D211: Advanced Data Acquisition

Analysis of Telecom Customer Churn Data

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The following report covers the Performance Assessment for D211 Advanced Data Acquisition. This document is categorized by the questions defined in the rubric.

Part I: Dashboards: Provide a copy of dashboards to support executive decision-making

A1. Provide *both* data sets that serve as the data source for the dashboards.

See Attached Files:

External Dataset:
kaggle_telecom_churn.csv

Exported CSV files from WGU PostgreSQL database (only tables necessary for this analysis):
wgu_customer.csv
wgu_contract.csv

A2. Provide step-by-step instructions to guide users through the dashboard installation.

The Tableau dashboard is provided in a Tableau packaged workbook format (.twbx) and is included in the attached files provided with the Performance Assesment's submission. Alternatively, the evaluator will be given a link to access and download all files through Google Drive. Google Drive can be accessed through copy and paste of the link below, or by clicking on the hyperlink provided.

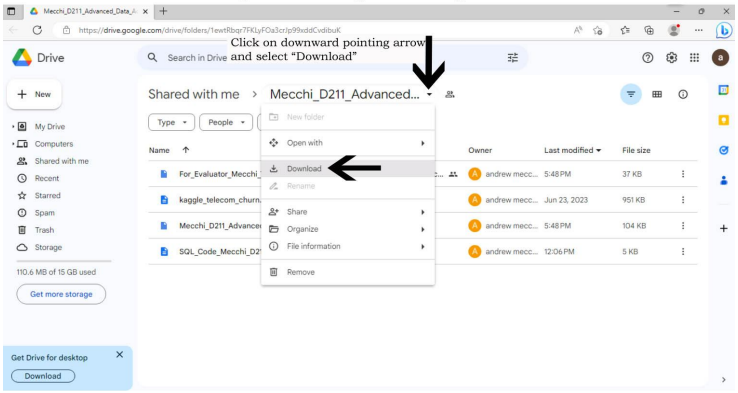
Hyperlink: Mecchi Google Drive

Copy and Paste:
https://drive.google.com/drive/folders/1ewtRbqr7FKLyFOa3crJp99xddCvdibuK?usp=sharing

Downloading Files from Google Drive

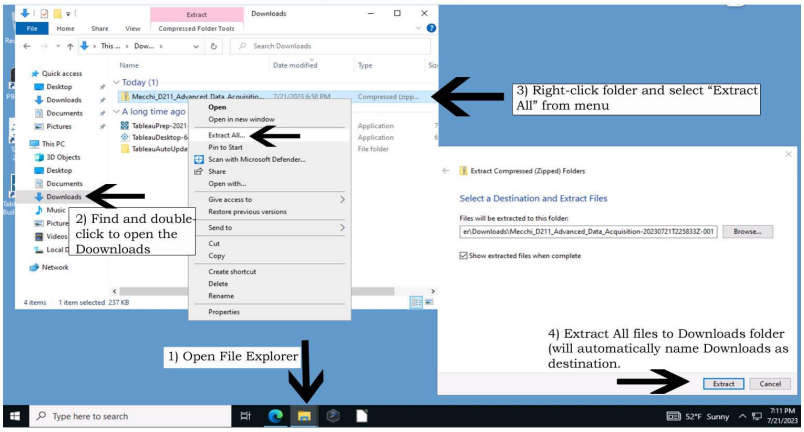
1) Open Google Drive using the link provided or copy and paste the link in the URL of an internet browser of choice.
2) With the Google Drive folder, "Mecchi_D211_Advanced_Data_Acquisition" open, click on the downward pointing arrow adjacent to the folder name and select "download" from the drop-down menu (Fig. 6).
    a) Note: If accessing the link directly without a Google gmail, there will be a button labeled "download all." Proceed with the "download all" if accessing the link without gmail.

Figure 6: Downloading Files from Google Drive



3) Open "File Explorer" located along the bottom of the computer screen (Fig. 7).
    a) Navigate down the left side of the window, select and open the "Downloads" folder.

Figure 7: Extract All Zip Files



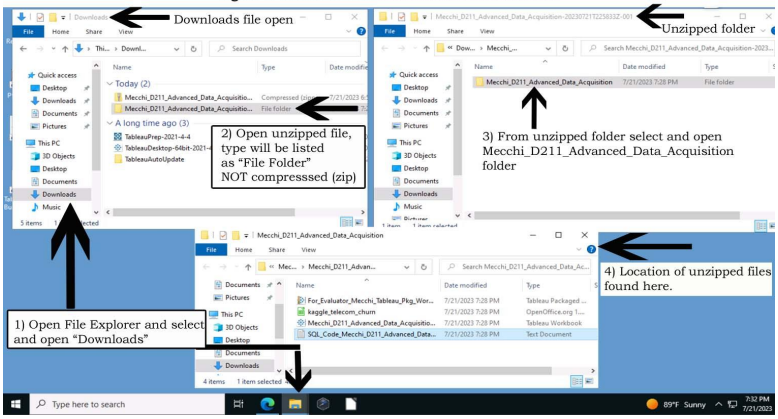
4) From the Downloads Folder, right-click on downloaded zip folder "Mecchi_D211_Advanced_Data_Acquisition"
    a) From the dropdown menu select "Extract All."
5) A new window will appear and automatically predetermines an extraction folder, in this case, the files will be extracted to the Downloads folder (Fig. 7).
    a) Select "Extract" to unzip files in folder
    b) Note: Location of extracted files are at the user's discretion, another location will be equally serviceable, but for the remaining steps, the files are extracted to the Downloads folder.

<u>Location of extracted files</u>

1) Open File Explorer located at the bottom of the computer screen (Fig. 8).
2) Navigate to the "Downloads" folder.

a) Note: There will be two seemingly identical folders of the same name, one will be the compressed zip file, and the other the extracted file folder (Fig. 8).

Figure 8: Familiarize with Location of Extracted Files

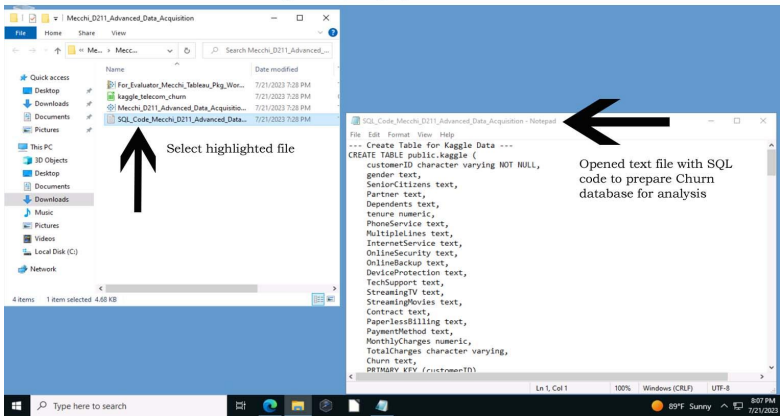


3) Click and open the extracted file folder
    a) Look at the folder "Type" to and select the folder listed as "File Folder."
4) Continue to open the "Mecchi_D211_Advanced_Data_Acquisition" folder in the unzipped file folder
5) The location of all files moving forward will be found here.

Prepare the PostgreSQL Database for Tableau Workbook

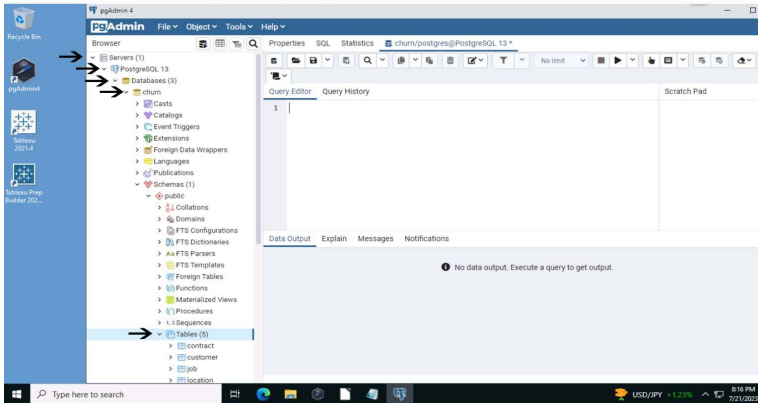
1) From the newly extracted file folder, locate the and open the file, "SQL_Code_Mecchi_D211_Advanced_Data_Acquisition" (Fig. 9)

Figure 9: Opening SQL Code Text File



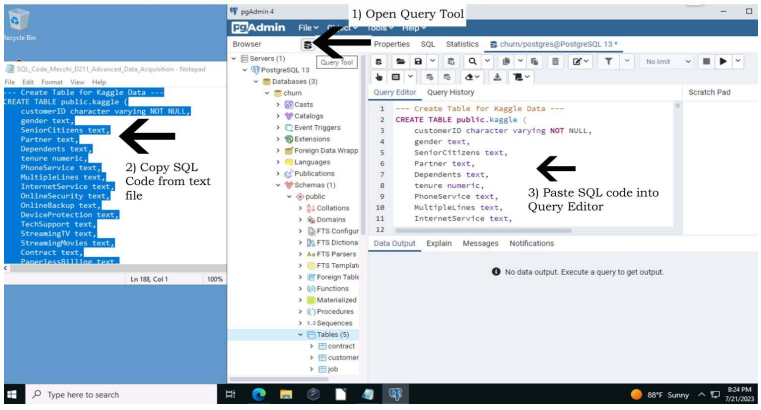
2) Open pgAdmin4 by highlighting the icon and hitting "Enter" on the keyboard or double left-click with the mouse.
    a) Navigate to the Churn database by selecting the downward pointing arrows of Servers → PostgreSQL 13 → Databases (3) → churn → Tables (Fig. 10)

Figure 10: Opening pgAdmin4 and Locate Churn Database



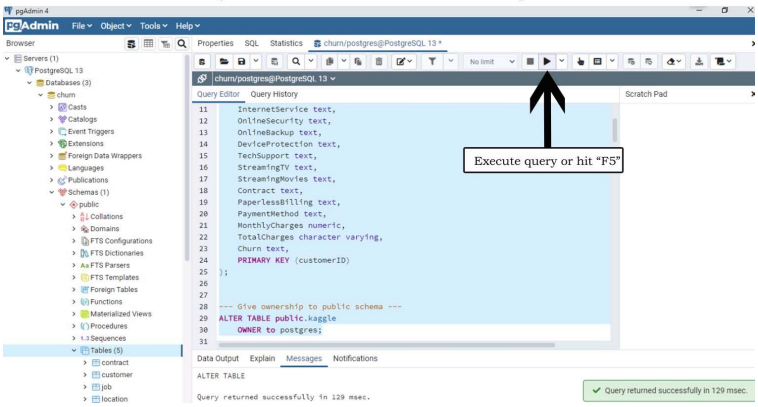
3) Create New “Kaggle” Table for external Kaggle data set: Open the query tool located on the toolbar adjacent to the “Browser” section (Fig. 11).
    a) With the SQL Code text file open, select all text using the keyboard and simultaneously type control+A (Ctrl+A) to highlight all text and then type control+C to copy the highlighted text (Ctrl+C).
        i) Alternatively, left-click with the mouse, hold, and highlight all text. With the text highlighted, proceed to use the keyboard to type, Ctrl+C to copy the text.
    b) Left-click into the query editor window and paste the copied code into the query editor by simultaneously typing control+P (Ctrl+P).

Figure 11: Copy and Paste SQL Code from Text File to pgAdmin4 Query Editor



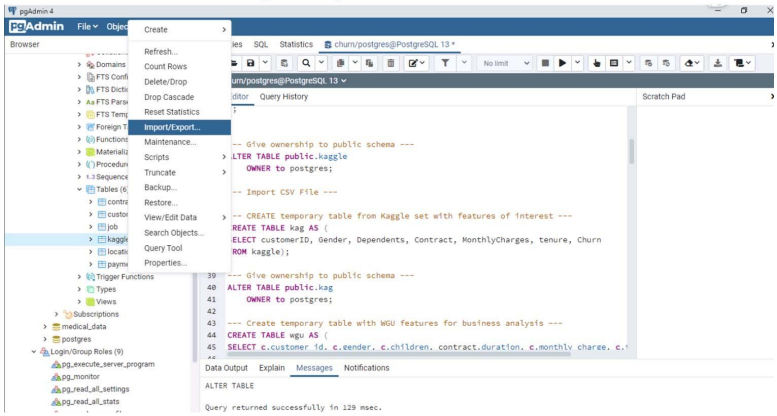
4) Use the mouse to select the first 30 lines of code by left-click on line one and continue to hold click until lines 1-30 are highlighted (Fig. 12).
    a) Alternatively, click into the Query Editor on line 1, hold “Shift” on the keyboard and hit the down arrow until lines 1-30 are highlighted.
5) To execute code, select the triangular “play” button or hit “F5” on the keyboard.
    a) Query will reflect successful completion of code with a green check mark.

Figure 12: Execute Code to Create Table for CSV upload



6) With the newly created “Kaggle” table navigate to “Tables” in the browser pane
    a) Note: Kaggle table may not appear initially. With the mouse, right-click “Tables” and select “Refresh”
7) Under “Tables,” right-click on the “Kaggle” table and select “Import/Export” from the menu window (Fig. 13).

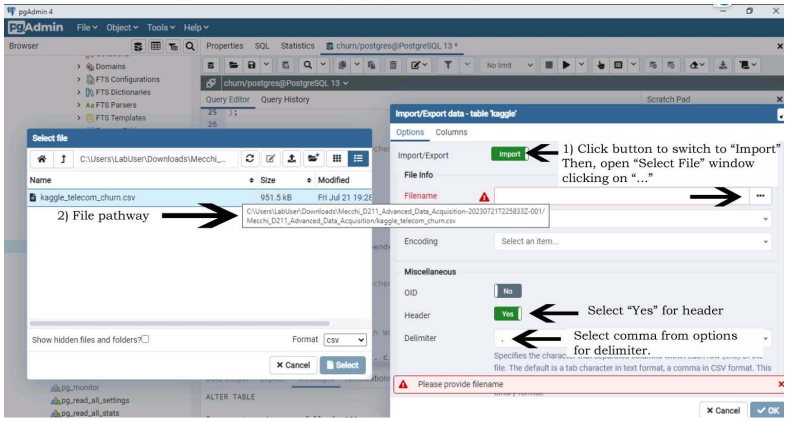
Figure 13: Import External Dataset CSV File



8) A new window will open “Import/Export” window (Fig. 14)
    a) Left-click on the three dots “...” for file name and use the search bar to locate the unzipped files from earlier, “C:Users\LabUser\Downloads\Mecchi_D211_Advanced_Data_Acquisition-20230721T225833Z-001\Mecchi_D211_Advanced_Data_Acquisition\kaggle_telecom_churn.csv”
        i) Note: File pathway may vary as pathway is determined by the user. Be sure to select the “kaggle_telecom_churn.csv” file from the unzipped folder location.
    b) Confirm file selection of “kaggle_telecom_churn.csv” and hit “select” in the select file window.
    c) Left-click with the mouse to change the “Header” button and switch to “Yes.”
    d) Select the “Delimiter” from the dropdown menu and choose the “,” (comma).

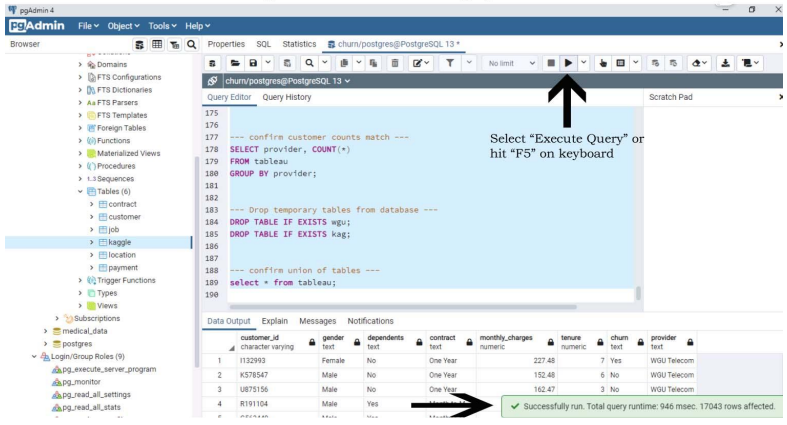
e) Click “OK” to complete importing of the CSV file.
   i) Confirm successful upload before proceeding.

Figure 14: Locate CSV File, Import, add Header, and Comma Delimiter



9) The remainder of the SQL code is now ready to be executed in preparation of data analysis.
10) Left-click the mouse into the Query Editor and place the cursor in line 34 or at the start of line 35.
    a) Select and highlight all remaining code using the mouse (click, hold, and scroll to the end of the code) or holding “Shift” on the keyboard and holding the down arrow.
    b) Note: Lines 35 - 189 should all be highlighted
11) With lines 35-189 highlighted, left-click the “Execute Query” button or hit “F5” on the keyboard to complete the query (Fig. 15).

Figure 15: Execute All Remaining SQL Code

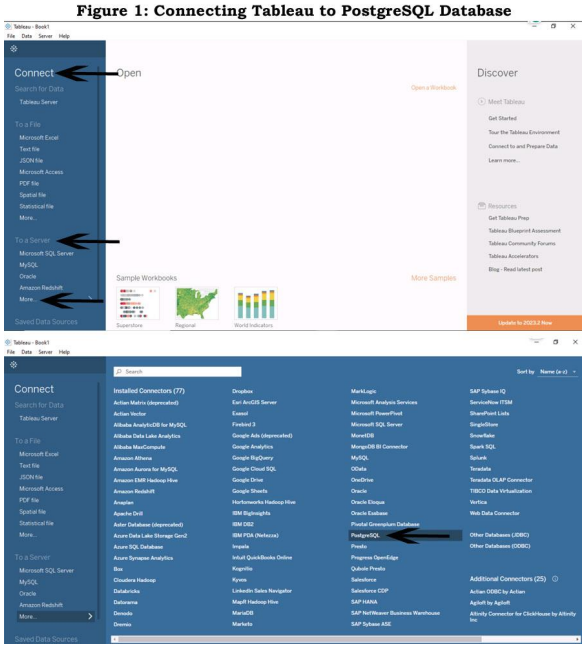


12) The last line of code shows the table “Tableau” which will be used to create visualizations in Tableau.

Opening Tableau and Connecting to Churn PostgreSQL Database

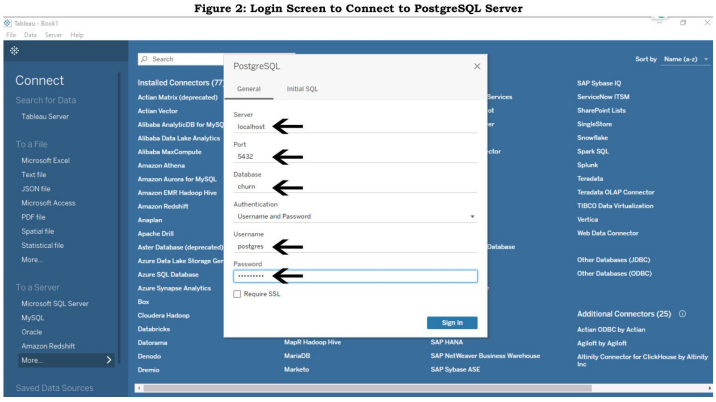
1) From the desktop, Double-left-click the “Tableau 2021.4” icon to open the program.
2) Navigate down the left-side of the window under “Connect” (Fig. 1).
3) Locate the section, “To a Server” and select PostgreSQL.
   Note: if not listed under “To a Server,” click on “more” and find PostgreSQL from the list (alphabetical order).

Figure 1: Connecting Tableau to PostgreSQL Database



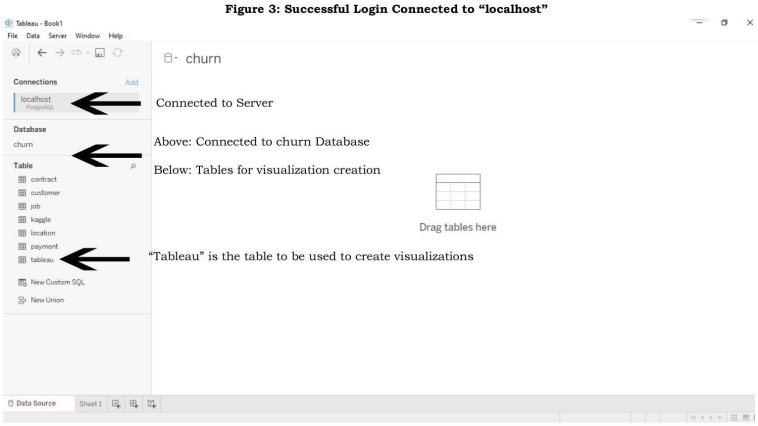
4) In the new PostgreSQL login window, enter the following credentials to login to PostgreSQL server (Fig. 2):
   Server: localhost
   Port: 5432
   Database: churn
   Username: postgres
   Password: Passw0rd!

Figure 2: Login Screen to Connect to PostgreSQL Server



5) The login will be confirmed when the “Connections” is listed as “localhost” (PostgreSQL), Database will be “Churn,” and the tables are listed below (Fig. 3)

Figure 3: Successful Login Connected to “localhost”

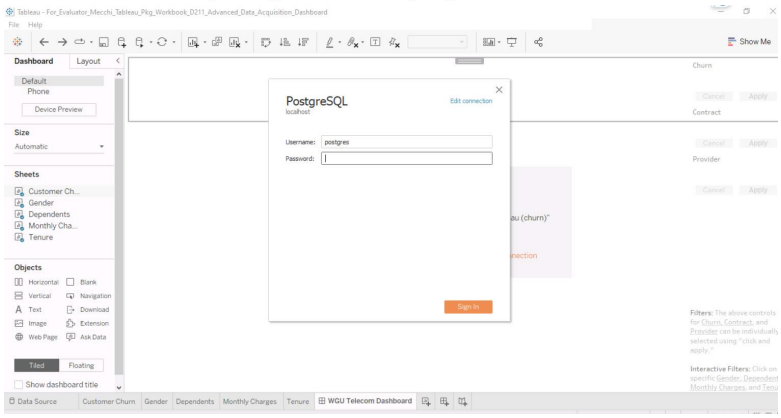


Opening Tableau Workbook File

Method 1:

1) Navigate to the “Downloads” folder and find the downloaded unzipped Tableau Packaged Workbook file (.twbx), “For_Evaluator_Mecchi_Tableau_Pkg_Workbook_D211_Advanced_Data_Acquisition_Dashboard.twbx”
2) Double left-click on the file or highlight the file with a single left-click and hit “Enter” on the keyboard to open the workbook.
3) A login window will appear and use the following credentials to obtain access (Fig. 4)
   Username: postgres
   Password: Passw0rd!

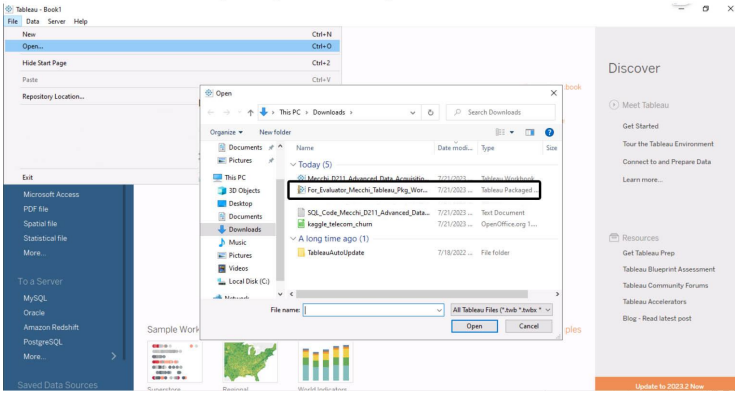
Figure 4: Login to Tableau from Opening .twbx Workbook File



Method 2:

1) From the desktop, Double-left-click the “Tableau 2021.4” icon to open the program.
2) Navigate down the left-side of the window under “Connect” (Fig. 1)
3) Locate the section, “To a Server” and select PostgreSQL.
   Note: if not listed under “To a Server,” click on “more” and find PostgreSQL from the list (alphabetical order)
4) In the new PostgreSQL login window, enter the following credentials to login to PostgreSQL server (Fig. 2):
   Server: localhost
   Port: 5432
   Database: churn
   Username: postgres
   Password: Passw0rd!
5) The login will be confirmed when the “Connections” is listed as “localhost” (PostgreSQL), Database will be “Churn,” and the tables are listed below (Fig. 3)
6) Once connected to the database, navigate to “File” on the toolbar atop the Tableau window (Fig. 5)
   a) From the cascading menu, select “Open.”

Figure 5: Open Tabelau Package Workbook Method #2

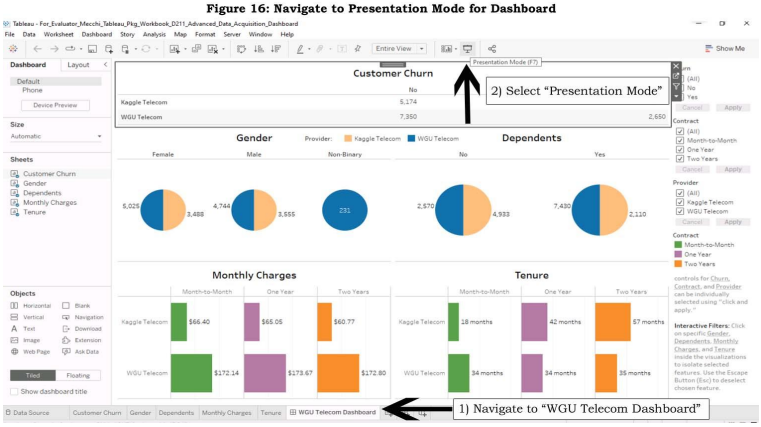


7) From the “Open” window, navigate to the Downloads folder, locate and select the Tableau packaged workbook file (.twbx), “For_Evaluator_Mecchi_Tableau_Pkg_Workbook_D211_Advanced_Data_Acquisition_Dashboard.twbx”
   a) Once the file is highlighted, click “open.”
8) A login window will appear and use the following credentials to obtain access (Fig. 4)
   Username: postgres
   Password: Passw0rd!

Viewing Dashboard in Presentation Mode

1) With access to the database and Tableau packaged workbook file open, navigate and select the “WGU Telecom Dashboard” tab.
2) Use the mouse to left-click the “Presentation Mode” icon located on the toolbar above the dashboard canvas. (Fig. 16)
    a) Alternatively, with the dashboard open, hit “F7” on the keyboard to initialize “Presentation Mode.”

Figure 16: Navigate to Presentation Mode for Dashboard



3) Once in “Presentation Mode” proceed to section A3 for dashboard controls and interactivity.

A3. Provide clear instructions to help users navigate the dashboards.

The dashboard includes several interactive features used to explore, manipulate, and visualize customer churn habits by analyzing customer demographics and key performance metrics. The visualization has two color keys, one for Provider (WGU, Kaggle) and the other for Contracts (Month-to-Month, One Year, Two Years). Blue and light orange are used to differentiate between WGU and Kaggle Telecom customer demographics (Gender and Dependents). For Contracts, green, purple, and orange are used to identify Month-to-Month, One Year, and Two Year terms respectively (Fig. 17). For in-depth analysis, several filters were included to give the user control for refined integration.

Figure 17: Dashboard Color Keys

The Tableau dashboard has several filters for the user to isolate Churn, Contracts, Provider, Monthly Charges, and Tenure. The three main filters are for customer Churn, Contracts, and Provider; are located along the right-hand side of the dashboard. The user can select the desired filter using the checkboxes to refine demographics or metrics and click “apply” to execute the filtered view (Fig. 18). Additionally, attributes of the visualization itself can be used for filtering views. Similar to the click-and-apply filters, the graphics for Gender, Dependents, Monthly Charges, and Tenure can all be used to isolate views and metrics (Fig 19). Multiple interactive filters can be applied simultaneously when the user holds the control button on the keyboard down and left-clicks on any number demographics or metrics (Ctrl+click). If using the interactive visualization filters, simply click the selection a second time (Ctrl+click if multiple selections), or, press the escape button on the keyboard (Esc) to deselect the selected filter(s).

Figure 18: Click and Apply Filters

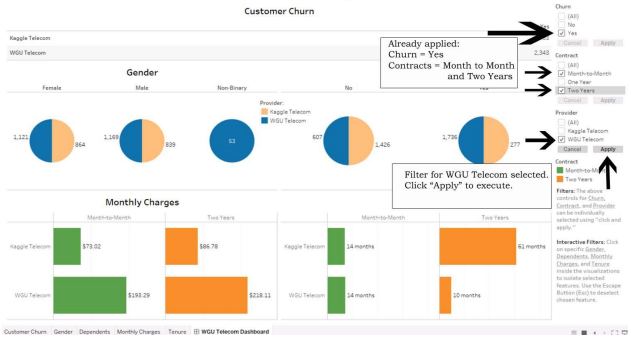
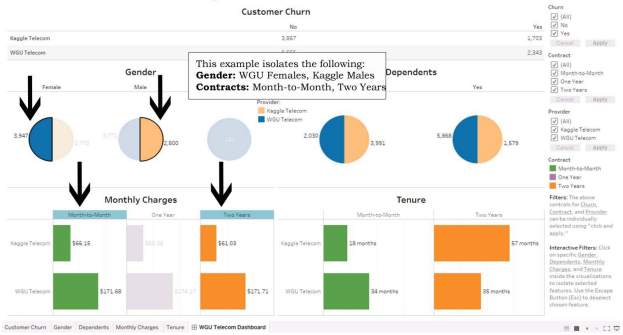
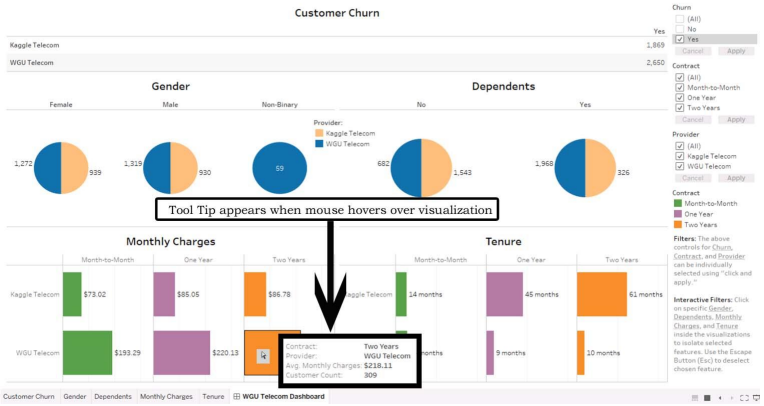


Figure 19: Interactive Visualization Filters



Provided click-and-apply filters and interactive dashboard feature selection, summary information can be accessed and interpreted with the on-screen visuals via a “Tool Tip.” The user can hover the computer mouse over a visualization and the Tool Tip provides the user with summary information for the targeted feature. Each graphic contains Tool Tips that presents additional information for the user to interpret content-specific data based on the feature interaction. For example, if the user hovers the mouse over the WGU Two-Year Contracts within the Monthly Charges bar chart, the Tool Tip highlights, Contract, Provider, Avg. Monthly Charges, and Customer Count (Fig. 20). These features of the interactive dashboard allow integral members of the board to garner multiple perspectives and metrics to influence business decisions.

Figure 20: Tool Tip Example



The WGU Telecom dashboard is fully equipped for users to isolate demographics and key performance metrics for their desired analysis.The dashboard is fully interactive with click-and-apply and collaborative visual filters. The design of the dashboard gives the user complete control to manipulate and explore features which will allow decision-makers to identify detailed metrics and develop actionable insights.

A4. Provide a copy of *all* SQL code and other code supporting the dashboards.

```
--- Create Table for Kaggle Data ---
CREATE TABLE public.kaggle (
    customerID character varying NOT NULL,
    gender text,
    SeniorCitizens text,
    Partner text,
    Dependents text,
    tenure numeric,
    PhoneService text,
    MultipleLines text,
    InternetService text,
```

```
    OnlineSecurity text,
    OnlineBackup text,
    DeviceProtection text,
    TechSupport text,
    StreamingTV text,
    StreamingMovies text,
    Contract text,
    PaperlessBilling text,
    PaymentMethod text,
    MonthlyCharges numeric,
    TotalCharges character varying,
    Churn text,
    PRIMARY KEY (customerID)
);

--- Give ownership to public schema ---
ALTER TABLE public.kaggle
    OWNER to postgres;

--- For PA Submission only ---
--- Command code for importing external Kaggle set ---
--- My permissions within Labs on Demand are limited and don’t allow for importation of CSV file
using COPY command —

-command " "\\copy public.kaggle (customerid, gender, seniorcitizens, partner, dependents,
tenure, phoneservice, multiplelines, internetservice, onlinesecurity, onlinebackup,
deviceprotection, techsupport, streamingtv, streamingmovies, contract, paperlessbilling,
paymentmethod, monthlycharges, totalcharges, churn) FROM
'C:/Users/LabUser/DOWNLO~1/MECCHI~1/MECCHI~1/KAGGLE~1.CSV' DELIMITER ',' CSV
HEADER QUOTE '\"' ESCAPE '"';""


--- CREATE temporary table from Kaggle set with features of interest ---
CREATE TABLE kag AS (
SELECT customerID, Gender, Dependents, Contract, MonthlyCharges, tenure, Churn
FROM kaggle);

--- Give ownership to public schema ---
ALTER TABLE public.kag
    OWNER to postgres;

--- Create temporary table with WGU features for business analysis ---
CREATE TABLE wgu AS (
SELECT c.customer_id, c.gender, c.children, contract.duration, c.monthly_charge, c.tenure,
```

```
c.churn
FROM public.customer c
INNER JOIN contract ON
        c.contract_id = contract.contract_id
        );

--- Give ownership to public schema ---
ALTER TABLE public.wgu
   OWNER to postgres;

--- Prepare wgu table for union of features with kag table ---
--- features and data types must match for union ---
--- match customer feature title and dtype ---
ALTER TABLE wgu
ALTER customer_id TYPE VARCHAR;

--- explore values of gender ---
SELECT gender, count(*)
FROM wgu
GROUP BY gender;

--- change "prefer not to answer" to non-binary ---
UPDATE wgu
SET gender = REPLACE(gender, 'Prefer not to answer', 'Non-Binary');

--- Reduce numeric children to match kaggle, yes/no to dependent ---
--- Data dictionary defines children as those living at home/dependents —
ALTER TABLE wgu
ALTER children TYPE text USING
CASE WHEN children >= '1' THEN 'Yes'
ELSE 'No'
END;

--- Rename column to match kaggle dependents column ---
ALTER TABLE wgu
RENAME COLUMN children TO dependents;

--- Amend duration column to reflect contracts of kaggle ---
ALTER TABLE wgu
ALTER duration TYPE text USING
CASE WHEN duration = 'Month-to-month' THEN 'Month-to-Month'
WHEN duration = 'One year' THEN 'One Year'
ELSE 'Two Years'
END;
```

```
--- rename duration column to match kaggle contract ---
ALTER TABLE wgu
RENAME COLUMN duration TO contract;

--- monthly charges, round numeric values to reflect two decimal place ---
UPDATE wgu
SET monthly_charge = ROUND(monthly_charge, 2);

--- match name for charges between tables ---
ALTER TABLE wgu
RENAME COLUMN monthly_charge TO monthly_charges;

--- tenure, round numeric values to reflect closest month, round to 0 decimals ---
UPDATE wgu
SET tenure = ROUND(tenure, 0);

--- add identifiable source columns to each set ---
ALTER TABLE wgu
ADD COLUMN provider text;

--- populate provider column for wgu ---
UPDATE wgu
SET provider = 'WGU Telecom';

--- confirm features and dtypes of wgu table prepared for union ---
select * from wgu;

--- prepare kag for union ---
--- match customer columns to match ---
ALTER TABLE kag
RENAME COLUMN customerID TO customer_id;


--- amend values for contracts to match wgu ---
ALTER TABLE kag
ALTER contract TYPE text USING
CASE WHEN contract = 'Month-to-month' THEN 'Month-to-Month'
WHEN contract = 'One year' THEN 'One Year'
ELSE 'Two Years' END;

--- monthly charges, round numeric values to reflect two decimal place ---
UPDATE kag
SET MonthlyCharges = ROUND(MonthlyCharges, 2);
```

```
--- rename column to match wgu table ---
ALTER TABLE kag
RENAME COLUMN MonthlyCharges TO monthly_charges;

--- tenure, round numeric values to reflect no decimal place ---
UPDATE kag
SET tenure = ROUND(tenure, 0);

--- add identifiable source columns to kag set ---
ALTER TABLE kag
ADD COLUMN provider text;

--- populate provider column for wgu ---
UPDATE kag
SET provider = 'Kaggle Telecom';

--- confirm matching columns and data types ---
select * from wgu;

select * from kag;

--- tables prepared for union ---
--- Create table Tableau for union to combine two data sets ---
CREATE TABLE tableau AS (
SELECT *
FROM wgu
UNION ALL
SELECT *
FROM kag);

--- Give ownership to public schema ---
ALTER TABLE public.tableau
    OWNER to postgres;

--- confirm customer counts match ---
SELECT provider, COUNT(*)
FROM tableau
GROUP BY provider;

--- Drop temporary tables from database ---
DROP TABLE IF EXISTS wgu;
DROP TABLE IF EXISTS kag;
```

```
--- confirm union of tables ---
select * from tableau;
```

Part II: Panopto multimedia presentation
B1 - B7. Panopto Video Submission

See Attached Panopto Video: Mecchi Panopto Presentation D211 Advanced Data Acquisition

https://wgu.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=a3a82418-d94b-4be7-86d7-b04901043320

Part III: Report: Write a report to outline the data analysis and use of SQL operations.

C1. Explain how the purpose and function of your dashboard aligns with the needs outlined in the data dictionary associated with your chosen data set.

The design of the WGU Telecom dashboard supplies executives with the information necessary to observe trends while analyzing demographics and key performance metrics. The data dictionary informs that annual customer churn rates may be as high as 25% and obtaining new customers can cost up to ten times more than retaining current subscribers. The potential of losing customers and incurring additional expenditures to acquire new clients could lead to financial distress. The focus of the dashboard creation will yield actionable insights on customer retention through the analysis of demographics, financial trends, and tenure.

The functional interactivity of the dashboard empowers executives with control to compare churn rates while assessing customer demographics, monthly expenditures, and retention (tenure). The observed key performance metrics delivered from the dashboard present decision-makers with unique perspectives of customers who have churned compared to those who remain loyal. Executives will be able to identify which contracts are most costly, if they lead to customer churn, and which customer demographic is likely to stay or churn. Analyzing these financial and demographic comparisons will yield actionable insights that will ultimately lead to retaining customers, limiting churn, and supply growth for the company.

C2. Justify the selection of the business intelligence tool you used.

The decision to use Tableau (desktop) as the business intelligence tool is rooted in the versatility and ease of use of the software. Tableau is a robust program that can be connected to remote, local, or public databases. Once connected to a database, the working environment within Tableau empowers the user to create complex data visualizations with a simple and

easy-to-use interface. As with the WGU Telecom dashboard, visual representations are made interactive and provide the user with control to explore, manipulate, and filter graphics to detect relationships and enact actionable observations.

C3. Explain the steps used to clean and prepare the data for the analysis.

Two data sets, WGU Telecom and Kaggle Telecom were used to prepare a Tableau dashboard for business analysis. These data sets were cleaned and prepared using PostgreSQL in pgAdmin4. The process started with the creation of a new table for the external data to bolster business insights and comparisons. The external Kaggle Telecom file was then imported using pgAdmin4 which shared common features to the provided WGU Telecom database, augmenting observations and analyzing key metrics of a similar business. Following the importation of the external data, temporary tables were made in preparation for a union of data to create a final table from which the dashboard would be designed.

After the Kaggle Telecom data flat file was imported into the churn database, a temporary table, “Kag” was created to isolate features from the main Kaggle table. These features included, Customer_id, Gender, Dependents, Contract, MonthlyCharges, Tenure, and Churn. Similarly, a near-identical temporary table was created from the WGU dataset. However, the WGU data was spread across multiple tables, thus, a join was made using a foreign key to connect the necessary tables. The temporary “WGU” table was created with the same features as Kag, Customer_id, Gender, Children, Duration, Monthly_Charges, Tenure, and Churn. The WGU table included “Duration” from the joined table (contracts) using the “contract_id” as the join predicate clause. To ensure a clean table union, all column names and data types must be identical, therefore, additional steps were taken to establish a clean union (W3 Schools, n.d.).

Union preparations were initially made by amending the temporary WGU and Kag tables. The Kaggle dataset was imported with customerID’s of the character varying data type and SQL code was used to change WGU’s temporary table data type from text to character varying. Next, matching values were amended for Gender between the data sets. During exploration, WGU’s data was found to have “Prefer not to Answer” as a value which was later defined as “Non-Binary,” to match the data dictionary. Values in a table union are case sensitive, therefore, all text pertaining to Gender for both temporary tables were defined as, “Male, Female, Non-Binary.” Kaggle Telecom’s data dictionary listed children as “Dependents,” therefore, WGU’s feature “Children” was prepared to match Kaggle’s Dependents. SQL code was used to define any WGU patron with one or more children as “Yes,” else “No,” and then the feature heading was redefined as “Dependents” to match the Kag table.

Similar to Gender, both datasets had identical contract terms, however, feature heading and data values had varying case-sensitive entries. The values of both datasets were recategorized to consist of identical values, “Month-to-Month, One Year, and Two Years” for contracts. Kaggle defined Contracts accordingly, but WGU contracts were joined from another table and “Duration” was relabeled “Contracts” to match feature names between sets. Both Monthly Charges and

Tenure features were classified as numeric, but to assure a successful union, these features needed to match. WGU and Kaggle Monthly Charges values were modified to be rounded to two decimal places while Tenure was rounded to the closest numeric integer. The Churn feature for both tables was identical and needed no additional preparations. Lastly, a column was added to each table to allow for differentiation between Telecom companies. A new column, Provider, was added to each temporary table; all values for WGU were defined as “WGU Telecom” while all values for the Kag table were defined as “Kaggle Telecom.”

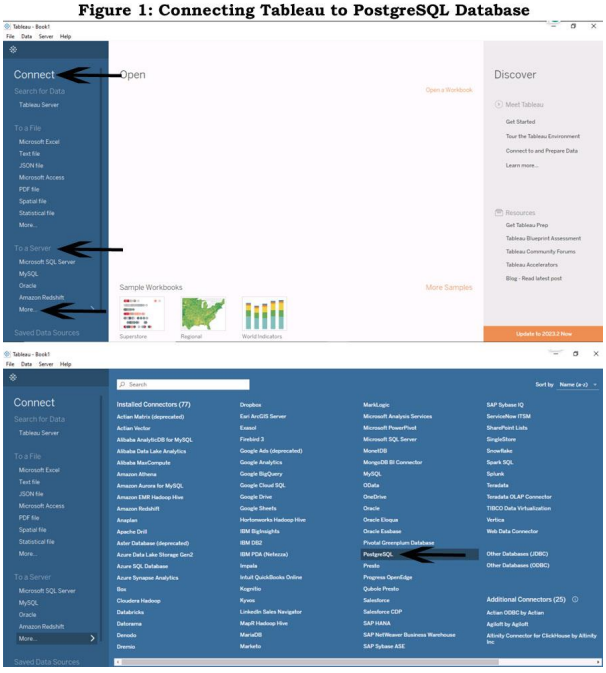
The addition of the Provider columns completed the preparation necessary to create a table union. Previous to executing the union, both temporary tables were explored to confirm feature labels and all corresponding data types matched. Once confirmed, a “Union All” was performed between temporary tables to create the final table, “Tableau.” After a successful union, both Kag and WGU temporary tables were dropped from the database to prevent data redundancies. The “Tableau” table contains all the required treated data to create data visualizations when the PostgreSQL database is connected with the Tableau program.

C4. Summarize the steps used to create the dashboards.

Opening Tableau and Connecting to Churn Database

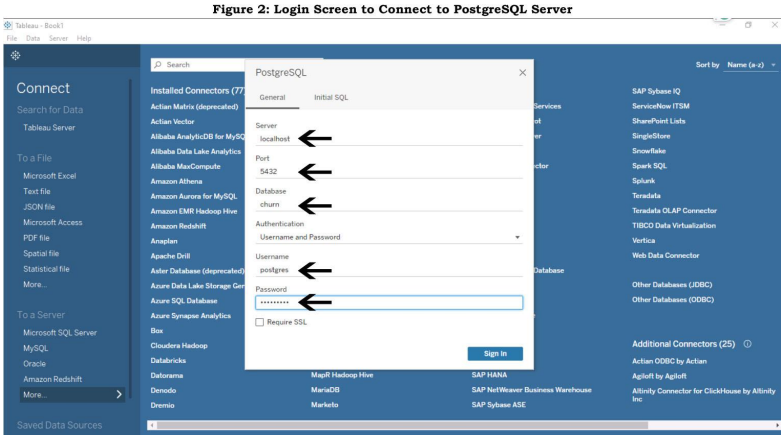
1) Open Tableau 2021.4 by double left-clicking icon.
2) Navigate down the left-side of the window under “Connect” and locate the section, “To a Server” and select PostgreSQL (Fig. 1)
    a) Note: if not listed under “To a Server,” click on “more” and find PostgreSQL from the list (alphabetical order)

Figure 1: Connecting Tableau to PostgreSQL Database



3) In the new PostgreSQL login window, enter the following credentials to login (Fig. 2):
   Server: localhost
   Port: 5432
   Database: churn
   Username: postgres
   Password: Passw0rd!

Figure 2: Login Screen to Connect to PostgreSQL Server

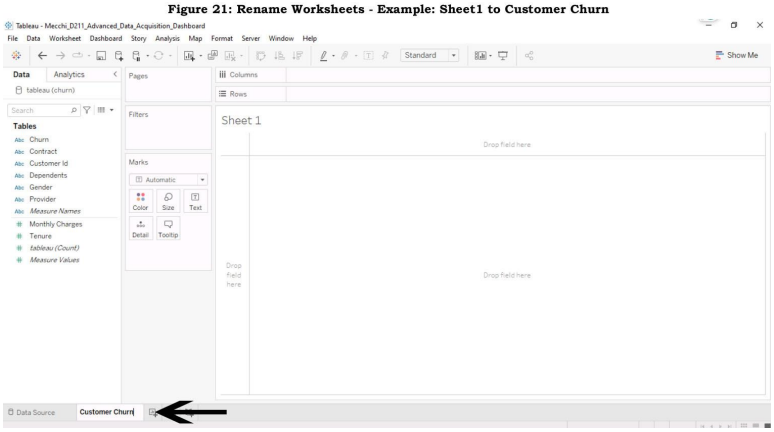


4) The login will be successfully confirmed when the “Connections” is listed as “localhost” (PostgreSQL), Database will be “Churn,” and the tables are listed below
5) Using the mouse, select and double left-click on the “tableau” table.
6) To create worksheets, use the computer mouse and left-click “Sheet1” located at the bottom of the screen.
   a) Note: With the Worksheet open, the left-hand side of the Tableau window has the database tables. Moving forward, this area will be described as the “Data Pane.” In the Data Pane, the newly connected data sets are found under “Tables.”

Customer Churn Worksheet

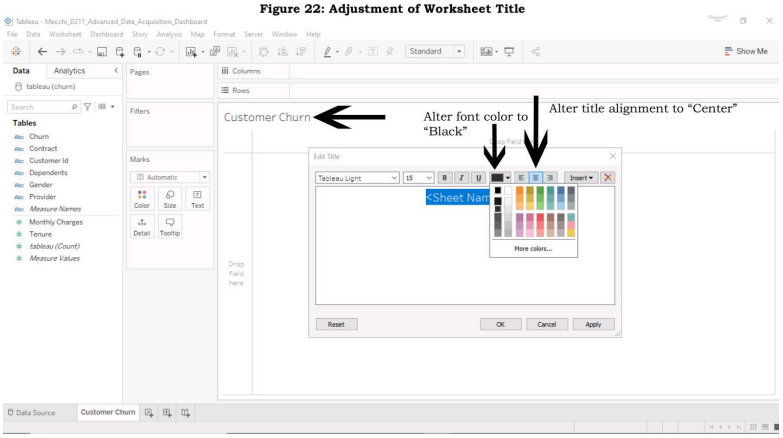
1) With Tableau open and connected to the Churn database, proceed to worksheet creation.
2) Located on the bottom portion of the window, select “Sheet1” and rename the worksheet, “Customer Churn.”
   a) Edit title: Double left-click on “Customer Churn” located in the main body of the work canvas (Fig. 21).

Figure 21: Rename Worksheets - Example: Sheet1 to Customer Churn



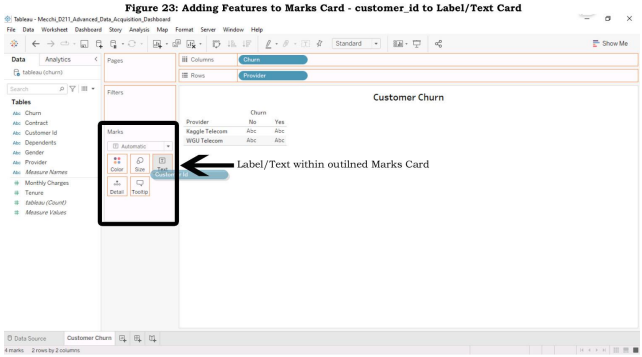
b) In the new window highlight, “<Sheet Name>”, either using the keyboard method of hitting the control button and the letter “a” (Ctrl+A) or click and highlight using the mouse (double click or click and highlight)..
c) With the title highlighted, select the “center” alignment and change the font color to black (Fig. 22)

Figure 22: Adjustment of Worksheet Title



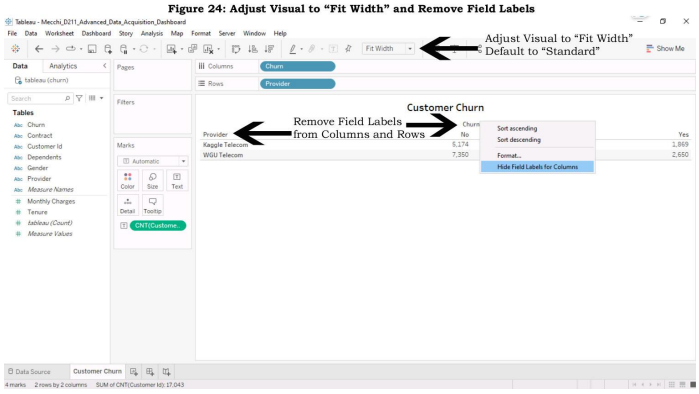
3) Using the data from the Data Pane, click and drag ‘*Churn’* to the Rows shelf.
4) Next, click and drag *‘customer_id*’ to the Label (text) card located in the Marks window (Fig. 23)

Figure 23: Adding Features to Marks Card - customer_id to Label/Text Card



5) To establish aggregate identifiers and provide customer count, left-click the down arrow next to the newly created *customer_id* Label (text) card. From the dropdown menu, hover over “Measure” and select the “Count” option.
6) Add ‘*Provider*’ to the worksheet, click and drag ‘*Provider’* to the Columns shelf.
7) From the toolbar located above the canvas, left-click on the dropdown menu and change the fit from “Standard” to “Fit Width” (Fig. 24).

Figure 24: Adjust Visual to “Fit Width” and Remove Field Labels

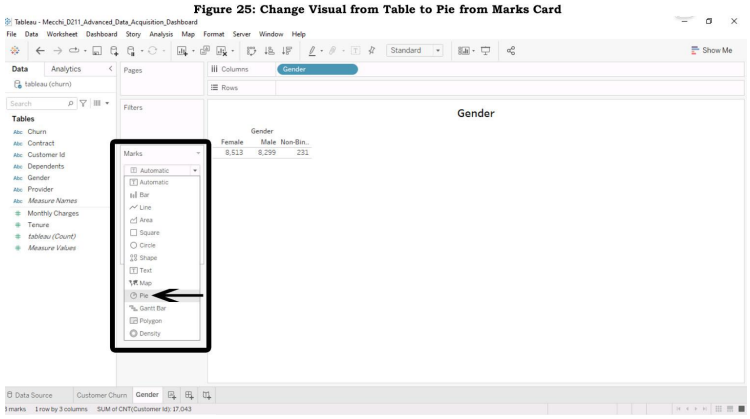


8) Remove field labels “Provider” and “Churn” from visualization: right-click “Provider” located on the body of the canvas below the “Customer Churn” title and select “Hide Field Labels for Columns.” Repeat this exact step for “Churn,” located above “No/Yes,” this time, selecting “Hide Field Labels for Rows” (Fig. 24).

<u>Gender (Demographic) Worksheet</u>

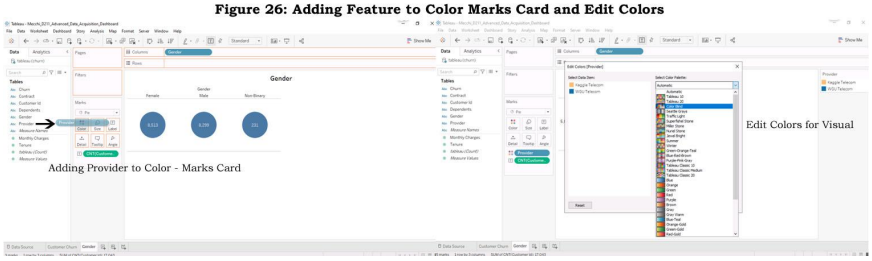
1) Located on the bottom portion of the window, select “New Worksheet” (adjacent to the “Customer Churn” worksheet created previously) and rename the worksheet by double-left-clicking the new “Sheet2” tab, and name “Gender.”
    a) Edit title: Double left-click on “Gender” located in the main body of the work canvas.
    b) In the new window highlight, “<Sheet Name>”, either using the keyboard method of hitting the control button and the letter “a” (Ctrl+A) or click and highlight using the mouse (double click or click and highlight)..
    c) With the title highlighted, select the “center” alignment and change the font color to black.
2) Using the data from the Data Pane, click and drag ‘*Gender’* to the Columns shelf.
3) Next, click and drag *‘customer_id*’ to the Label (text) card located in the Marks window
4) To establish aggregate customer count, left-click the down arrow next to the newly created *customer_id* Label (text) card. From the dropdown menu, hover over “Measure” and select the “Count” option.
5) From the Marks Card, use the dropdown menu and change “Automatic” to “Pie.” (Fig. 25)

Figure 25: Change Visual from Table to Pie from Marks Card



6) To delineate between companies, click and drag '*Provider*' from the data pane to the Color block in the Marks Card (Fig. 26).

Figure 26: Adding Feature to Color Marks Card and Edit Colors

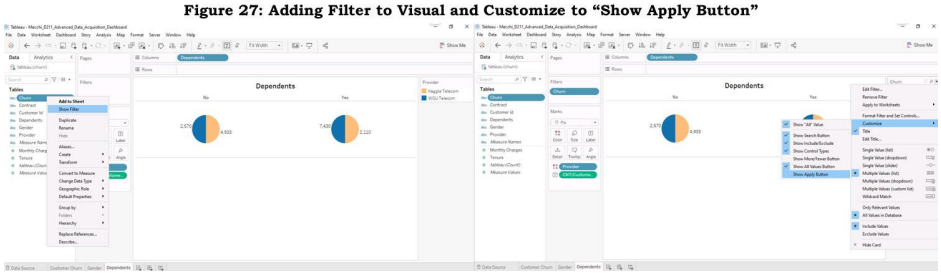


   a) Edit Colors: Navigate to the right-side of the work canvas and select the dropdown arrow located in the upper right-hand corner of the newly added color key and select "Edit Colors."
   b) Under "Select Color Palette," select "Color Blind" palette. Proceed to click and highlight "Kaggle Telecom" under "Select Data Item" and select a color (Light Orange) and repeat this step for "WGU Telecom," opting for another color (Blue).
   c) Assign the colors to the worksheet by clicking "Apply" before confirming change with clicking "OK."
7) Add Filters: To include additional features, use the mouse to right-click '*Churn*' on the Data Pane and from the dropdown menu select, "Show Filter." The filter will appear on the right-hand side of the window above the Color Key.
   a) With the mouse hovering over the newly created Churn filter, left-click the down-arrow, scroll down to highlight the "Customize" menu option and select the "Show Apply Button" from the cascading menu.
   b) Repeat steps 7 and 7a, and add a filter for "Contracts."
8) From the toolbar located above the canvas, left-click on the dropdown menu and change the fit from "Standard" to "Fit Width."
9) Remove field labels "Gender" from visualization: right-click "Gender" located on the body of the canvas below the "Gender" title and select "Hide Field Labels for Columns."

Dependents (Demographic) Worksheet

1) Located on the bottom portion of the window, select “New Worksheet” (adjacent to the “Customer Churn” and “Gender” worksheets created previously) and rename the worksheet by double-left-clicking the new “Sheet3” tab, and name “Dependents.”
    a) Edit title: Double left-click on “Dependents” located in the main body of the work canvas.
    b) In the new window highlight, “<Sheet Name>”, either using the keyboard method of hitting the control button and the letter “a” (Ctrl+A) or click and highlight using the mouse (double click or click and highlight)..
    c) With the title highlighted, select the “center” alignment and change the font color to black.
2) Using the data from the data pane, click and drag ‘*Dependents’* to the Columns shelf.
3) Next, click and drag *‘customer_id*’ to the Label (text) card located in the Marks window
4) To establish aggregate customer count, left-click the down arrow next to the newly created *customer_id* Label (text) card. From the dropdown menu, hover over “Measure” and select the “Count” option.
5) From the Marks Card, use the dropdown menu and change “Automatic” to “Pie.”
6) To delineate between companies, click and drag “*Provider*” from the data pane to the Color block in the Marks Card.
    a) Note: Provider color key should automatically adapt to the colors previously selected for the Gender worksheet (Blue for WGU and Light Orange for Kaggle). If colors do not match, proceed to steps 6b-6d.
    b) Edit Colors: Navigate to the right-side of the work canvas and select the dropdown arrow located in the upper right-hand corner of the newly added color key and select “Edit Colors.”
    c) Under “Select Color Palette,” select “Color Blind” palette. Proceed to click and highlight “Kaggle Telecom” under “Select Data Item” and select a color (Light Orange) and repeat this step for “WGU Telecom,” opting for another color (Blue).
    d) Assign the colors to the worksheet by clicking “Apply” before confirming change with clicking “OK.”
7) Add Filters: To include additional features, use the mouse to right-click ‘*Churn*’ on the data pane and from the dropdown menu select, “Show Filter.” The filter will appear on the right-hand side of the window above the Color Key (Fig. 27)
    a) With the mouse hovering over the newly created Churn filter, left-click the down-arrow, scroll down to highlight the “Customize” menu option and select the “Show Apply Button” from the cascading menu.
    b) Repeat steps 7 and 7a, and add a filter for “Contracts.”

Figure 27: Adding Filter to Visual and Customize to "Show Apply Button"

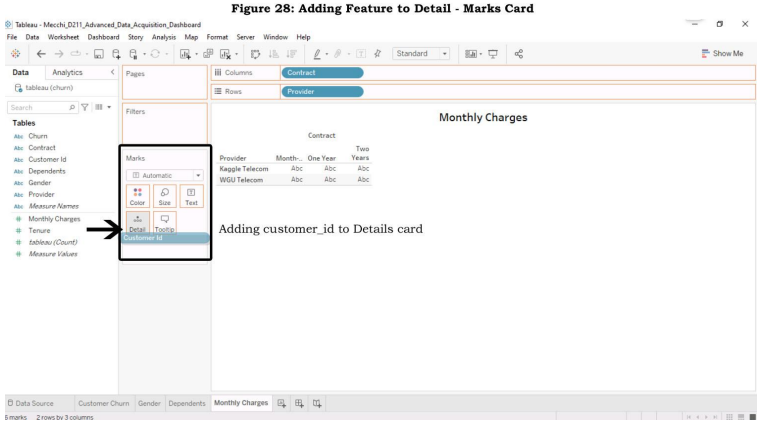


8) From the toolbar located above the canvas, left-click on the dropdown menu and change the fit from "Standard" to "Fit Width."
9) Remove field labels "Dependents"from visualization: right-click "Dependents" located on the body of the canvas below the "Dependents" title and select "Hide Field Labels for Columns."

Monthly Charges Worksheet

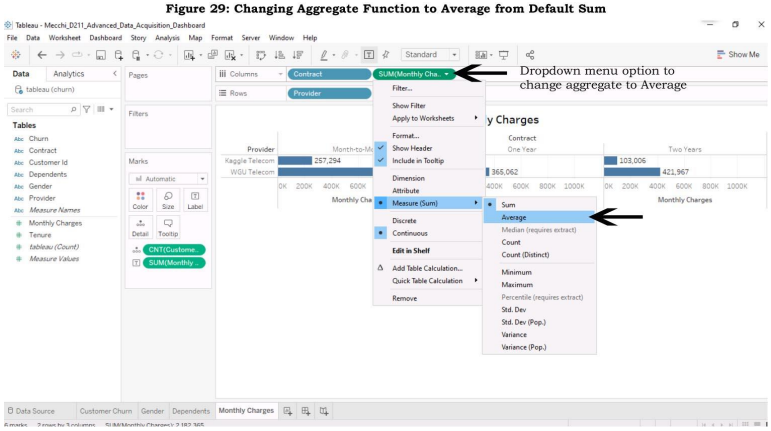
1) Located on the bottom portion of the window, select "New Worksheet" (adjacent to the "Customer Churn," "Gender," and "Dependents" worksheets created previously) and rename the worksheet by double-left-clicking the new "Sheet4" tab, and name "Monthly Charges."
    a) Edit title: Double left-click on "Monthly Charges" located in the main body of the work canvas.
    b) In the new window highlight, "<Sheet Name>", either using the keyboard method of hitting the control button and the letter "a" (Ctrl+A) or click and highlight using the mouse (double click or click and highlight)..
    c) With the title highlighted, select the "center" alignment and change the font color to black.
2) Using the data from the Data Pane, click and drag '*Contract'* to the Columns shelf.
3) Then, from the Data Pane, click and drag '*Provider*' to the Rows shelf.
4) Next, click and drag *'customer_id*' to the Detail card located in the Marks window (Fig. 28).

Figure 28: Adding Feature to Detail - Marks Card



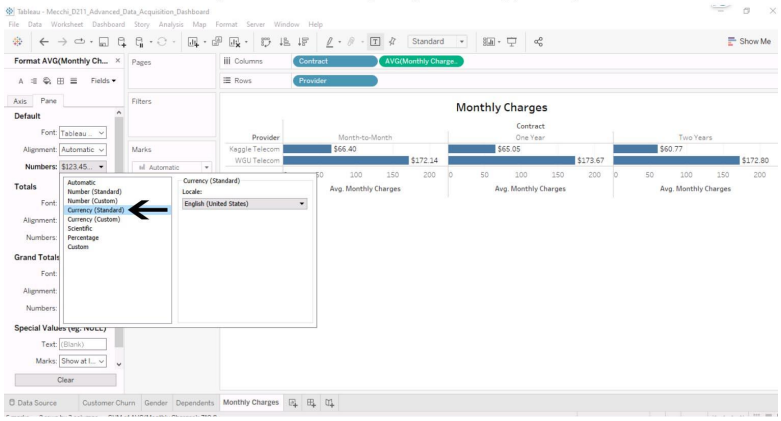
5) To establish customer count, left-click the down arrow next to the newly created *customer_id* Detail card. From the dropdown menu, hover over “Measure” and select the “Count” option.
6) Add ‘*Monthly Charges*’ to the Columns shelf by click and drag.
    a) Note: Tableau will default to “Sum” for the aggregate function. With the addition of charges to the column shelf, the visualization will change to a bar chart (which is intentional).
    b) Change the aggregate function of ‘*Monthly Charges*’ by left-clicking the down arrow from ‘*Monthly Charges*’ in the column shelf.
    c) From the cascading dropdown menu, hover the mouse over “Measure (Sum)” and change the measure to “Average.” (Fig. 29).

Figure 29: Changing Aggregate Function to Average from Default Sum



7) Adding labels to visual: with the mouse and keyboard, select and hold the Control button on the keyboard and left-click the mouse (Ctrl + click) “AVG(Monthly Charges)” from the Columns shelf and Ctrl+click and drag to the Label Marks card.
    a) Format the labels: Under the Marks card, left-click the down-arrow for “AVG(Monthly Charges)” and select “Format” (FIG C4-10)
        i) The data pane now shows the “Format” menu: under “Default” click the dropdown menu for “Numbers” and select “Currency (Standard)”
        ii) Close the “Format” menu by clicking the “x” atop the menu window.

Figure 30: Format Monthly Charges to Currency(Standard)



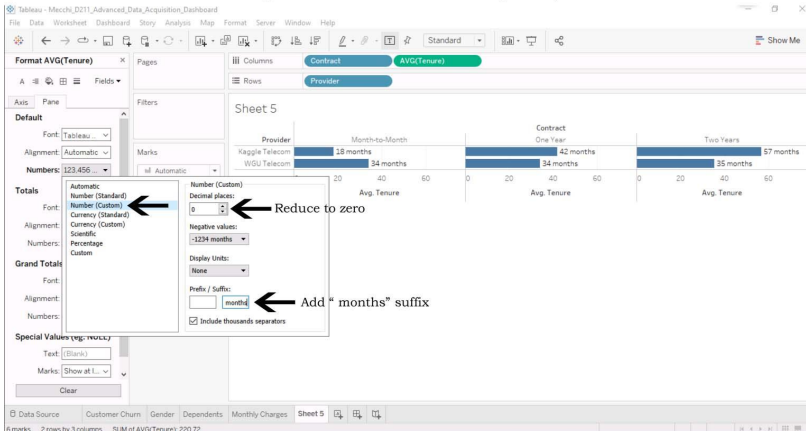
8) To better differentiate customer contracts, click and drag "*Contracts*" from the Data Pane to the Color block in the Marks Card.
    a) Edit Colors: Navigate to the right-side of the work canvas and select the dropdown arrow located in the upper right-hand corner of the newly added color key and select "Edit Colors."
    b) Under "Select Color Palette," select "Automatic" palette. Proceed to click and highlight "Month-to-Month" under "Select Data Item" and select a color (Green) and repeat this step for "One Year," opting for another color (Purple), and "Two Years" (Orange) .
    c) Assign the colors to the worksheet by clicking "Apply" before confirming change with clicking "OK."
9) Add Filters: To include additional features, use the mouse to right-click '*Churn*' on the Data Pane and from the dropdown menu select, "Show Filter." The filter will appear on the right-hand side of the window above the Color Key.
    a) With the mouse hovering over the newly created Churn filter, left-click the down-arrow, scroll down to highlight the "Customize" menu option and select the "Show Apply Button" from the cascading menu.
    b) Repeat steps 9 and 9a, and add a filter for "*Provider*."
10) From the toolbar located above the canvas, left-click on the dropdown menu and change the fit from "Standard" to "Fit Width."
11) Remove field labels "Contract" from visualization: right-click "Contract" located on the body of the canvas below the "Monthly Charges" title and select "Hide Field Labels for Columns."
    a) Repeat step 11 for "Provider" found on the left-side of the visual and select "Hide Field Labels for Rows."

<u>Tenure Worksheet</u>

1) Located on the bottom portion of the window, select "New Worksheet" (adjacent to the "Customer Churn," "Gender," "Dependents," and "Monthly Charges" worksheets created previously) and rename the worksheet by double-left-clicking the new "Sheet5" tab, and name "Tenure."

   a) Edit title: Double left-click on “Tenure” located in the main body of the work canvas.
   b) In the new window highlight, “<Sheet Name>”, either using the keyboard method of hitting the control button and the letter “a” (Ctrl+A) or click and highlight using the mouse (double click or click and highlight).
   c) With the title highlighted, select the “center” alignment and change the font color to black.
2) Using the data from the Data Pane, click and drag ‘*Contract’* to the Columns shelf.
3) Then, from the Data Pane, click and drag ‘*Provider*’ to the Rows shelf.
4) Next, click and drag *‘customer_id*’ to the Detail card located in the Marks window
5) To establish a customer count, left-click the down arrow next to the newly created *customer_id* Detail card. From the dropdown menu, hover over “Measure” and select the “Count” option.
6) Add ‘*Tenure*’ to the Columns shelf by click and drag.
   a) Note: As with “Monthly Charges” Tableau will default to “Sum” for the aggregate function. The addition of ‘*Tenure*’ to the column shelf will also alter the visualization to a bar chart as intended.
   b) Change the aggregate function of ‘*Tenure*’ by left-clicking the down arrow from ‘*Tenure*’ in the column shelf.
   c) From the cascading dropdown menu, hover the mouse over “Measure (Sum)” and change the measure to “Average.”
7) Adding labels to visual: with the mouse and keyboard, select and hold the Control button on the keyboard and left-click the mouse (Ctrl + click) “AVG(Tenure)” from the Columns shelf and Ctrl+click and drag to the Label Marks card.
   a) Format the labels: Under the Marks card, left-click the down-arrow for “AVG(Tenure)” and select “Format.”
      i) The data pane now shows the “Format” menu: under “Default” click the dropdown menu for “Numbers” and select “Number (Custom)” (Fig. 31)
      ii) Reduce the number of decimal places to “0” by typing the value or clicking the downward pointing arrow reducing the default “2” to zero.
      iii) Click in the “Suffix” box near the bottom of the Number(Custom) window and type, “[*space*] months” (do not type space, simply hit the spacebar for “[*space*]”)
      iv) Close the “Format” menu by clicking the “x” atop the menu window.

Figure 31: Format Tenure to Number (Custom)

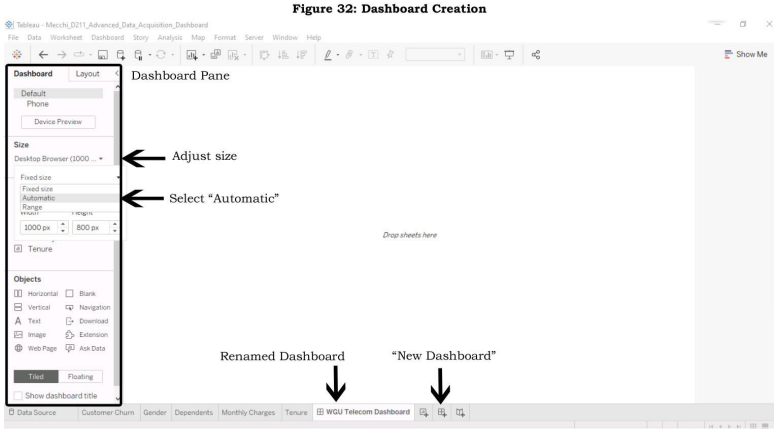


8) To better differentiate customer contracts, click and drag "*Contracts*" from the data pane to the Color block in the Marks Card.
    a) Note: Contracts color key should automatically adapt to the colors previously selected for the Monthly Charges worksheet (Green for Month-to-Month, Purple for One Year, and Orange for Two Years). If colors do not match, proceed to steps 8b-8d.
    b) Edit Colors: Navigate to the right-side of the work canvas and select the dropdown arrow located in the upper right-hand corner of the newly added color key and select "Edit Colors."
    c) Under "Select Color Palette," select "Automatic" palette. Proceed to click and highlight "Month-to-Month" under "Select Data Item" and select a color (Green) and repeat this step for "One Year," opting for another color (Purple), and "Two Years" (Orange) .
    d) Assign the colors to the worksheet by clicking "Apply" before confirming change with clicking "OK."
9) Add Filters: To include additional features, use the mouse to left-click '*Churn*' on the Data Pane and from the dropdown menu select, "Show Filter." The filter will appear on the right-hand side of the window above the Color Key.
    a) With the mouse hovering over the newly created Churn filter, left-click the down-arrow, scroll down to highlight the "Customize" menu option and select the "Show Apply Button" from the cascading menu.
    b) Repeat steps 9 and 9a, and add a filter for '*Provider*.'
10) From the toolbar located above the canvas, left-click on the dropdown menu and change the fit from "Standard" to "Fit Width."
11) Remove field labels "Contract" from visualization: right-click "Contract" located on the body of the canvas below the "Monthly Charges" title and select "Hide Field Labels for Columns."
    a) Repeat step 11 for "Provider" found on the left-side of the visual and select, "Hide Field Labels for Rows."

Dashboard Creation

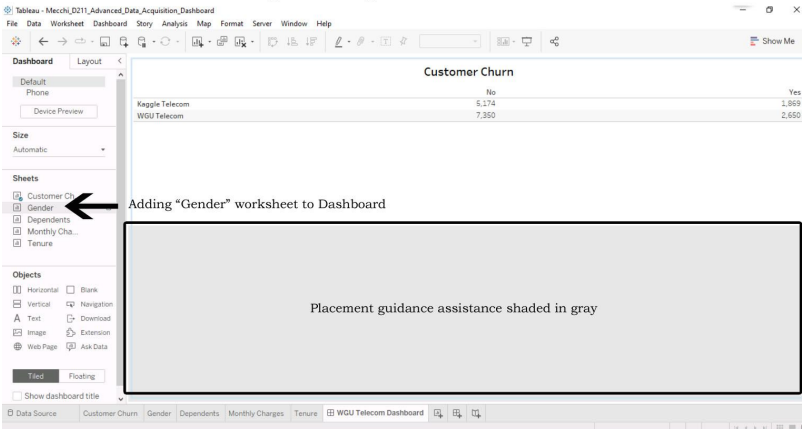
1) Located on the bottom portion of the window, select “Dashboard” (adjacent to the “Customer Churn,” “Gender,” “Dependents,” “Monthly Charges,” “Tenure,” and “New Worksheet” tabs) and rename the Dashboard by double-left-clicking the new “Dashboard1” tab, and name “WGU Telecom Dashboard.” (Fig. 32).

Figure 32: Dashboard Creation



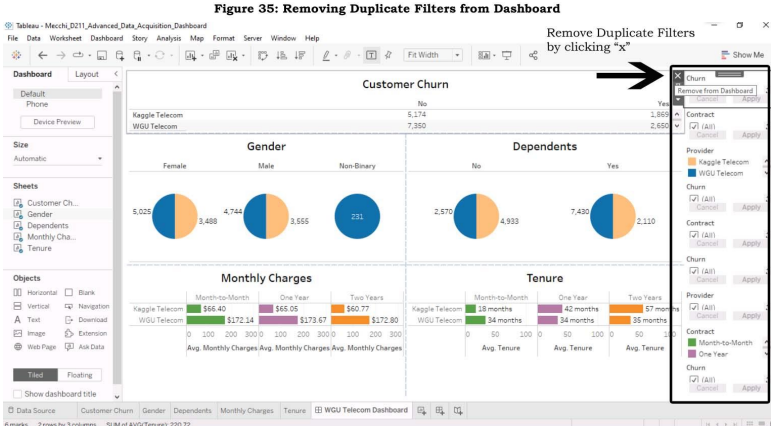
2) The left-hand side of the window previously referred to as “Data Pane” will now be referred to the Dashboard Pane for this portion of Dashboard creation.
    a) Dashboard Pane options include, device previews, adaptable window sizes, sheets (our created worksheets), and an object panel.
3) Change the size of the dashboard for universal adaptability: On the Dashboard Pane, under “Size” left-click the downward pointing arrow, next to “Fixed Size” click on the downward arrow again, changing “Fixed Size” to “Automatic.”
4) All worksheets previously created are listed under the ”Sheets” section of the Dashboard Pane. The demographic dashboard will be composed of Customer Churn, Gender, and Dependents worksheets.
5) Click and drag the “Customer Churn” worksheet from the Dashboard Pane to the canvas.
6) Click and drag the “Gender” worksheet from the Dashboard Pane to the canvas and drop below “Customer Churn” (Fig. 33).
    a) Note: Gray highlights appear when clicking and dragging a worksheet to the dashboard canvas. The highlighted gray area denotes where the location of the worksheet will be placed.
    b) Adjust the size of “Customer Churn” by clicking anywhere inside the “Customer Churn” worksheet of the dashboard.
        i) Use the mouse to adjust the height to the upper third of the dashboard window.

Figure 33: Adding Worksheets to Dashboard



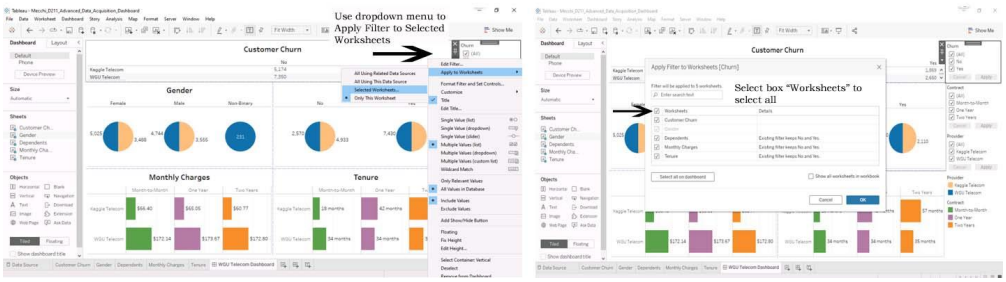
7) Similarly, click and drag the "Dependents" and place to the right of the "Gender" worksheet using the gray highlights to assist with proper placement.
8) Click and drag the "Monthly Charges" worksheet from the Dashboard Pane to the canvas and drop below the "Gender" worksheet using the gray highlight as guidance.
    a) Adjust the size of "Gender" by clicking anywhere inside the "Gender" worksheet of the dashboard. Then proceed to use the mouse to adjust height and width to fit the dashboard visual as desired.
9) Next, click and drag the "Tenure" worksheet and place below the "Dependents" worksheet, adjacent to "Monthly Charges" using the gray highlights to assist with proper placement.
10) Alter Monthly Charges and Tenure to better fit visual: Select Monthly Charges worksheet and use the toolbar located above the dashboard canvas, alter the view from "Fit Width" to "Entire View."
    a) Repeat Step 10 for Tenure Worksheet
    b) Repeat Step 10 for Gender Worksheet
    c) Repeat Step 10 for Dependents Worksheet
    d) Repeat Step 10 for Customer Churn
11) Both Monthly Charges and Tenure have appropriate labels on the dashboard, thus, the axis headers can be removed for a cleaner representation.
    a) Select Monthly Charges Worksheet from the Dashboard by clicking inside the visual. Use the mouse to right-click on the axis where it says "Avg. Monthly Charges." From the options, deselect "Show Header" (FIG C4-14???)
    b) Repeat Step 11a with Tenure Worksheet
12) Adjust Filters: Along the right-hand side of the dashboard, each of the worksheet's filters or color key(s) are automatically added to the visualization.
    a) First, remove any and all duplicate filters: Churn and Contracts. This can be completed by clicking on the filter, then clicking on the "x" to close the small window pane (Fig. 35).

Figure 35: Removing Duplicate Filters from Dashboard



b) With the remaining filters, Churn, Contracts, and Provider complete the following.
   i) Select filter and left-click the down-arrow for "More Options" and highlight "Apply to Worksheets" from the cascading menu and click the "Selected Worksheets" option.
   ii) When the "Selected Worksheets" menu opens, click on the checkbox to select all worksheets (Fig. 36).
   iii) Repeat steps 12b i-ii for the Contract and Provider filters.

Figure 36: Applying Filter to All Worksheets



13) Relocate Provider Color Key: Left-click on Provider key and click on the downward arrow icon to open the menu and select "Floating" from the cascading window.
   a) Move Key to the area between "Gender" and "Dependents."
14) Add interactive filters: Select the "Gender" worksheet by left-clicking anywhere inside the visualization. Once selected, navigate to the window options and select the icon that looks like a funnel ("Use as Filter" when mouse hovers over icon).
   a) Repeat step 14 for Dependents: highlight worksheet and select funnel icon to use as filter.
   b) Repeat step 14 for Monthly Charges: highlight worksheet and select funnel icon to use as filter.
   c) Repeat step 14 for Tenure: highlight worksheet and select funnel icon to use as filter.

C5. Discuss the results of your data analysis and how it supports executive decision-making.

The WGU Telecom dashboard revealed important information that will support actionable insights from key decision-makers. It's apparent that both WGU and Kaggle Telecoms unfortunately fall under the umbrella where approximately 26% of subscribers churned in the last 30-days. This attention-grabbing statistic will frustrate executives, however, observations and relationships learned from the dashboard will assist executives with future decision-making.

Comparing metrics of loyal subscribers relative to those who churned allows executives to see potential pitfalls that may be the cause of losing customers. When viewing demographics, the largest WGU Telecom departures were those with dependents while the inverse was true of Kaggle Telecom. However, no discernable conclusions could be made based on the evenly spread churn among all genders. The most telling observations are those learned from monthly charges and tenure based on contract terms.

Analyzing contract terms relative to monthly expenditures and customer retention revealed some glaring concerns. Tables One and Two (below) summarize a noticeable disparity between the monthly charges and tenure of customers who churned compared to those who remained loyal. Customers who churned were paying more and staying less than loyal patrons, key details executives will be interested in learning. Alarmingly, (on average) customers who churned from One- and Two Year contracts left before the terms of their contract were reached (Table 2) and were paying between 31-33% more every month than retained subscribers (Table 1). Decision-makers will also observe the cheapest contract averaged the longest tenure, whereas, the most expensive contract resulted in the shortest tenure. Executives are now equipped with key metrics that show a noticeable trend in customer churn between monthly charges, tenure, and contract terms. These results may lead executives to further reexamine the monthly charges of the contracts and consider reducing the prices of more expensive plans that led to churn to avoid incurring additional expenditures to acquire new subscribers.

Table 1: Monthly Charges between Customers who Churned and those Retained

Note: Cost Difference represents the monthly charges CHURN customers paid more than RETAINED customers

Contract Terms	CHURN - Charges	RETAINED - Charges	Cost Difference
Month-to-Month	$193.29	$159.57	$33.72 ~21% more
One Year	$220.13	$165.73	$54.40 ~33% more
Two Years	$218.11	$166.23	$51.88 ~31% more

Table 2: Tenure (months) between Customers who Churned and those Retained

Note: Month Difference represents number of months RETAINED customers stayed longer than those who CHURNED

Contract Terms	CHURN - Tenure	RETAINED - Tenure	Months Difference
Month-to-Month	14	46	-32
One Year	9	38	-29
Two Years	10	39	-29

C6. Discuss the limitation(s) of your data analysis.

The analysis of WGU Telecom and Kaggle Telcom data sets revealed concerning relationships that will influence executives' future decision-making, however, it is also important to discuss the limitations of the analysis. While observable trends were noticeable with WGU Telecom customer churn, the comparison to the supporting external Kaggle Telecom data was limited. WGU Telecom customer representation is nationwide while Kaggle Telecom (as defined by data dictionary) is localized to California (Kaggle, n.d.). The addition of regional data to the Kaggle dataset may have helped draw stronger conclusions relative to trends in different markets. Often, markets determine costs, and observing nationwide average monthly charges could be misleading as larger markets tend to have more subscribers and higher cost than smaller markets, thus possibly influencing the cost national average.

Additionally, both Telecom companies showed approximately 26% churn rates and similar trends where subscribers who churned had higher monthly averages with shorter tenure, however, there were some details that are potentially confounding. When comparing contract costs for both churn and not churn, the Kaggle Telecom average monthly charges were universally and substantially less than WGU Telecom. Therefore, it is possible that cost isn't the the lone cause of customer churn and additional data would greatly assist with deeper analysis. Having access or adding data collection to include details, such as, internet services offered, packaged add-ons, and internet performance metrics (data/bandwidth consumption) would greatly assist in developing stronger relationships of subscriber churn rates.

CODE SOURCES

N/A

REFERENCES

Kaggle. (n.d.). Teleco Customer Churn. Retrieved July 20, 2023. https://www.kaggle.com/datasets/blastchar/telco-customer-churn?resource=download.

W3 Schools (n.d.) SQL Union Operator. Retrieved July 20, 2023. https://www.w3schools.com/sql/sql_union.asp.

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