CHARGES\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN TOTAL\_LONG\_DISTANCE\_CHARGES IS NULL THEN 1 ELSE 0 END ) AS TOTAL\_LONG\_DISTANCE\_CHARGES\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN TOTAL\_REVENUE IS NULL THEN 1 ELSE 0 END ) AS TOTAL\_REVENUE\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN CUSTOMER\_STATUS IS NULL THEN 1 ELSE 0 END ) AS CUSTOMER\_STATUS\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN CHURN\_CATEGORY IS NULL THEN 1 ELSE 0 END ) AS CHURN\_CATEGORY\_NULL\_VALUE\_COUNT,  
SUM( CASE WHEN CHURN\_REASON IS NULL THEN 1 ELSE 0 END ) AS CHURN\_REASON\_NULL\_VALUE\_COUNT  
FROM CUSTOMER\_DATA ;  
  
  
  
------------------------ REMOVE NULL AND INSERT THE NEW DATA INTO PROD TABLE ----------------  
CREATE TABLE PROD\_CHURN  
AS SELECT  
    Customer\_ID,  
    Gender,  
    Age,  
    Married,  
    State,  
    Number\_of\_Referrals,  
    Tenure\_in\_Months,  
    IFNULL(Value\_Deal, 'None') AS Value\_Deal,  
    Phone\_Service,  
    IFNULL(MULTIPLE\_LINES,"NONE") AS MULTIPLE\_LINES,  
    Internet\_Service,  
    IFNULL(INTERNET\_TYPE, "NONE") AS INTERNET\_TYPE,  
    IFNULL(Online\_Security, 'No') AS Online\_Security,  
    IFNULL(Online\_Backup, 'No') AS Online\_Backup,  
    IFNULL(Device\_Protection\_Plan, 'No') AS Device\_Protection\_Plan,  
    IFNULL(Premium\_Support, 'No') AS Premium\_Support,  
    IFNULL(Streaming\_TV, 'No') AS Streaming\_TV,  
    IFNULL(Streaming\_Movies, 'No') AS Streaming\_Movies,  
    IFNULL(Streaming\_Music, 'No') AS Streaming\_Music,  
    IFNULL(Unlimited\_Data, 'No') AS Unlimited\_Data,  
    Contract,  
    Paperless\_Billing,  
    Payment\_Method,  
    Monthly\_Charge,  
    Total\_Charges,  
    Total\_Refunds,  
    Total\_Extra\_Data\_Charges,  
    Total\_Long\_Distance\_Charges,  
    Total\_Revenue,  
    Customer\_Status,  
    IFNULL(Churn\_Category, 'Others') AS Churn\_Category,  
    IFNULL(Churn\_Reason, 'Others') AS Churn\_Reason  
FROM CUSTOMER\_DATA;  
SELECT \* FROM PROD\_CHURN;  
SELECT CUSTOMER\_STATUS FROM PROD\_CHURN WHERE CUSTOMER\_STATUS = "JOINED" ;  
  
  
----------------------------------------- CREATE VIW FOR POWERBI ------------------  
  
--- 1.CHURNED AND STAYED  
CREATE VIEW VW\_CHURNDATA AS SELECT \* FROM PROD\_CHURN WHERE CUSTOMER\_STATUS IN ("CHURNED","STAYED");  
SELECT \* FROM VW\_CHURNDATA ;  
  
  
  
----- 2.JOINED  
CREATE VIEW VW\_JOINDATA AS SELECT \* FROM PROD\_CHURN WHERE CUSTOMER\_STATUS = "JOINED" ;  
SELECT \*  
 FROM VW\_JOINDATA ;