D211 Advanced Data Acquisition Performance Assessment, Task 1

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Part I: Data Dashboard

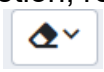
A1. Datasets

The datasets utilized for this dashboard were the WGU-provided telecommunication dataset as well as the additional dataset given by Kaggle representing the IBM-provided telecommunication (Telco customer churn: IBM dataset IBM Cognos Analytics 11.1.3+ base samples dataset, n.d.). The CSV file attachments were called "wgu_churn.csv" and "ibm_churn.csv", which were the cleaned reduced variable versions utilized in the dashboard creation. The uncleaned version of the IBM and the missing Services datasets were also attached within the zipped file, "AFisher_D211.zip" as part of the submission. Those CSV files were needed to import into the pgAdmin environment as part of the data preparation steps.

A2. Dashboard Installation Instruction

Please see below for the step-by-step installation guide for the dashboard. These steps guided users on how the dashboard was opened. The dashboard itself was provided as a packaged tableau format called ".twbx".

1. Download the attached zip file with this submission, "AFisher_D211.zip".
2. Open the File Explorer file on the taskbar and navigate to "C\Users\LabUser\Downloads".
    a. Right-Click on the "AFisher_D211.zip" and "Extract All" the files to "C\Users\LabUser\Downloads\AFisher_D211".
    b. Open the following .txt files within the folder: "SQLImportServices_AF.txt", "SQLImportIBM_AF.txt", "SQLIBMDataprep_AF.txt", and "SQLWGUDataprep_AF.txt".
3. On the Desktop, double-click on the pgAdmin icon to open it.
    a. On the left panel of the environment, navigate to the "churn" database. It is the very first database under Servers.
4. Under the "churn" database click the arrow next to "Schemas" to view the tables.
5. Click the arrow next to "Tables" to view the tables already included in the database.

6. Right Click on the “Tables” field and navigate to “Query Tool”.
7. In the opened Query Editor copy the SQL code from the downloaded “SQLImportServices_AF.txt” file. Then Click the Run ( ) button in the Query tool navigation.
8. Once successfully processed, go to the Tables field again, right-click, and select “Refresh”. The new table, “services”, will appear under Tables.
9. Navigate to the newly created “services” table and right-click and select the “Import/Export Data” option.
    a. A new window will appear, follow the following steps.
        i. Import/Export: Toggle to: “Import” from “Export” by clicking on it.
        ii. Filename is blank, click on the three dots to select a file. You need to navigate to “C:\Users\LabUser\Downloads\AFisher_D211” and select the “Services.csv”.
        iii. Format will stay at “csv”.
        iv. Encoding will stay with the “Select an item” as default.
        v. OID should read “No”
        vi. Header: Toggle to “Yes” by clicking “No”.
        vii. Delimiter should be set to comma “,”
        viii. Click Ok.
10. Upon successful completion of the import of the services table, return to the Query Editor and remove the code by clicking “Clear Query Window” under the Clear button,  . Click “Yes” on the subsequent prompt.
11. Next add the SQL codes from the “SQLWGUDataprep_AF” file. Then Click the Run ( ) button in the Query tool navigation.
12. Upon successful completion, remove the code by clicking “Clear Query Window” under the Clear button,  . Click “Yes” on the subsequent prompt.
13. Copy and paste the SQL script from the “SQLImportIBM_AF.txt” file. Then Click the Run ( ) button in the Query tool navigation.
14. Once successfully processed, go to the Tables field again, right-click, and select “Refresh”. The new table, “ibm_churn”, will appear under Tables.
15. Navigate to the newly created “ibm_churn” table and right-click and select the “Import/Export Data” option.
    a. A new window will appear, follow the following steps.
        i. Import/Export: Toggle to: “Import” from “Export” by clicking on it.
        ii. Filename is blank, click on the three dots to select a file. You need to navigate to “C:\Users\LabUser\Downloads” and select the “ibm_uncleaned.csv”.
        iii. Format will stay at “csv”.
        iv. Encoding will stay with the “Select an item” as default.
        v. OID should read “No”
        vi. Header: Toggle to “Yes” by clicking “No”.
        vii. Delimiter should be set to comma “,”
        viii. Click Ok.

16. Upon successful completion of the import of the ibm_churn table return to the Query Editor and remove the code by clicking “Clear Query Window” under the Clear button,  . Click “Yes” on the subsequent prompt.
17. Copy and paste the SQL script from the “SQLIBMDataprep_AF.txt” file. Then Click the Run ( ) button in the Query tool navigation.
18. Once successfully processed, go to the Tables field again, right-click, and select “Refresh”. The new table, “ibm_temp” will appear under Tables.
19. Once the query is complete, close the pgAdmin application and return to the desktop.
20. Navigate to the File Explorer folder on the desktop taskbar.
21. Open the Downloads folder found here: “C\Users\LabUser\Downloads” and open the downloaded “AFisherD211Dashboard.twbx” file.
22. The Tableau Desktop 2021.4 application will open.
    a. It will open with a prompt for a password.
        i. Enter Password: Passw0rd!
23. If the Dashboard Unavailable error appears. Click on “Edit Connection”
    a. A PostgreSQL window will open. Make sure the following information is populated accordingly.
        i. Server: localhost
        ii. Port: 5432
        iii. Database: churn
        iv. Authentication: Username and Password.
        v. Username: postgres
        vi. Password: Passw0rd!
        vii. Then click “Sign In”
    b. Navigate to the wgu_temp+ table panel and in the right-hand bottom panel click “Update Now”.
    c. This will update the table to show the 24 fields and 17043 rows.
24. Dashboard is viewable on the dashboard tab called “WGU vs IBM”.

The dashboard is fully installed and interactable.

A3. Dashboard Navigation

The dashboard presentation was found on the “WGU vs IBM “ dashboard tab at the bottom of the screen. It was best to navigate to the mentioned tab to view the interactive dashboard. The below would provide a reference guide to the navigation features of the dashboard.

1. Interactive Elements of this dashboard were summarized with the following controls.

a. Click Navigation
    i. Using Click on the “Gender” attributes of “Female”, “Male” or “Nonbinary” would filter all representations to show only customers with the chosen gender.
        - To remove the filter, click on the selected gender another time.
    ii. Using Click on the “Average Monthly Charge per State” map will filter all representations to show only the customers within the selected State.
        - IBM data automatically was hidden when any state within the WGU source map was selected.
        - WGU data would automatically become hidden when any state was selected on the IBM source map.
        - Selecting multiple states was completed by holding down the control key and clicking each needed state.
        - To remove the filter, click on the selected state another time.
        - Toggling the Source navigation on the map would switch to show maps for the WGU-only data and the IBM-only data.
    iii. Using Click on the “IBM Distro” or “WGU Distro” variables within the stacked bar chart filtered all representations with the selected “Churn” and “Internet Service” status.
        - To Remove the Filter, Click on the Selected “Internet Service” or “Churn” again.
    iv. Using Click on the “WGU Addons” or “IBM Addons” variables filtered all representations with the selected “Gender” status.
        - To remove the filter, Click on the Selected “Gender”/ “Churn” again.
b. Hover Navigation
    i. Hovering Over Items showed each Worksheet Source Tooltip information.
        - Both the IBM and WGU addon service visualizations provided additional information on the average monthly tenure per the selected service.
        - The Map hover specified information about the monthly charge average per State.
c. Radio Button Navigation
    i. Selecting the Radio Button options in the “Measures” parameter filtered add-on representations to show the visualization of the churn status and gender of the customers that have the add-on service selected.

A4. SQL Code

Please see below for the SQL code utilized to support the dashboard creation. These SQL codes were attached within the zipped file within the submission.

```
/* adding/importing missing services dataset to Postgres*/
-- Table: public.services

-- DROP TABLE IF EXISTS public.services;

CREATE TABLE IF NOT EXISTS public.services
(
    customer_id text COLLATE pg_catalog."default" NOT NULL,
    internetservice text COLLATE pg_catalog."default",
    phone text COLLATE pg_catalog."default",
    multiple text COLLATE pg_catalog."default",
    onlinesecurity text,
    onlinebackup text,
    deviceprotection text COLLATE pg_catalog."default",
    techsupport text,
    CONSTRAINT services_pkey PRIMARY KEY (customer_id)
)

TABLESPACE pg_default;

ALTER TABLE IF EXISTS public.services
    OWNER to postgres;

/* adding a column for WGU data specification*/

ALTER TABLE customer
ADD COLUMN source text;
```

```
UPDATE public.customer SET source = 'WGU';

/* locating different gender types*/
SELECT DISTINCT gender FROM customer;

/* updating preferred not to answer to nonbinary*/
UPDATE customer
SET gender = 'NonBinary'
WHERE gender = 'Prefer not to answer';

/* updating yes/no to 1/0*/
SELECT DISTINCT techsupport FROM services;
UPDATE services
SET techsupport = 0
WHERE techsupport = 'No';
UPDATE services
SET techsupport = 1
WHERE techsupport = 'Yes';

/* updating yes/no to 1/0*/
SELECT DISTINCT onlinebackup  FROM services;
UPDATE services
SET onlinebackup  = 0
WHERE onlinebackup  = 'No';
UPDATE services
SET onlinebackup = 1
WHERE onlinebackup = 'Yes';

/* updating yes/no to 1/0*/
SELECT DISTINCT deviceprotection FROM services;
```

```
UPDATE services
SET deviceprotection = 0
WHERE deviceprotection = 'No';
UPDATE services
SET deviceprotection = 1
WHERE deviceprotection = 'Yes';

/* updating yes/no to 1/0*/
SELECT DISTINCT onlinesecurity FROM services;
UPDATE services
SET onlinesecurity = 0
WHERE onlinesecurity = 'No';
UPDATE services
SET onlinesecurity = 1
WHERE onlinesecurity= 'Yes';
/* joining churn tables based on columns needed*/
SELECT c.customer_id, l.city AS City, l.state as State, l.zip AS ZipCode,
c.lat AS Latitude, c.lng AS Longitude, c.churn as Churn, c.tenure as tenure,
c.gender AS Gender, c.monthly_charge AS MonthlyCharge,
s.internetservice, s.deviceprotection, s.onlinebackup, s.onlinesecurity, s.techsupport, c.source
INTO TABLE wgu_temp
FROM customer AS c
JOIN services AS s ON c.customer_id = s.customer_id
LEFT JOIN location AS l ON c.location_id = l.location_id;

SELECT *
FROM wgu_temp;
```

```
/*import ibm_churn ibm dataset into postgresql*/

-- Table: public.ibm_churn

-- DROP TABLE IF EXISTS public.ibm_churn;

CREATE TABLE IF NOT EXISTS public.ibm_churn
(
    customerid text COLLATE pg_catalog."default" NOT NULL,
    count integer,
    country text COLLATE pg_catalog."default",
    state text COLLATE pg_catalog."default",
    city text COLLATE pg_catalog."default",
    zipcode integer,
    latitude numeric,
    longitude numeric,
    gender text COLLATE pg_catalog."default",
    seniorcitizen text COLLATE pg_catalog."default",
    partner text COLLATE pg_catalog."default",
    dependent text COLLATE pg_catalog."default",
    tenure numeric,
    phone text COLLATE pg_catalog."default",
    mulitple text COLLATE pg_catalog."default",
    internetservice text COLLATE pg_catalog."default",
    onlinesecurity text COLLATE pg_catalog."default",
    onlinebackup text COLLATE pg_catalog."default",
    deviceprotection text COLLATE pg_catalog."default",
    techsupport text COLLATE pg_catalog."default",
    streaming_tv text COLLATE pg_catalog."default",
    streaming_movies text COLLATE pg_catalog."default",
```

```
    contract text COLLATE pg_catalog."default",
    paperless_billing text COLLATE pg_catalog."default",
    payment_method text COLLATE pg_catalog."default",
    monthly_charge numeric,
    total_charges numeric,
    churn text COLLATE pg_catalog."default",
    churn_value numeric,
    churn_score numeric,
    cltv numeric,
    churn_reason text COLLATE pg_catalog."default",
    CONSTRAINT ibm_churn_pkey PRIMARY KEY (customerid)
)

TABLESPACE pg_default;

ALTER TABLE IF EXISTS public.ibm_churn
    OWNER to postgres;

/* adding a column for IBM data specification*/

ALTER TABLE ibm_churn
ADD COLUMN source text;
UPDATE public.ibm_churn SET source = 'IBM';

SELECT DISTINCT internetservice FROM ibm_churn;

/* updating no to none*/
UPDATE ibm_churn
SET internetservice = 'None'
WHERE internetservice = 'No';
```

```
/* updating spelling to match across both datasets*/
UPDATE ibm_churn
SET internetservice = 'Fiber Optic'
WHERE internetservice = 'Fiber optic';

/* updating the state to abbrev.*/
UPDATE ibm_churn
SET state = 'CA'
WHERE state = 'California';

/* updating yes/no to 1/0*/
SELECT DISTINCT techsupport FROM ibm_churn;
UPDATE ibm_churn
SET techsupport = 0
WHERE techsupport = 'No internet service';
UPDATE ibm_churn
SET techsupport = 0
WHERE techsupport = 'No';
UPDATE ibm_churn
SET techsupport = 1
WHERE techsupport = 'Yes';

/* updating yes/no to 1/0*/
SELECT DISTINCT onlinebackup  FROM ibm_churn;
UPDATE ibm_churn
SET onlinebackup = 0
WHERE onlinebackup = 'No internet service';
UPDATE ibm_churn
SET onlinebackup  = 0
```

```
WHERE onlinebackup  = 'No';
UPDATE ibm_churn
SET onlinebackup = 1
WHERE onlinebackup = 'Yes';

/* updating yes/no to 1/0*/
SELECT DISTINCT deviceprotection FROM ibm_churn;
UPDATE ibm_churn
SET deviceprotection = 0
WHERE deviceprotection = 'No internet service';
UPDATE ibm_churn
SET deviceprotection = 0
WHERE deviceprotection = 'No';
UPDATE ibm_churn
SET deviceprotection = 1
WHERE deviceprotection = 'Yes';

/* updating yes/no to 1/0*/
SELECT DISTINCT onlinesecurity FROM ibm_churn;
UPDATE ibm_churn
SET onlinesecurity = 0
WHERE onlinesecurity = 'No internet service';
UPDATE ibm_churn
SET onlinesecurity = 0
WHERE onlinesecurity = 'No';
UPDATE ibm_churn
SET onlinesecurity = 1
WHERE onlinesecurity= 'Yes';

/* making temp table pulling only columns needed*/
```

```
SELECT customerid AS customer_id, city, state, zipcode,
latitude, longitude, churn, tenure,
gender, monthly_charge AS MonthlyCharge,
internetservice, deviceprotection, onlinebackup, onlinesecurity, techsupport, source
INTO TABLE ibm_temp
FROM ibm_churn;

SELECT *
FROM ibm_temp;

--- CUSTOM SQL QUERY in Tableau for UNION ALL of wgu_temp and ibm_temp tables ---

SELECT "t0"."Table Name" AS "Table Name",
  "t0"."churn" AS "churn",
  "t0"."city" AS "city",
  "t0"."customer_id" AS "customer_id",
  "t0"."deviceprotection" AS "deviceprotection",
  "t0"."gender" AS "gender",
  "t0"."internetservice" AS "internetservice",
  "t0"."latitude" AS "latitude",
  "t0"."longitude" AS "longitude",
  "t0"."monthlycharge" AS "monthlycharge",
  "t0"."onlinebackup" AS "onlinebackup",
  "t0"."onlinesecurity" AS "onlinesecurity",
  "t0"."source" AS "source",
  "t0"."state" AS "state",
  "t0"."techsupport" AS "techsupport",
  "t0"."tenure" AS "tenure",
```

```
  "t0"."zipcode" AS "zipcode"
FROM (


  SELECT "t1"."Table Name" AS "Table Name", "t1"."churn" AS "churn", "t1"."city" AS "city", "t1"."customer_id" AS "customer_id", "t1"."deviceprotection" AS "deviceprotection", "t1"."gender" AS "gender", "t1"."internetservice" AS "internetservice", "t1"."latitude" AS "latitude", "t1"."longitude" AS "longitude", "t1"."monthlycharge" AS "monthlycharge", "t1"."onlinebackup" AS "onlinebackup", "t1"."onlinesecurity" AS "onlinesecurity", "t1"."source" AS "source", "t1"."state" AS "state", "t1"."techsupport" AS "techsupport", "t1"."tenure" AS "tenure", "t1"."zipcode" AS "zipcode"
  FROM (
    SELECT ('wgu_temp'::text) AS "Table Name",
      CAST("wgu_temp"."churn" AS TEXT) AS "churn",
      CAST("wgu_temp"."city" AS TEXT) AS "city",
      CAST("wgu_temp"."customer_id" AS TEXT) AS "customer_id",
      CAST("wgu_temp"."deviceprotection" AS TEXT) AS "deviceprotection",
      CAST("wgu_temp"."gender" AS TEXT) AS "gender",
      CAST("wgu_temp"."internetservice" AS TEXT) AS "internetservice",
      "wgu_temp"."latitude" AS "latitude",
      "wgu_temp"."longitude" AS "longitude",
      "wgu_temp"."monthlycharge" AS "monthlycharge",
      CAST("wgu_temp"."onlinebackup" AS TEXT) AS "onlinebackup",
      CAST("wgu_temp"."onlinesecurity" AS TEXT) AS "onlinesecurity",
      CAST("wgu_temp"."source" AS TEXT) AS "source",
      CAST("wgu_temp"."state" AS TEXT) AS "state",
      CAST("wgu_temp"."techsupport" AS TEXT) AS "techsupport",
      "wgu_temp"."tenure" AS "tenure",
      "wgu_temp"."zipcode" AS "zipcode"
    FROM "public"."wgu_temp" "wgu_temp"
```

```
) "t1"

 UNION  ALL

 SELECT "t2"."Table Name" AS "Table Name", "t2"."churn" AS "churn", "t2"."city" AS "city", "t2"."customer_id" AS "customer_id", "t2"."deviceprotection" AS "deviceprotection", "t2"."gender" AS "gender", "t2"."internetservice" AS "internetservice", "t2"."latitude" AS "latitude", "t2"."longitude" AS "longitude", "t2"."monthlycharge" AS "monthlycharge", "t2"."onlinebackup" AS "onlinebackup", "t2"."onlinesecurity" AS "onlinesecurity", "t2"."source" AS "source", "t2"."state" AS "state", "t2"."techsupport" AS "techsupport", "t2"."tenure" AS "tenure", "t2"."zipcode" AS "zipcode"
 FROM (
   SELECT ('ibm_temp'::text) AS "Table Name",
     CAST("ibm_temp"."churn" AS TEXT) AS "churn",
     CAST("ibm_temp"."city" AS TEXT) AS "city",
     CAST("ibm_temp"."customer_id" AS TEXT) AS "customer_id",
     CAST("ibm_temp"."deviceprotection" AS TEXT) AS "deviceprotection",
     CAST("ibm_temp"."gender" AS TEXT) AS "gender",
     CAST("ibm_temp"."internetservice" AS TEXT) AS "internetservice",
     "ibm_temp"."latitude" AS "latitude",
     "ibm_temp"."longitude" AS "longitude",
     "ibm_temp"."monthlycharge" AS "monthlycharge",
     CAST("ibm_temp"."onlinebackup" AS TEXT) AS "onlinebackup",
     CAST("ibm_temp"."onlinesecurity" AS TEXT) AS "onlinesecurity",
     CAST("ibm_temp"."source" AS TEXT) AS "source",
     CAST("ibm_temp"."state" AS TEXT) AS "state",
     CAST("ibm_temp"."techsupport" AS TEXT) AS "techsupport",
     "ibm_temp"."tenure" AS "tenure",
     "ibm_temp"."zipcode" AS "zipcode"
```

```
    FROM "public"."ibm_temp" "ibm_temp"
  ) "t2"

) "t0"
```

Part II: Demonstration

B1. Panopto Video

The Panopto video provided a presentation of the data observed to an audience of data analytics peers. Key points discussed included the technical environment used to create the dashboard, the functionality of the dashboard, how the databases were created, and how referential integrity was enforced. Also, a few more points were included such as the SQL scripts used, how the data streams were prepared, and how the data were aligned with the other data points. Please see attached Panopto video link. Link Found here:

[redacted]

Part III: Report

C1. Explanation of Dashboard Function

The data dictionary from the previous D210 course was used on determining what the audience was looking for. The data dictionary provided by WGU described the stakeholders' interest in marketing strategies, customer engagement, and retention efforts based on regional availability. The created dashboard allowed for a visualization of these objectives. One objective

was to analyze and identify which variables contributed to the customer churn rate. The attributes used within the analysis were based on internet services, service addons, monthly charges as well as a specific gender. The stakeholders could utilize this analysis to pinpoint key contributing factors to what areas should be focused on in terms of retention (Expert Panel, Forbes Agency Council, 2019).

Another purpose and function of the dashboard was the map feature. The map feature allowed for the information to be shown regionally or state specific. A specific region was built by selecting multiple states. The multi-selection allowed for a representation of the customers within those states. These purposes aligned with the needs of the various executive leaders within the organization. The function of the dashboard permitted the telecommunication company to explore the various legacy data to utilize in marketing and sales efforts in a regional capacity in the future (Expert Panel, Forbes Agency Council, 2019).

Lastly, another purpose of the dashboard was to discover customer product engagement. Customer engagement was represented by the add-on services selections. The organization could utilize the dashboard to compare which of the add-on services were more popular based on specific genders. The add-on services visualization provided insight into which gender had a greater likelihood of churn based on the services selected.

C2. Justification of Business Intelligence Tool

The business intelligence tool used for this analysis was the Tableau Desktop. The application allowed for the creation of data visualizations. This tool provided an uncomplicated way to create interactable visualizations to help with communicating insightful information

(What is Tableau?, n.d.). The information can provide conclusions to business questions or provide guidance on various relationships between the data. In the telecommunication datasets, the stakeholders were able to utilize the Tableau dashboard to visually see how the data interacted based on the information they were interested in obtaining insight. For example, the dashboard in Tableau provided a graphical visualization of the breakdown of churn status based on internet service in a stacked bar chart. It was easy to see which service had a large churn rate.

C3. Data Cleaning and Preparation

The data cleaning and preparation process included the following steps.

1. Create Table "Services" to import the missing Services.csv into the pgAdmin environment.
    a. Table creation involved making a new table in pgAdmin within the churn public database. A table could be created by using the "CREATE TABLE" SQL script and adding the variables as new columns and setting the primary key accordingly. After the table creation, the "Services.csv" was imported using the Import/Export option for the "services" table.
2. Rename the "Gender" value "Prefer Not to Answer" to "NonBinary" based on the data dictionary and dataset from the previous course.
    a. The SQL code "UPDATE", "SET", and "WHERE" were used to rename the values.

3. Converted service values from “Yes/No” values to “1/0” on attributes that would be used such as Tech Support, Online Security, Online Backup, and Device Protection.
    a. This was completed using the same method as the renaming of the “gender” value.
4. Added an additional “Source” variable to note the data from the WGU-provided dataset.
    a. The “ALTER TABLE”, “ADD COLUMN”, and “UPDATE” SQL scripts were used to add the new variable.
5. Joined churn tables of customer, services, and location to pull the relevant variables into a new table called wgu_temp.
    a. The “Customer” table and “Services” table were “fully joined” on the “customer_id” variable. Then the “Location” table was “left joined” to the customer table. This meant that all the variables from both the “Customer” and “Services” tables were joined without any loss of data. The “Location” attribute was joined to the left of the “Customer” table by keeping all of the “Customer” table data and including any of the “Location” table variables that matched accordingly afterward.
6. Create Table “ibm_churn” to import the additional Kaggle-provided IBM telco dataset.
7. Rename the “State” variable value from “California” to the state abbreviation “CA” to match the data format from the provided WGU dataset.

8. Converted add-on service values from “Yes/No/No internet service” to “1/0/0” of the similar variables to the WGU-provided dataset.
9. Corrected spelling of “Fiber optic” to “Fiber Optic” and “No” to “None” of the Internet Services variable from the IBM dataset to match the same format as the WGU Internet service attribute.
10. Added an additional “Source” variable to notate the data was from the IBM-provided dataset.
11. Created a new table called “ibm_temp” to only include relevant variables from the IBM data set.
12. Exported both the “wgu_temp” and “ibm_temp” files to include with submission renaming them “wgu_churn” and “ibm_churn” respectfully.

C4. Creation of Dashboard

The instructions below provided a guide on how to create the dashboard within Tableau.

1. On the Bottom Tab, Select “Sheet 1”
2. Right-click “Sheet 1” to rename. Rename to “WGU Distro”
3. From Data Panel: Drag the “Internet Service” variable to Columns.
4. From Data Panel: Drag the “Churn” variable to the Marks Panel: Color
5. In the Data Panel: Create a new Calculated Field called “WGU” to only show the count of WGU customers. This is done by clicking on the down arrow next to the search field in the Data Panel.
    a. The Calculation : SUM(IF [Source]= "WGU" THEN 1 ELSE 0 END)
6. In the Data Panel: Duplicate the WGU calculated variable and rename it to “IBM”.
    a. Change the Calculation to read: SUM(IF [Source]= "IBM" THEN 1 ELSE 0 END)
7. From the Data Panel: Drag the “WGU” variable to Rows. It will change to “AGG(WGU)”
8. From the Data Panel: Drag the “WGU” variable to Marks Panel: Label
9. From the Data Panel: Drag the “WGU” variable to Marks Panel: Tooltip
10. From the Data Panel: Drag the “WGU” variable to Marks Panel: Detail
11. In the Marks Panel: Select and Click on the Dropdown arrow for the “AGG(WGU)” variable with the Detail category. Navigate to the “Add Table Calculation”.

a. Under Table Calculation; Calculation Type: Select “Percent of Total” and Under Compute Using: Select “Specific Dimensions” unchecking “Internet Service” then Close.
b. Change the Marks type for the “AGG(WGU)” with the Calculation variable with the Detail category to the Tooltip category. This is done by dragging the variable to Tooltip.
    i. Hold the Ctrl button on the keyboard and click the “AGG(WGU)” with the Calculation variable with the Tooltip category and drag it to the Marks category Label.

12. From Data Panel: Drag the “Gender” variable to the Filter Panel.
    a. Click “All”, then Click “OK” to select all values for this variable.
13. Format the Sheet as noted:
    a. In the Marks Panel: Click “Color” and select Edit Colors.
    b. Select the “Colorblind” Palette from the dropdown.
        i. Click the “No” value from the Data Item Panel and Select the “Dark Gray 57606C” color in the palette.
        ii. Click the “Yes” value from the Data Item Panel and Select the “Light Blue A3CCE9” color in the palette.
        iii. Click OK.
    c. In the Marks Panel: Click “Label” and make sure that “Show marks labels” and “Allow labels to overlap other marks” are checked.
        i. Under the “Label Appearance” section: Select Alignment: Center, Font: Tableau Book.
        ii. Under Text: Click the three “…” button for additional formatting of text.
            1. Highlight the <AGG(WGU)> and Change the font size to 14, Bold, Color Black #000000, Center alignment.
            2. Put this (<% of Total AGG(WGU)> within parentheses.
            3. Highlight the (<% of Total AGG(WGU)>) and Change the font to Tableau Light, font size to 9, Color “Black #000000”, Center alignment.
            4. Click OK
        iii. Under the Marks to Label: Select All
    d. In the Marks Panel: Click “Tooltip”
        i. Highlight “Churn: “ and change the font color to “Dark Gray #57606C”.
        ii. Highlight “Internet Service: “ and change the font color to “Dark Gray #57606C”.
        iii. Change “Count of WGU” to read “# of Customers: ”.
        iv. Highlight “# of Customers:“ and change the font color to “Dark Gray #57606C”.
        v. Remove (<% of Total AGG(WGU)>)
        vi. After the <% of Total AGG(WGU)>, add “of” and insert <internetservice>” changing the font color to “Dark Gray #57606C”.
            1. Highlight (<% of Total AGG(WGU)>)
                a. Bold and Change Font to Black, #000000

2. Click Ok

e. Navigate to the Title, using the drop-down arrow Click Edit Title.
    i. Remove <Sheet Name>
    ii. Type in “WGU Company”, enter for a new line, and type “Customer Distribution of Internet Service”.
    iii. Highlight all text and Change the Font color to Blue #1170AA and Center alignment.
    iv. Highlight just the “WGU Company” and change the font size to 12, bold, and underline.
    v. Highlight just the “Customer Distribution of Internet Service” and change the font size to 10.
f. Underneath the Title, Right-click on the Field label name “internetservice” and “Hide Field Labels for Columns”.
g. Navigate to the Axis, using the dropdown arrow Click Edit Axis.
    i. Remote the Axis Title of “Count of WGU”
    ii. Rename to “# of Customers” and Close.

14. Change the Worksheet view from “Standard View” to “Entire View”.
15. Right-click the “WGU Distro” sheet and Click Duplicate.
16. Right-click the “WGU Distro(2)” sheet and Click Rename.
    a. Rename the sheet to “IBM Distro”.
17. Overwrite the WGU count variables in the sheet with the IBM count equivalent.
    a. Drag the “IBM” variable to the Rows and drop it overlapping the previous “AGG(WGU)” variable. This will automatically rename it to “AGG(IBM)”
    b. Drag the “IBM” variable to the Marks panel and drop it overlapping the previous “AGG(WGU)” variable with Marks category: Label.
    c. Drag the “IBM” variable to the Marks panel and drop it overlapping the previous “AGG(WGU)” variable with the Marks category: Tooltip.
    d. Drag the “IBM” variable to the Marks Panel and drop it on the Marks category: Detail.
        i. In the Marks Panel: Select and Click on the Dropdown arrow for the “AGG(IBM)” variable with the Detail category. Navigate to the Add Table Calculation.
        ii. Under Table Calculation; Calculation Type: Select “Percent of Total” and Under Compute Using: Select “ Specific Dimensions” unchecking “Internet Service” then Close.
        iii. Change the Marks type for the “AGG(IBM)” with the Calculation variable with the Detail category to the Tooltip category. This is done by Dragging the variable to Tooltip.
        iv. Hold the Ctrl button on the keyboard, click the “AGG(IBM)” with the Calculation variable in the Tooltip category, and drag it to the Marks category Label.
    e. Remove the previous variables of “AGG(WGU)” with the Calculation variable from both Tooltips and Label.
18. If formatting is lost, Repeat steps 13a through 13c. with IBM Table equivalent.
    a. After the “# of Customers:”, Select Insert and toggle to “AGG(IBM)”

i. Highlight the newly inserted “AGG(IBM)” and change font color to Black #000000 and Bold.

b. Click before the “of” in the fourth row of text.
c. Select Insert and toggle to “% of Total AGG(WGU)”
    i. Highlight the newly inserted “% of Total AGG(IBM)” and change font color to Black #000000 and Bold.
d. Click Ok
e. Navigate to the Title, using the drop-down arrow Click Edit Title.
    i. Remove “WGU” and type “IBM” in its place.
    ii. Highlight all text and Change the font color to Brown #C85200.
f. Navigate to the Axis, using the drop-down arrow Click Edit Axis.
    i. Remote the Axis Title of “Count IBM”
    ii. Rename to “# of Customers” and Close.

19. Click on New Worksheet.
20. Right-click “Sheet 3” to rename. Rename to “WGU Addons”
21. In the Data Panel: Navigate to the Dropdown menu next to the Search field.
    a. Click and select Create Parameter.
        i. Rename the Parameter to “Measures”
        ii. Select the Data type as “String”.
        iii. In the Allowable Values Select List.
            1. Click to add the following list of Values:
                a. Online Backup, Online Security, Device Protection, and Tech Support
                b. Click Ok.
22. In the Data Panel: Navigate to the Dropdown menu next to the Search field.
    a. Click and select Create Calculated Field.
        i. Rename Calculation to WCase
        ii. In the main body text field: type the following:

```
SUM(INT(IF[Source]="WGU" THEN(
CASE [Measures]
WHEN "Online Backup" THEN [Onlinebackup]
WHEN "Online Security" THEN [Onlinesecurity]
WHEN "Tech Support" THEN [Techsupport]
WHEN "Device Protection" THEN [Deviceprotection]
END)
END))
```

        iii. Click Ok
23. Repeat step 22a but rename the new Calculated Field as “ICase”.
    a. The main body text will also change to the following:

```
SUM(INT(IF[Source]="IBM" THEN(
CASE [Measures]
WHEN "Online Backup" THEN [Onlinebackup]
WHEN "Online Security" THEN [Onlinesecurity]
WHEN "Tech Support" THEN [Techsupport]
WHEN "Device Protection" THEN [Deviceprotection]
END)
```

END))
    b. Click Ok.
24. In the Data Panel: Drag the “WCase” variable to Columns.
25. In the Data Panel: Drag the variables, “Gender” and “Churn” to Rows
26. In the Data Panel: Drag the variables “State” and “Internet Service“ to the Filter panel.
27. In the Data Panel: Drag the variable, “Gender” to the Marks Panel: Color
    a. Format the Marks for color.
        i. In the Marks Panel: Click “Color” and select Edit Colors.
        ii. Select the “Colorblind” Palette from the dropdown.
        iii. Click the “Female” value from the Data Item Panel and Select the “Brown #C85200” color in the palette.
        iv. Click the “Male” value from the Data Item Panel and Select the “Blue #1170AA”.
        v. Click the “Nonbinary” value from the Data Item Panel and Select the “Light Orange #FFBC79”.
        vi. Click OK.
28. In the Data Panel: Drag Tenure to the Marks Panel: Tooltip.
    a. Click the Down Arrow to change Measure.
    b. Toggle to “Measure: Sum “
    c. Select “Average”
29. In the Marks Panel: Click “Label”
    a. Make sure that “Show marks labels” is checked.
    b. Change Font to Tableau Book, Size 14 font, Bold and Select Automatic.
    c. Change Alignment to Center and Middle.
30. In the Marks Panel: Click Tooltip
    a. Type “months” after <AVG(Tenure)>
    b. Change “WCase” to “# of Customers with”
        i. After “# of Customers with” Insert “Measures” Parameter
31. Navigate to the Title, using the dropdown arrow Click Edit Title.
    a. Remove <Sheet Name>
    b. Type in “WGU Addon”
    c. Highlight “WGU Addon” and Change the following:
        i. Font: Tableau Light
        ii. Font color: Blue #1170AA
        iii. Center Alignment
        iv. Font Size 14
        v. Bold and Underline
32. Format the Rows
    a. Use the dropdown on “Gender” and Navigate to Format.
        i. In the Format panel: Default Font change the following attributes.
            1. Font: Tableau Book
            2. Font Color: Blue #1170AA
            3. Font Size: 10
    b. Use the dropdown on “Churn” and Navigate to Format.
        i. In the Format panel: Default Font change the following attributes.

1. Font: Tableau Semibold
2. Font Color: Brown #C85200
3. Font Size: 12

33. Remove the Column header.
    a. Right-Click “WCase” along the bottom axis
    b. Uncheck “Show Header”
34. In the Data Panel under Parameters: Right-Click the Measures
    a. Toggle and Select Show Parameters
    b. Select the “Measures” parameter card.
        i. Click the dropdown arrow and change the list view to Single Value List.
35. Change Worksheet view from “Standard View” to “Entire View”.
36. Right-click the “WGU Addon” sheet and Click Duplicate.
37. Right-click “WGU Addon(2)” sheet and Click Rename.
    a. Rename the sheet to “IBM Addon”.
38. Overwrite the WGU variables in the sheet with the IBM equivalent.
    a. Drag the “ICase” variable to Columns, overlapping the previous “SUM(WCase)”
39. If formatting was lost, format the sheet to match “WGU Addon” by following the following steps.
    a. Repeat Step 27, excluding 35a, section v. for Nonbinary.
    b. Repeat Step 33 for “ICase”
40. Click on New Worksheet.
41. Right-click “Sheet 5” to rename. Rename to “Map of Mthly Chrg”
42. In the Data Panel: Right-Click “ State” and select Add to the sheet.
43. Change the Marks type to “Map” in the Marks Panel.
44. Change “State” from the Marks: Detail category to Label by dragging to the Marks: Label.
45. Drag the “Source” and “State” variables to Filter.
46. Drag “Source” to Pages.
    a. Add Filter to Pages.
        i. Dropdown arrow on “Source”
        ii. Toggle to Show Filter
        iii. On the right side of the screen Source Filter will appear.
            1. Dropdown arrow on filter.
            2. Customize and Uncheck the following: Show Page Slider, Show Playback Controls, Show History Controls
47. Drag the “Monthly Charge” variable to Color.
    a. Change the default calculation from SUM to Average.
        i. Dropdown arrow on “SUM(Monthly Charge)”
        ii. Toggle to “Measure: Sum”
        iii. Toggle to “Average”
    b. Format Numbers
        i. Dropdown arrow on “AVG(MonthlyCharge)”
        ii. Format
            1. Under the “Scale” subsection in Axis

            a. Change Numbers format from Automatic to Currency (Standard)
        2. Under the “Default” subsection in Pane
            a. Change Numbers format from Automatic to Currency (Standard)
    c. Format Colors
        i. In Marks Panel: Color Click Edit Colors
            1. Select Palette as Custom Diverging
                a. Select the left Color as “Brown #C85200”.
                b. Select the right Color as “Blue 5FA2CE”.
                c. Select Stepped Color “8” Steps
                d. Select Start: 150, End: 200
                e. Click Ok

48. Format Tooltip
    a. In the Marks Panel: Click Tooltip
        i. Highlight all text.
            1. Change Font Size to 12.
        ii. Highlight “State:”
            1. Change Font Color: Dark Gray #57606C.
        iii. Highlight “<State>”
            1. Change Font Color: Brown #C85200
        iv. Change “Avg. Monthlycharge” to “Avg. Monthly Charge“
            1. Highlight “Avg. Monthly Charge: <AVG(Monthlycharge)> “
                a. Change Font Color: Dark Gray #57606C.
                b. Click Ok
49. Navigate to the Title, using the dropdown arrow Click “Edit Title”.
    a. Remove <Sheet Name>
    b. Type in “Average Monthly Charge per State”
    c. Highlight “Average Monthly Charge per State” and Change the following:
        i. Font: Tableau Medium
        ii. Font color: Gray #7B848F
        iii. Center Alignment
        iv. Font Size 14
50. Click on New Worksheet.
51. Right-click “Sheet 7” to rename. Rename to “AllCustomers”
52. In the Data Panel: Navigate to the Dropdown menu next to the Search field.
    a. Click and select Create Calculated Field.
    b. Rename Calculation to “ActiveAll”
    c. In the main body text field: type the following:
       SUM(IF [Churn] = "No" THEN 1 ELSE 0 END)
    d. Click OK
53. In the Data Panel: Navigate to the Dropdown menu next to the Search field.
    a. Click and select Create Calculated Field.
    b. Rename Calculation to “ChurnAll”
    c. In the main body text field: type the following:
       SUM(IF [Churn] = "Yes" THEN 1 ELSE 0 END

d. Click OK

54. In the Data Panel: Drag the “wgu_temp(Count)” variable to Marks Panel: Label
    a. Format Label
        i. Click the Label Category in the Marks Panel
            1. Select the “…” after the Text field.
                a. Highlight all text and change font features.
                    i. Font: Tableau Light
                    ii. Font Size: 16
                    iii. Bold
                    iv. Font Color: Blue #5FA2CE
                    v. Center Alignment
                b. Before the “<CNT(wgu_temp)>”; Type: “Total of”
                c. Hit Enter to bring “<CNT(wgu_temp)>” to a new line.
                d. After the “<CNT(wgu_temp)>”; Hit Enter to start a new line and Type: “Customers”.
                e. Change the font features of “Total of” and “Customers”.
                    i. Font Size: 14
                    ii. Remove Bold from the text.
                f. Click Ok
            2. Alignment, Select Center and Middle
55. In the Marks Panel: Click Tooltip
    a. Format Tooltip
        i. Change “Count of wgu_temp” to “Total # of Customers”
        ii. Click Ok
56. Change Worksheet view from “Standard View” to “Entire View”.
57. Right-click the “AllCustomers” sheet and Click Duplicate.
58. Right-click the “AllCustomers (2)” sheet and Click Rename.
    a. Rename the sheet to “ActiveCustomers”.
59. Drag the “ActiveAll” variable to overlap the “CNT(wgu_temp)” in the Marks panel.
60. In the Marks Panel: Click Label
    a. Format Label
        i. Select the “…” after the Text field.
            1. Highlight all text and change font features.
                a. Font Color: Brown #C85200
            2. Before “Customers” type “Active ”
61. In the Marks Panel: Click Tooltip
    a. Format Tooltip
        i. Change “Active All” to “ Total # of Active Customers”
        ii. Click Ok
62. Right-click the “ActiveCustomers” sheet and Click Duplicate.
63. Right-click the “ActiveCustomers (2)” sheet and Click Rename.
    a. Rename the sheet to “ChurnCustomers”.
64. Drag the “ChurnAll” variable to overlap the “AGG(ActiveAll)” in the Marks panel.
65. In the Marks Panel: Click Label
    a. Format Label

        i. Select the "…" after the Text field.
            1. Highlight all text and change font features.
                a. Font Color: Dark Gray #57606C
            2. Change "Active Customers" to "Customers have Left".
            3. Click Ok
66. In the Marks Panel: Click Tooltip
    a. Format Tooltip
        i. Change "Total # of Active Customers" to " Total # of Customers that Left".
        ii. Click Ok
67. Click on New Worksheet.
68. Right-click "Sheet 9" to rename. Rename to "GenderAll"
69. In the Data Panel: Drag "Gender" to Columns
70. Drag the "CNT(wgu_temp)" variable to Marks Panel: Label
71. Drag the "Gender" variable to Filters Panel
    a. Select All
    b. Click OK
72. Drag the "Gender" variable to the Marks Panel: Color
73. Underneath the Title, Right-click on the Field label name "Gender" and "Hide Field Labels for Columns".
74. In the Marks Panel: Click Label
    a. Change Alignment to Middle Center
    b. Click on the "…" after the Text field.
        i. Highlight all text and increase the font size to 14.
75. In the Marks Panel: Click Tooltip
    a. Change "Count of wgu_temp" to "Total # of Customers"
76. In the Columns: Click the dropdown arrow in Gender and Select Format.
    a. On the Format Panel: Select the Header tab.
        i. Change Default Font to Font Size 12
77. Click on New Dashboard
78. Right-Click on "Dashboard 1" to rename. Rename to "WGU vs IBM".
79. In the Dashboard Panel: Change Size to Automatic.
80. In the Objects Panel: Select Vertical Container and Drag it into the Dashboard.
    a. Repeat this step until you have "3" Containers one on top of the other signifying 3 separate rows.
81. Drag "GenderAll" to the dashboard and place it into the Top Vertical container.
    a. Right-Click and Hide Title
82. Drag "AllCustomers" to the dashboard and place it to the right of "GenderAll" in the Top Vertical container.
    a. Right-Click and Hide Title
83. Drag "ActiveCustomers" to the dashboard and place it to the right of "AllCustomers" in the Top Vertical container.
    a. Right-Click and Hide Title
84. Drag "ChurnCustomers" to the dashboard and place it to the right of "JoinedActive" in the Top Vertical container.
    a. Right-Click and Hide Title

85. Drag “WGU Distro” to the dashboard and place it in the Middle Vertical container.
86. Drag “IBM Distro” to the dashboard and place it to the right of the “WGU Distro” in the Middle Vertical container.
87. Drag “Map of Monthly Charge” to the Dashboard and place it in the Middle container to the right of “IBM Distro”.
88. Remove the Legend Card for Gender by clicking the “X” on the Right side of the card.
89. Change the Legend cards for “Churn” and “Avg. Monthly Charge” to Floating. Move them into the third container while resizing the other items.
90. Resize WGU and IBM Distros to be the same size by using the mouse to drag arrows along the edges of each container.
91. Resize the Map to be slightly larger than the previous two.
92. Drag the Floating legend to their respective chart.
    a. The Churn legend for “IBM Company” and “WGU Company” should be placed in the whitespace on the right side of the IBM chart.
    b. The Avg Monthly Charge Legend for the map should be placed in the lower right corner of the chart.
93. Drag “WGU Addon” onto the dashboard placing it into the bottom vertical container.
    a. Remove the Legend Card for Gender.
        i. Select the Gender Card
        ii. Clicking the “X” on the Right side of the card.
    b. Place the Measures parameter to the right of the “WGU Addon”.
94. Drag “IBM Addon” onto the dashboard placing it into the bottom container to the right of “Measures”.
    a. Remove the Legend Card for Gender
        i. Select the Gender Card
        ii. Click the “X” on the Right side of the card.
95. Resize the charts to ensure all font is visible and “WGU Addon” and IBM Addon” are the same size.
    a. Format the “Measures” by clicking on the down arrow on each card and selecting “Format Parameters”.
        i. Change Title font to Tableau Medium, Size 14, Bold, Color: Blue #1170AA
        ii. Alignment: Center
        iii. Change Body Font to Tableau Book, Size 14, Color: Dark Gray #57606C
96. Add Filters to add Interactions between items.
    a. Click “Use as a Filter”  on the following items:
        - Gender All
        - WGU Addon
        - IBM Addon
        - Map of Monthly Charges
        - WGU Distro
        - IBM Distro

C5. Results of Data Analysis

The summarized results of the data analysis were noted in the following points.

1. The WGU telecommunication customers had a vastly different churn status spread in comparison to the IBM telecommunication customers.
2. The gender of the customers with the higher churn status for each add-on service was different for each company.
3. The monthly charge rate was higher for the internet service "Fiber Optic" in comparison to the internet service "DSL" across both companies.

The WGU telecommunication customers have a similar split of churn status across all of their internet service options. There were about 23% to 32% of customers that left the WGU company within the last month. The IBM company had a wider range of customers departure being between 7% to 42%. The IBM customers were localized to just the state of California. When reviewing the sampled WGU customers from just the state of California to provide an ideal comparison, it showed the percentage range was similar to their national percentage. It resulted in a 21% to 36% departure rate. The two companies had different internet services that were the front runners of customer churn. WGU had the highest churn rate in "DSL" with IBM being in the internet service, "Fiber Optic".

The gender of the customers with the higher churn status count was different for each company based on the additional service selected. In the WGU company, male customers had a higher churn status compared to other genders in all add-on services of online backup, online security, device protection, and tech support. In contrast, the IBM company showed that

females were more likely to churn with the add-on services of online backup, online security, and tech support.

Lastly, the average monthly charge for each internet service was higher for the internet service “Fiber Optic” in both companies. The WGU company was restricted to the state of California to capture a comparison. Customers were charged the most when selecting “Fiber Optic” for an average charge of $189.74 per month. It was followed closely behind by “DSL” with an average charge of $169.44 per month. With the IBM company, although “Fiber Optic” had the highest monthly charge of $91.50 per month, there was a larger price gap with “DSL”. The internet service “DSL” had a monthly charge of $58.10 per month, which was about a $33 per month difference. Overall, the cost breakdowns on average were better marketing-aligned with IBM. It was a noticeable $30 or more difference in the pricing tier. The faster services such as “Fiber Optic” in the highest bracket, the lower service of “DSL” in the lower tier, and the lack of internet service, “None”, in the lowest tier. The WGU company had the pricing for the “Fiber Optic” and “DSL” services oddly priced. The differences in the pricing tiers varied from tier to tier. There was about a $20 difference from the highest tier to the middle tier and around a $10 difference from the middle to the lowest. This was not an ideal sales strategy as there is an enormous difference in internet download speed between the tiers. Fiber Optic was considered the fastest internet speed with a download speed of 250-1000 Mbps (DSL vs Cable vs Fiber: Comparing Internet Options, 2023). The DSL service had a download speed of 5 -35 Mbps (DSL vs Cable vs Fiber: Comparing Internet Options, 2023).

These points supported executive decision-making. The churn percentage rate for the WGU company provided insight into if the internet service selection was a key attribute in churn

status. Another point of support would be the difference in monthly charges based on the internet services. The comparison between the two companies could guide the sales team to evaluate the pricing brackets for each internet service. Another guidance would be for the marketing team in terms of customer retention. The observance that males had a higher churn rate in all add-on services could help target this gender in retention efforts.

C6. Limitations of Data Analysis

There was a limitation to the data analysis of the WGU and IBM telecommunication companies. The WGU company was based on a national view of the company whereas the IBM company was localized to just a specific state. This led to interpretation skew if the company was just utilizing the WGU customer information on one specific state in a one-to-one comparison. The particular state may not provide an overall picture of the customer alignment and churn status to provide an accurate comparison. The sample sizing would be too small to make a strong analysis of the data.

D. Third-Party Web Sources

There were no third-party web sources used to acquire data or segments of third-party code to support the analysis. All code was original work.

E. References

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