PERFORMANCE MANAGEMENT DASHBOARD

A Power BI Dashboard for Employee Management

Target Users

The project intends to build a dashboard that can be used by different stakeholders at an organization. I have developed several dashboards based on the intended user need.

- Employee Management: Intended for Management (CEO/Directors/Managers)
- Employees: Intended for Employees as well as Management
    - Client Management: Detailed analysis of Clients intended for Employees
    - Performance Management: Detailed performance statistics of Employees

POWER BI VISUALIZATIONS

Visualizations are an essential aspect for any business. In fact, there are numerous tools available in market for developing insightful visualizations that can aid in business decision making process. Microsoft has been the leader in providing the most versatile BI tool i.e., MS Excel that has been in market for 35 years and still is the most important tool for many domains of an organization. As there have been rapid advancements in technology over the last decade, especially focussed on Data Science & Analytics, Microsoft has come up with yet another suite of Business Intelligence, Reporting, and Data Visualization products & services for individuals as well as teams known as Power BI.

About Power BI

Microsoft Power BI is a business intelligence platform that provides non-technical business users with tools for aggregating, analyzing, visualizing, and sharing data. Power BI's user interface is intuitive for users familiar with Excel and its deep integration with other Microsoft products makes it a very versatile self-service tool that requires little upfront training.

Microsoft says,

"Power BI is a business analytics solution that lets you visualize your data and share insights across your organization or embed them in your app or website."

Power BI offers various variants based on type of organization & requirements. Below is brief description that can help decide which version best works for an organization. Since I have a free version of Power BI desktop with Power Bi Service only, I am restricted in terms of some of implementations. These are discussed in Future Work section

Power BI service

Power BI service [1] is a secure Microsoft hosted cloud service that lets users view dashboards, reports, and Power BI apps. It enables access to visualizations via internet. Power BI Apps are a type of content that combines related dashboards and reports that can be viewed using a web browser or via mobile apps for Windows, iOS, and Android.

Power BI Desktop

Power BI Desktop [2] is a free, self-service data analysis and report authoring tool that can be installed on a Windows computer only (no support for Mac). It can connect to more than 70 on-premises and cloud data sources to turn information into interactive visuals. Reports are produced in Desktop application and are made available to the Power BI service by publishing them.

In Power BI Desktop, users can:
- Connect to data
- Transform and model the data
- Create charts and graphs
- Create reports and dashboards that are collections of visuals
- Share reports with others using the Power BI service

There is also Power BI Report Server for companies that must maintain their data and reports on premises. That version of Power BI requires a special version of the desktop app -- aptly called Power BI Desktop for Power BI Report Server.[3]

Power BI Report Server

Report Server [3] is an on-premises report server. You can create reports in Power BI Desktop or Pro, and viewers can use Report Server to access those reports on a web browser or mobile device, or they can receive them as an email. Report Server would be useful for a company that has restrictions on cloud usage.

Power BI Pro

Power BI Pro [4] is cloud-based software that comes with a monthly fee of $12.8 per user. The biggest difference between Power BI Desktop and Power BI Pro is the ability to collaborate with other Power BI users and distribute reports and visualizations to other Power BI subscribers across the organization.

With Power BI Pro, users can:
- Embed Power BI visuals into Power BI apps
- Integrate with other Microsoft solutions, such as Azure data services
- Share data, dashboards, and reports with other Power BI users
- Create workspaces — places to collaborate with colleagues to create collections of dashboards and reports. This is a very important utility as it makes working in teams seamlessly efficient.
- Enable peer-to-peer sharing — a way to share published dashboards or reports with people outside the organization who have a Power BI Pro license

Power BI Premium

Unlike Power BI Desktop and Pro, Power BI Premium [5] is not an application. Premium gives an organization space and capacity in a Microsoft-hosted cloud to share reports. An organization can choose how to apply its dedicated capacity by allocating it based on the number of users, workload needs, or other factors — and scale up or down as needed.

With Power BI Premium users have:

- Flexibility to publish reports across an enterprise, without requiring recipients to be licensed individually per user
- Greater scale and performance than shared capacity in the Power BI service
- The ability to maintain BI assets on-premises with Power BI Report Server
- One API surface, a consistent set of capabilities, and access to the latest features for embedded analytics

Note: Pro and Premium considerations
If your organization has many people who create reports and visualizations, and who don't share information often, a Pro subscription may be sufficient. However, if you must share the information both inside and outside of your organization, you'll need a Premium subscription. Power BI Premium is priced based on the number of virtual cores Microsoft dedicates to the service.

Power BI Mobile & Embedded

Power BI has mobile apps [6] for iOS, Android, and Windows 10 mobile devices that let users connect to and interact with data. Power BI Embedded [7] allows developers to embed Power BI dashboards and reports into other applications, either within their own organization — which requires users to sign into a Power BI account — or in an application for a client or customers who don't have a Power BI account.

A comparison between these variants & corresponding latest pricing details can be found here.

Power BI Data Connections

The Power BI provides support for a variety of data types to be used as source. As discussed above, the data extracted from PSS Tool can either be consumed as a flat file (csv, excel) or can be dumped to a SQL server which can be connected with Power BI. Both the methods enable periodic refresh of the data such that the visualizations are in-sync with the latest information about Employee's meetings. The Data connections are easy to setup in Power Bi. We have explained the process of loading & maintain data from flat files as well as database sources.

Processed Flat Files Connection

The flat files are static files such as CSV, EXCEL, TXT etc. The data can easily be loaded using these files in Power BI. We loaded the pre-processed data we obtained using Python script to develop the dashboard

Caveat: This file currently resides on the local system and gets updated every time the python script is scheduled to run. Clients need to setup this scheduled job on their system for updating the flat file on periodic intervals.

Improvement: These files can also be maintained online by setting up the Python Script to upload the files to shared one drive location. The Power BI can then be connected to these online files that reside on OneDrive. Since this implementation required paid version of O365 & Power BI, we could not implement this functionality.

We performed the following steps to connect the processed files to Power BI. The same steps can be followed to connect more data sources in future as well.

Step 1: Open a Power BI report to which you want to connect the data. You can either load an existing report or create a new one.
To create a new report, Open Power Bi Desktop and Click on File > New.
To Open an existing one, Click on File > Browse Reports and select an existing report from local.
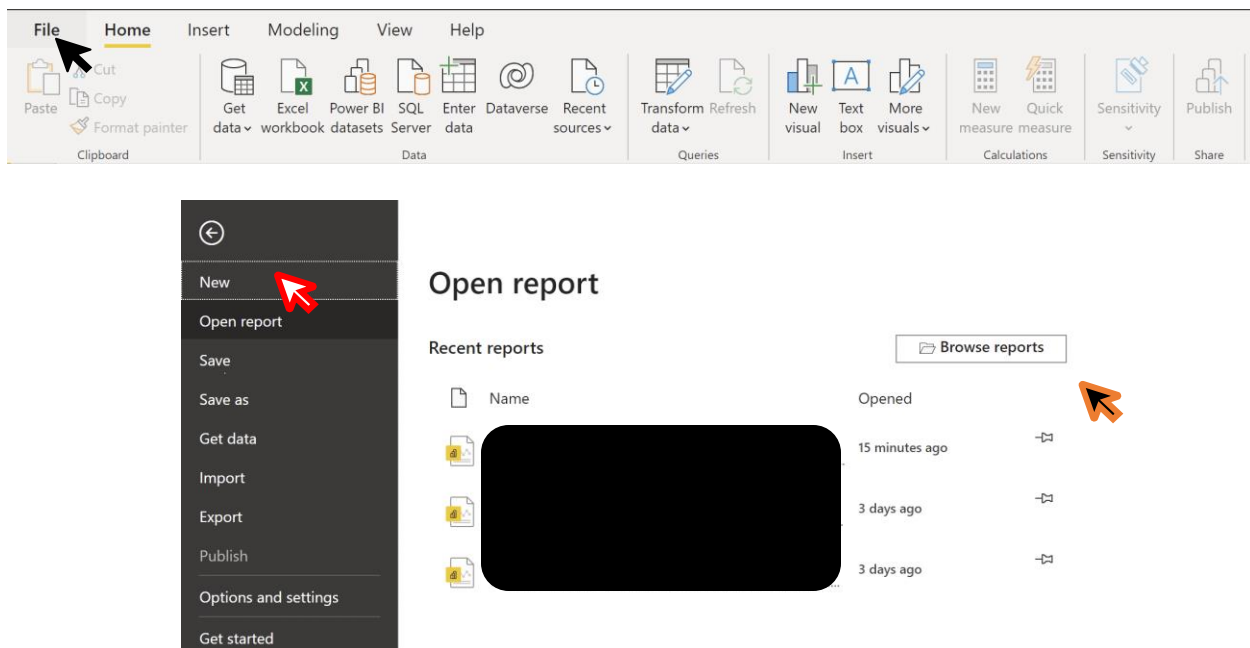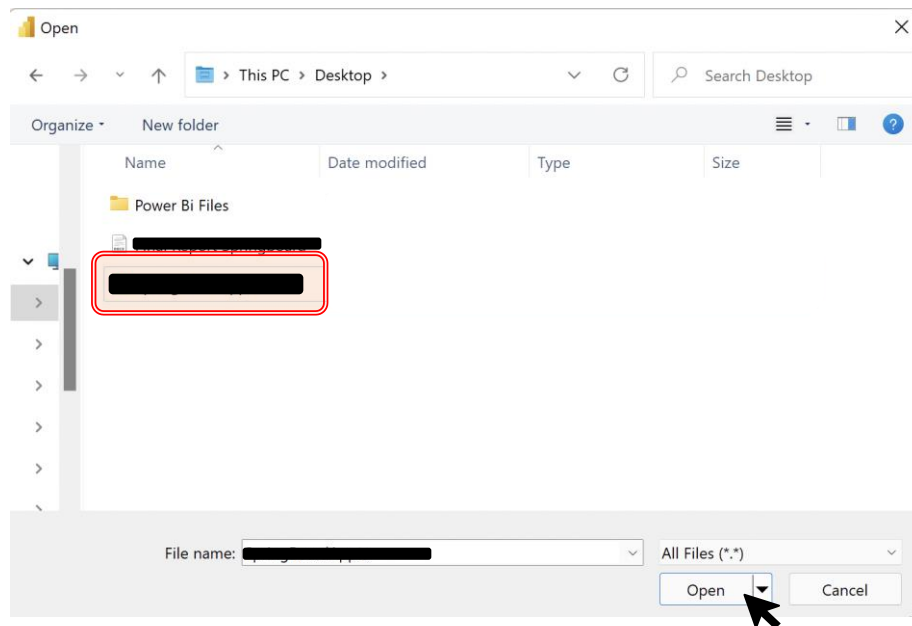

**Step 2**: From **Data Pane** in the 'Home' ribbon, click on '**Get Data**'
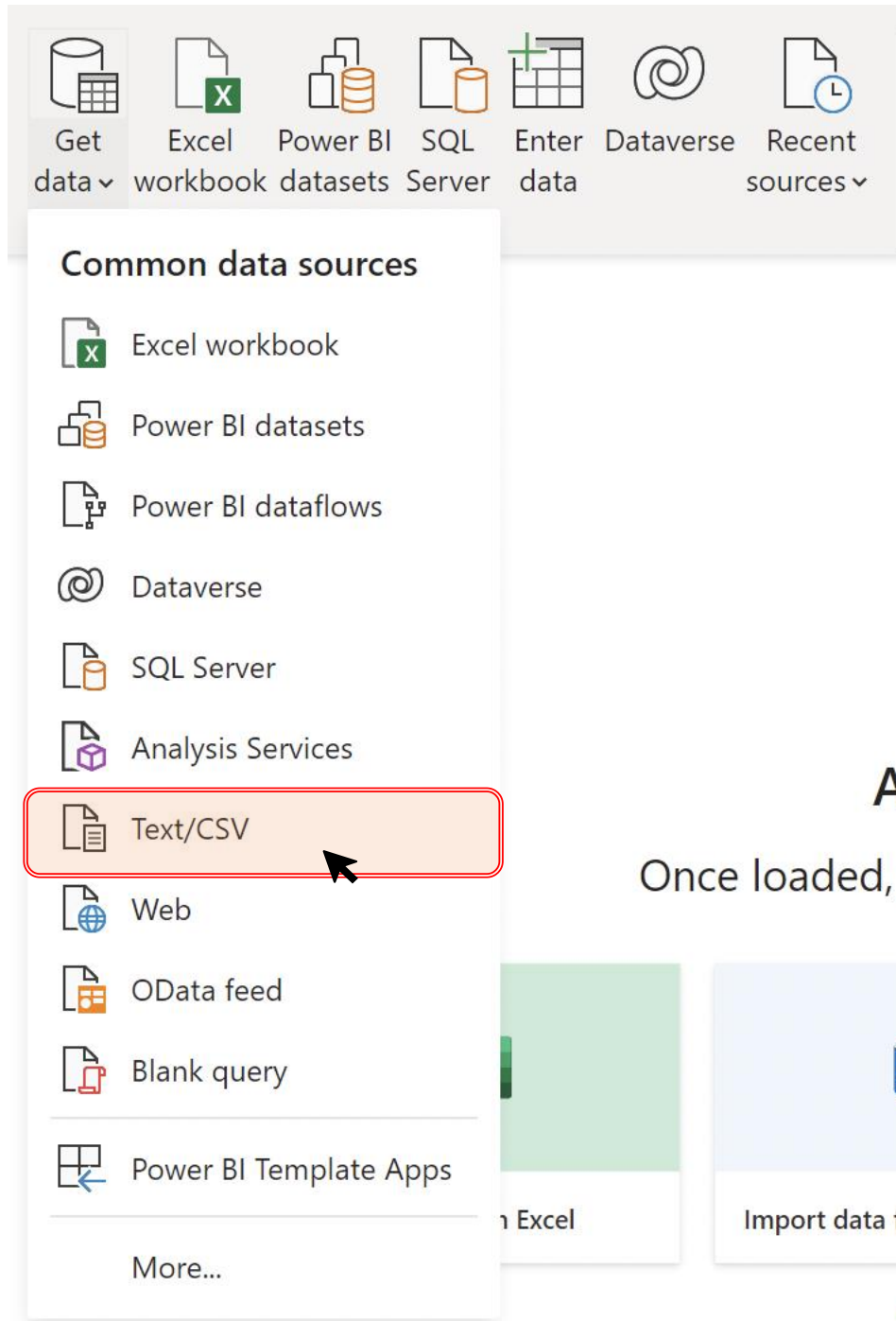
Here you can see a variety of Data Sources you can connect to. Since the files we generated using Python scripts were CSV files, we selected the **Text/CSV** option from the above drop-down.

Step 3: Choose the file from local directory that is to be connected to report.

Step 4: Load or Transform Data

Power BI functionality of an ETL tool as it allows you to transform data within the application. It means that you can perform cleaning, transformation etc. within Power BI and get rid of the code aspect of loading the data altogether. Since in this project, the data had variety of quality issues as discussed in this section, we kept the code aspect as it was essential to load a cleaner data to Power BI.
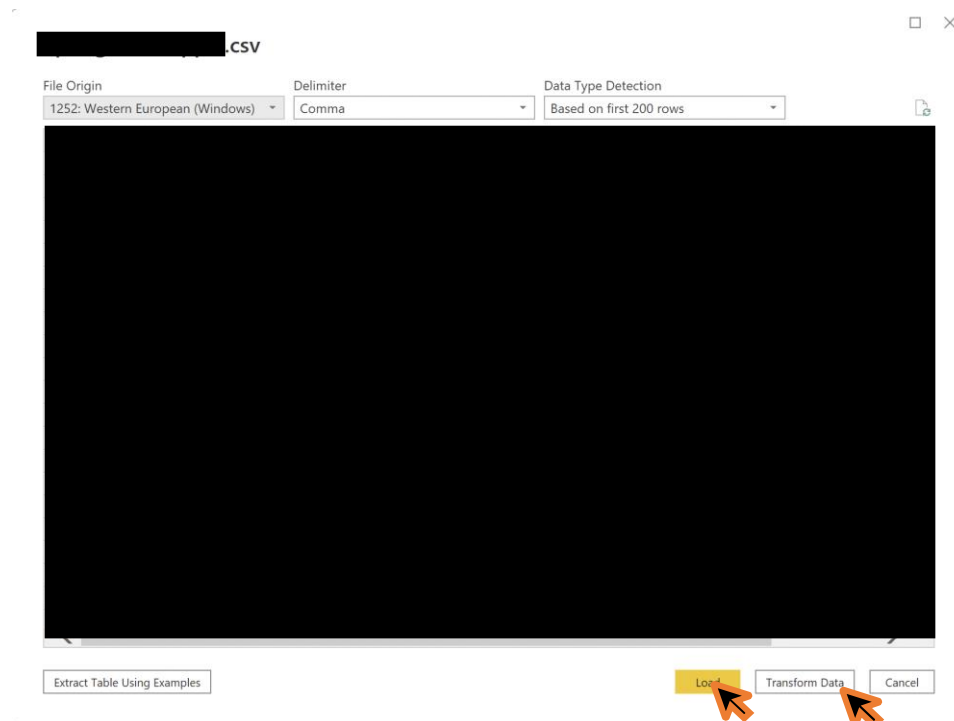

Here you can set the file delimiter (in this case it is comma) if it is not loaded automatically or is incorrectly detected.

Step 5: Transforming Data

If you selected the Transform Data option in the above step (like we did), Power BI loads the data in **Power Query Editor** which is an excellent utility offered by the application. This editor is itself a complete BI tool like MS Excel.

From the top ribbons you can find numerous operations that can be performed on the data:
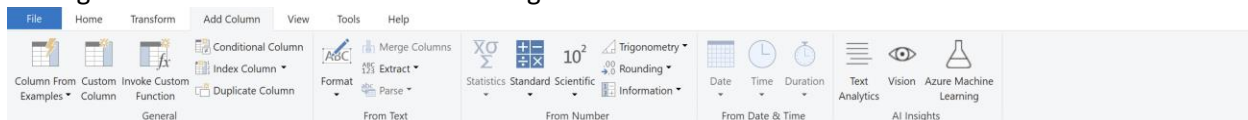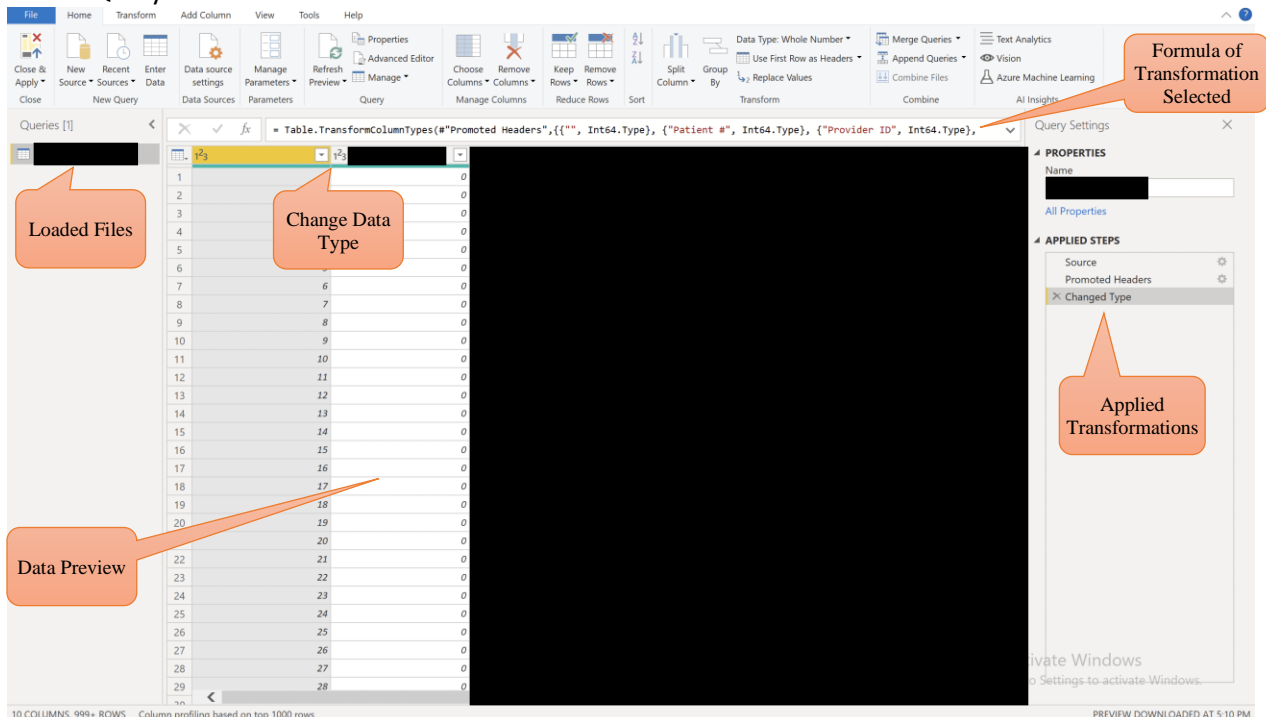
Basic Operations:
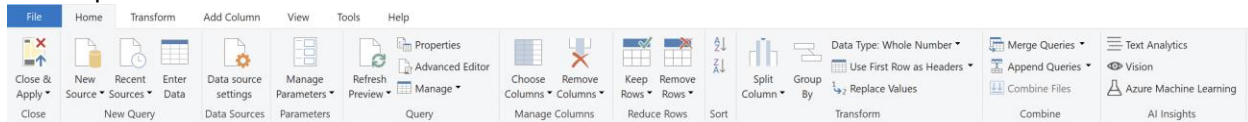
Transformations on Existing Columns:
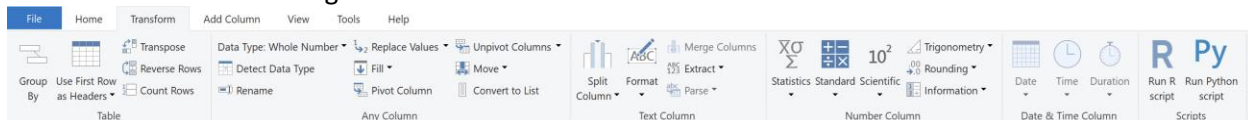
Adding New Columns or Derive from Existing:

Power Query Editor Panes:

The format of each column is pre-loaded based on first 1000 rows. But if you found invalid, can easily be modified by clicking on datatype icon adjacent to each column name (as shown above). We applied the following transformations to data loaded to Power BI.

APPLIED STEPS		
Source	⚙	Performed By Power BI Automatically when loads the data
Promoted Headers	⚙	
Changed Type		
Inserted Division	⚙	Inserted a new column dividing the duration by 60
Renamed Columns		Renamed the Column to Duration_Hours
Inserted Date	⚙	Inserted a Date Column from DateTime
Changed Type1		Inserted a New Column for Week of Month
Inserted Year	⚙	Inserted a year Column from Datetime
Inserted Month	⚙	Inserted a Month Column from DateTime
Inserted Month Name	⚙	Inserted a Name of the Month column
Merged Queries	⚙	Merged data with another data
Expanded ▮▮▮▮	⚙	Added column from another Table merged
✕ Inserted Time	⚙	Added a new column for Time

Step 6: Click on Close & Apply to apply the transformations performed and close the Power Query Editor.
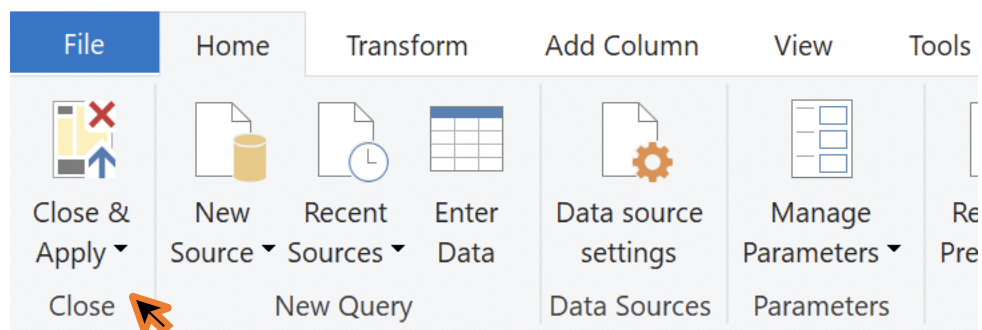

Similarly, all the other files are loaded to Power BI.

PostgreSQL Database Connection

PostgreSQL DB is used as the Database platform to preview the Relational Database-loaded dashboard. The database is easy to use with variety of features and integrates efficiently with Python as well as Power BI. The choice of using a particular DB other than PostgreSQL resides with Company as the same process mentioned here can be extended to any other database variant. We have also provided the complete SQL file to generate the database and the python scripts also include the code to load the database with latest data.
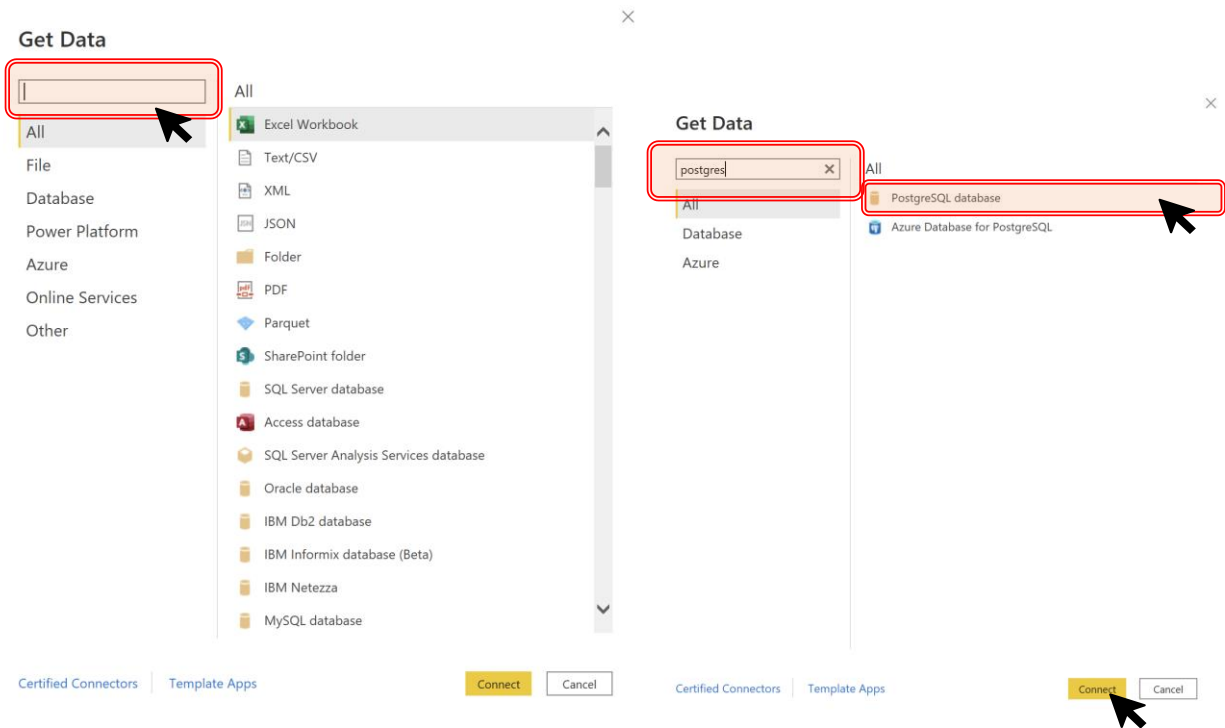
We performed the following steps to connect to PostgreSQL DB:

Step 1: Follow *Step 1* from previous section and then from **Data Pane** in the 'Home' ribbon, click on '**Get Data**'
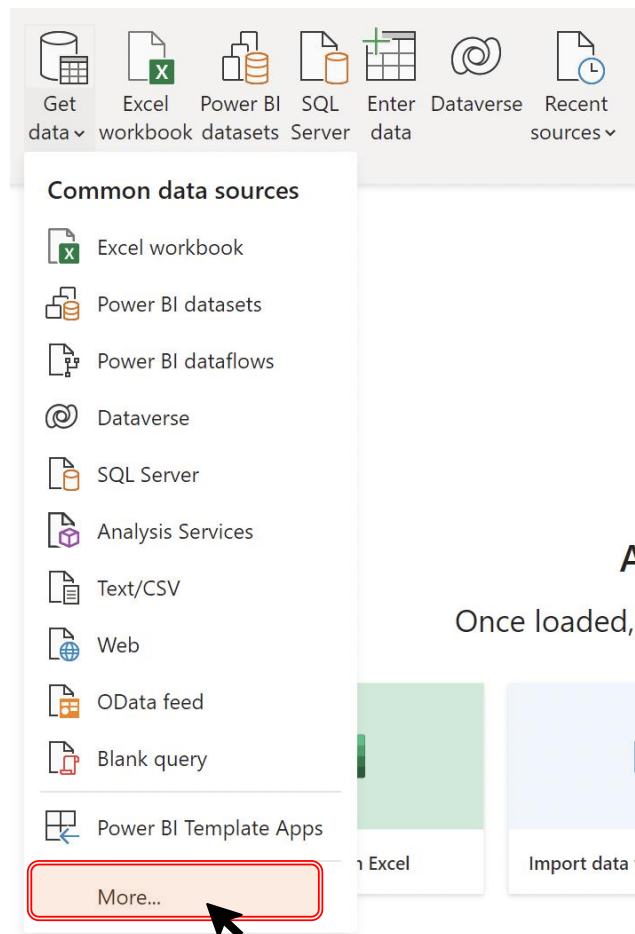
Click on **More…** to open exhaustive list of data source options.

Step 2: Here in the search bar, type **Postgres** and select PostgreSQL database option. Click on Connect.

Step 3: Enter the Server and Databse information in the configuration dialog box. Since, we used a local server for running postgres, we have entered the IP address of locahost. Also, we have created a database for storing data.

There are two modes to load data from DB in Power BI. The Import mode captures a snapshot of data and loads a copy while Direct Query doesn't maintain a local copy, instead, it queries the actual source every time a used interacts with dashboard (also after every 15 mins which can be configured). Use this guide [8] to select optimal option as per database backbone setup. We used the Import option.

Step 4: Enter credentials for connecting to database. Since we are using a local database, we used the default user 'PostgreSQL' and corresponding password. Also, select the database 'name of db' from level dropdown. Click on '**Connect**' to continue.

Step 5: Navigator dialog opens showing all the tables under database. You can select the table you want to load and follow the steps from **Step 4** of previous section.


Note: The PostgreSQL connection requires additional drivers installed on the system. Please refer to this guide to install them prior to connection. [9]

Power BI DB Modelling

Power BI provides **Model View** which can be used to manage the data model of the table loaded to report. As most business do not have a Database backend and work using flat files, Model View provides them to define data model, relationships etc. without a Database backend.

As you load data to Power BI, it creates tables, and these tables get loaded on Model View. By default, Power BI opens in "Report View". To open the Model View, click on the relationship icon from left pane as shown:
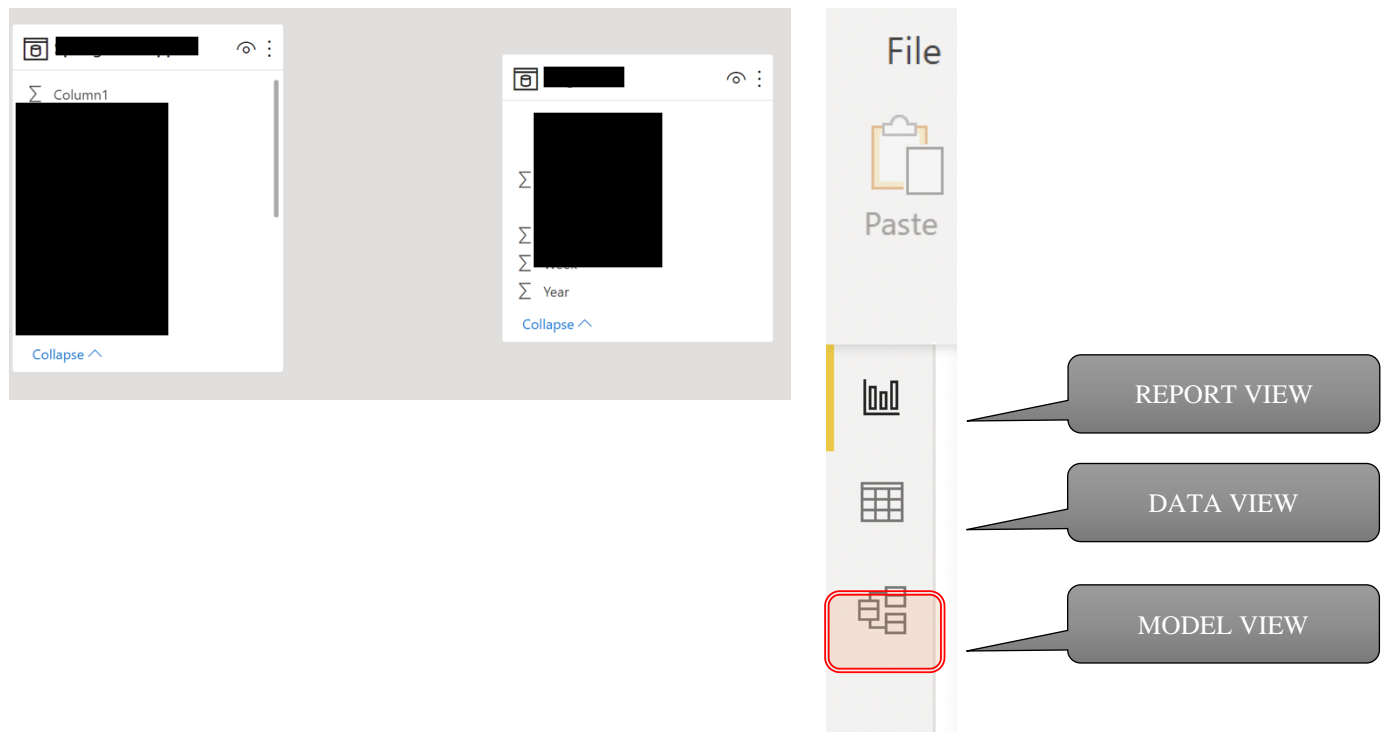
Initially, the tables loaded in Model View are separate without any relationships. One can define relationships by selecting a field from one table and dragging it to another table. You also get option to define type of relationship i.e., One-to-One, Many-to-One and Many-to-Many.

Based on our understanding of data, we defined relationships and developed a Data Model as shown below. The Model follows partially a Star Topology design where there is a fact table and others are Dimension tables. Dates table is created inside Power BI itself. Use this guide to understand about importance of Dates table in Power BI [10]
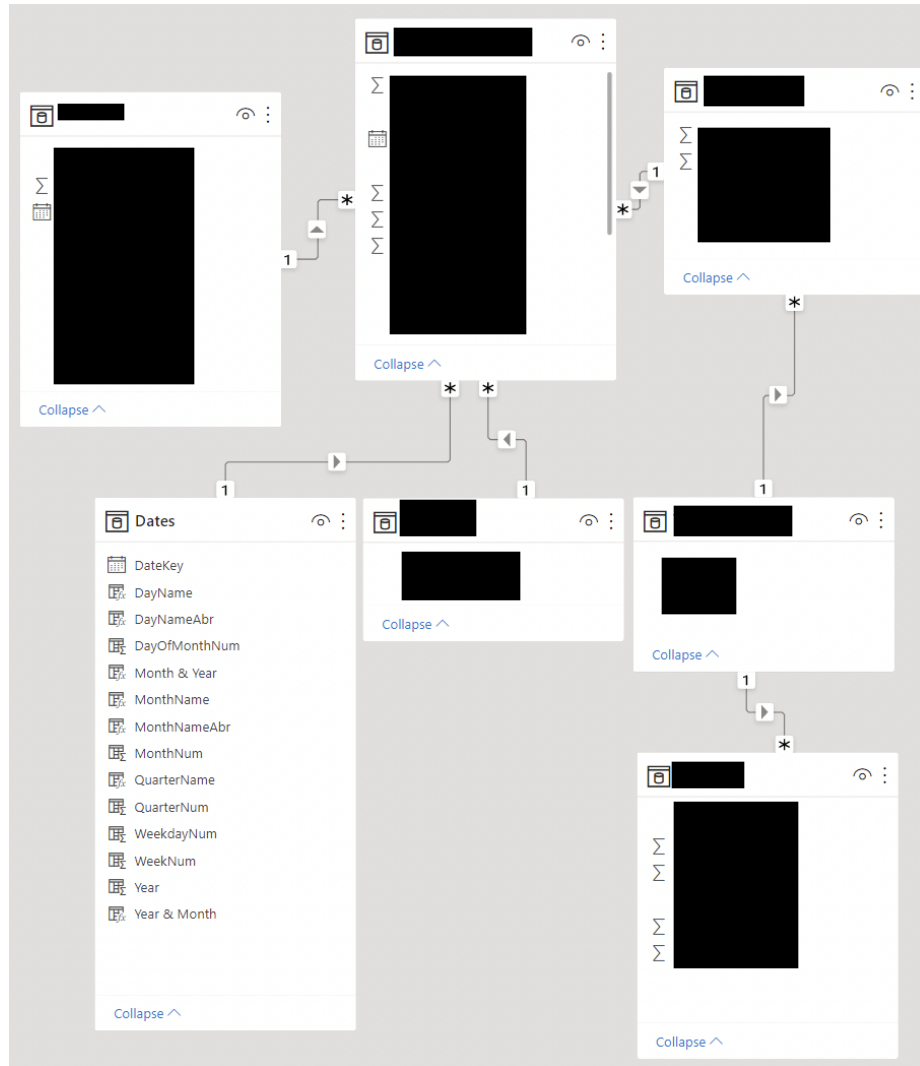
Dashboard Walkthrough

We developed 5 reports for this project to cover every metric possible from the available data. The Power BI uses the term 'Report' to describe the dashboards. This is because these are detailed descriptions of a particular aspect. Power BI provides an option to select some specific visuals from reports to be displayed as an 'Overview' on 'Dashboard'.

Two of the reports developed are based on intended user. 'Employee Management' report is intended for management as they can look at overall statistics of employees, their performance, and other metrics. 'Employees report is intended for individual employees to view their own performance, manage clients, and compare their current state with past performance. Client Management & Performance management are extended reports for employees to get detailed statistics & information.

Note: Due to limitation of license of Power BI available, we have added an option to select employees on these reports. An intended use should be to limit access to individuals' data only while management has full access. This can be implemented using RLS as explained in Future Work
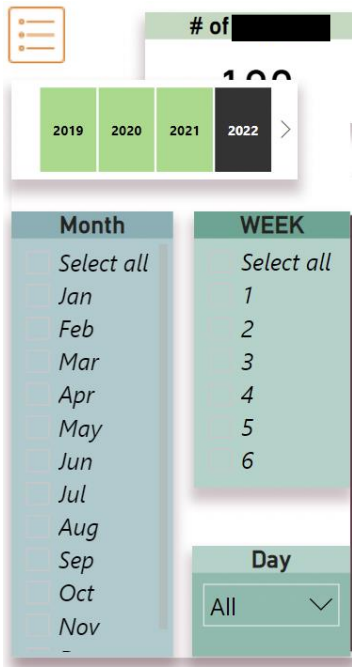
Employee Management
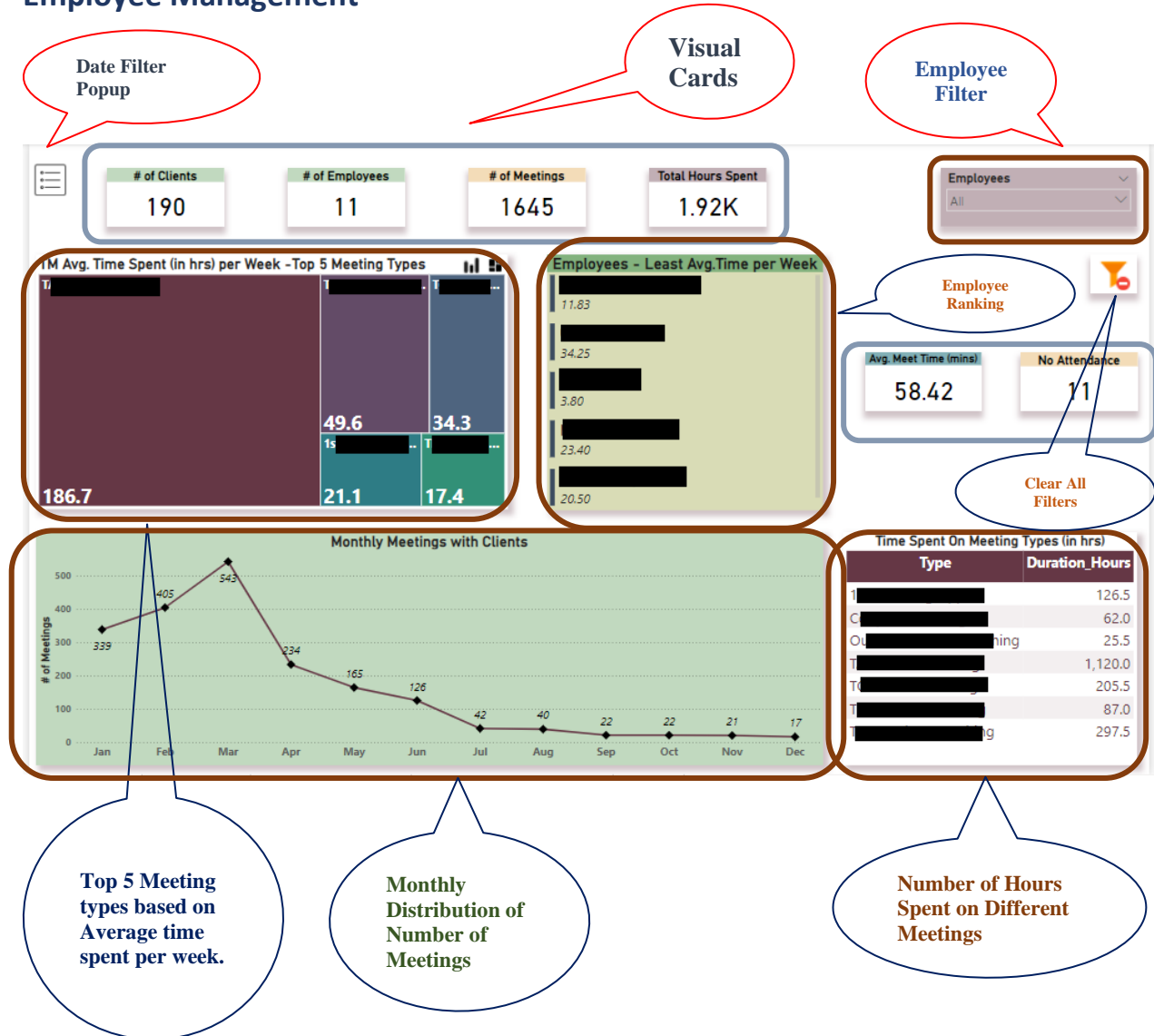
The above displayed report consists of following elements:

- **Date Popup Filter**: This button is used to open Date Filter. We added this element to save space on dashboard for relevant visuals. This has been implemented using Bookmarks feature of Power BI.

 Once it is ctrl+clicked, the following filters popup:

This filter enables user to select a combination Year, Month, Week and Day to filter the entire dashboard. The year filter is scrollable such that on addition of future years of data, the arrow it its right corner can be used to select other years.

You can close the popup by again pressing ctrl+click on orange menu button.

- **Value Cards**: These cards display major overall values of various metrics
  - *# Of Clients*: Number of Distinct Clients based on filters. It helps in getting a quick view on total clientele.
  - *# Of Employees*: Number of Employees who handled meetings based on filters. This provides an insight into number actively involved employees.
  - *# Of Meetings*: Number of Meetings made during the time based on filters. This number can help to understand the current workload on employees.
  - *Total Hours Spent*: Total number of hours spent on all meetings combined based on filters. This gives an insight into which meeting types are common and consume most of the time of employees.
  - *Average Meet Time (mins)*: Average duration in minutes spent on meetings based on filters selected.
  - *No Attendance*: Total number of no-attendance meetings in the time period selected via filters. It helps in digging deeper into why clients are not showing up.

- **Employee Filter**: This filter provides user with accessibility to select one or more employees to filter the visuals on report.
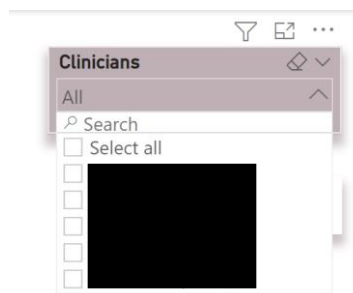
- **Employee Rankings**: Based on duration of meetings handled, the bottom 5 employees with least time spent on meetings. Changes based on filters selected. It can give an insight into employees who are low performers and how can be helped to improve.
Employee Filter does not apply.

- **Total Duration by Meetings(hours)**: Amount of type spent in hours on each meeting type in hours. The details change based on filters.

- **Average Duration (hours) per Week by Type – Top 5**: The top 5 meeting types on which the average duration spent weekly in hours is highest. The values change based on filters selected. Since the visual is treemap which is difficult to read for some users, we have added buttons to change this visual to bar graph. It helps in understanding the weekly statistics of different meeting types. It can help to distribute employees time to different type of meetings.
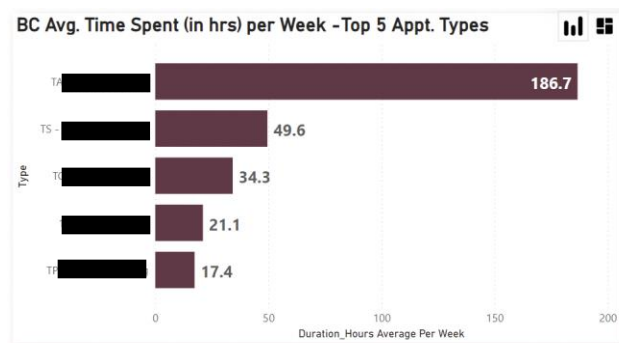
- **Monthly Meetings**: Trend of Number of Meetings made over a year for different months. Changes based on Years & Employees Filters. It provides an insightful look into yearly performance. It can be extended to show future predictions.

- **Clear All Filter**: This button clears all the filter i.e., date as well as employees and reset the report.
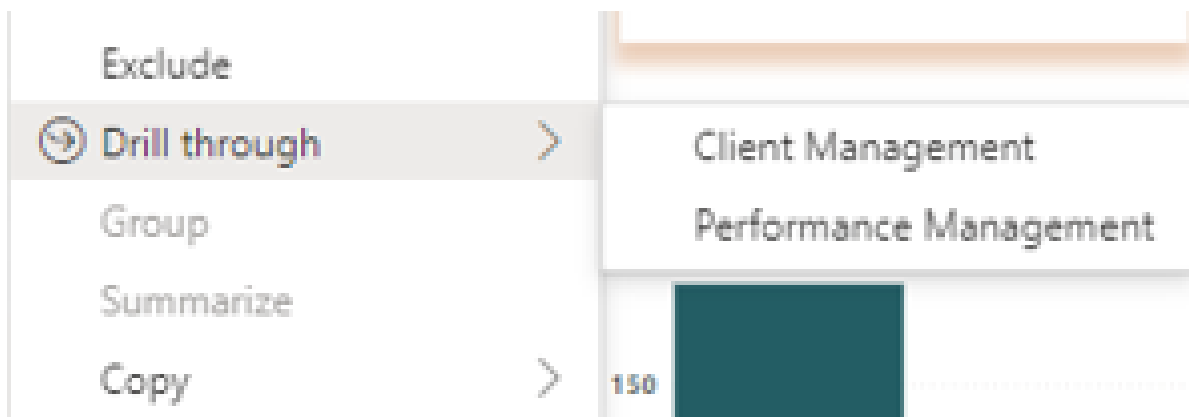
Employees

The above displayed report consists of following elements:

- **Date Filter**: Multi Select filter to get information about a specific week, month, or Year.
- **Employees Filter**: This filter provides user with accessibility to select one or more employees to filter the visuals on report. In a restricted report based on RLS, this can be removed for employees
- **Visual Cards**: These cards display major overall values of various metrics. This can help to analyse if a employee can handle more clients.

    - *# Of Clients*: Employees can look at number of distinct clients they are handling in a specific time period.
    - *# Of Meetings*: Number of meetings made during the time based on filters.
    - *Total Duration*: Total number of hours spent on all meetings combined based on filters. By default, shows total number of hours spent on meetings for a selected year.

- **Actual vs Target**: Performance comparison of employees based on their weekly targets. This visual make sense only if Year+Month+Week filters are selected for a specific week. Also, it is needed that a Target exists for that employee for selected week.

- **Top 3 Frequent/Rare Clients**: This visual is very important to understand the 3 clients that are either most Frequent (can work towards maintaining the client) or most rare (can work on making better communication to find a reason of absence)

- **Number of Meetings Handled**: It is a hierarchical bar graph that can be drilled down to view number of meetings handled in each year, month, week, and day. This can help to analyse performance and check workload to make appropriate decisions.

- **Employees Schedule**: The schedule of employees is an important visual required to check current, past, and future schedule. This helps in analysing availability and assigning/ de-assigning work based on workload. The visual can be further drilled down to check time of each meeting. Thus, it can help eliminate meeting conflicts as well.

- **Top 5 Meeting Types**: The most handled meeting types by employees can help in understand the work area of an employee. This can further help to strategically assign meetings and, take up new meeting types if needed.

The report can further be drilled down to check detailed information on Clients & Performance. The Employees selected from filter, can be right clicked to open the following menu:

Clicking on any one of the drill-through report, the corresponding report opens with the current filters on this report (Employee Name, year, month, and week).

Client Management

The above displayed report consists of following elements:
- **List of Clients**: List of current Clients of employees
- **Meeting Count Decomposition**: This visual provides an in-detail analysis of number of meetings handled. The number can be decomposed either by Name of Clients or Type of Meeting.
- **Employee Time Distribution**: This visual helps to understand how the time of an employee is divided among different meeting types. Selecting a particular client from list can help understand which section he/she belongs.

Performance Management

The above displayed report consists of following elements:

- **Meetings per Week**: A weekly distribution of different meetings type being handled. It helps to understand client pattern for specific meeting types.
- **Weekly Targets vs Actual Bar chart**: This visual provides a weekly comparison of actual vs set target of hours of meetings. It has its own month filter to select any month's comparison.
- **Waterfall Chart**: This chart provides an extensive look into employee's performance over the past year. It shows increase/decrease in number of meetings of specific type month-over-month. It can help track performance and work on pain points.
- **Funnel Chart**: It helps in understanding the overall contribution towards different meeting types.

Filtered Content:
The data to be displayed on these dashboards can be restricted by applying filters on all pages. The

To accommodate the requirements keeping the data intact, we can apply filters on all pages. Based on change in requirements in future these can be modified.
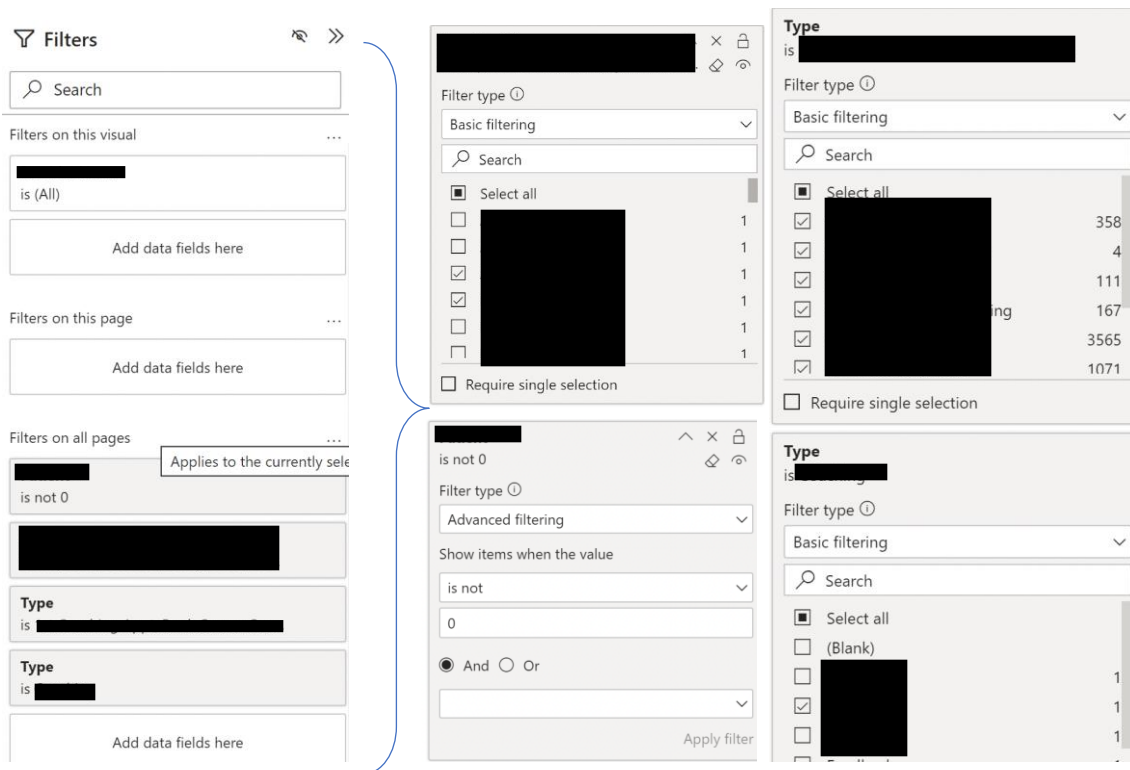
FUTURE WORK

We explored various options and aspects that we could not complete due various reasons, one of them being time. Below is the description of these options that can be leveraged to improve the system and visualizations.

Power Apps

Microsoft provides an ecosystem of connected apps that can be leveraged to increase the connectivity of dashboard. Power Apps enable one to create visual apps using a drag-drop tool available online. This functionality can be utilized to create an app that can be added as visual to dashboard for managing data.

Power Automate

Microsoft provides yet another brilliant tool for automating repeated task. Power Automate can be used to automate the process of manually extracting data daily from source. We tried it on our system, and it worked with few bugs. Through a dedicated effort to integrate it, this can help to make the system fully automatic. These automated processes are controlled over the cloud and thus provide flexibility to run from anywhere.

Row-Level Security

Power BI pro provides functionality to restrict data as per the logged in user. This is known as RLS i.e., row level security. This feature can really help define the usage of dashboard and control who can view which part of dashboard.

Perditions & Patterns

Availability of more data with data points reflecting the factors that affect a client's retention, meeting considerations etc., can be used to predict future meetings. Moreover, these datapoints can be utilized for detecting patterns and performing advanced tasks such as recommendations, segmentation of clients etc.

Client Dashboard

We also recommend developing a Clients Dashboard for clients to check their own status. Since power bi is accessible via various devices such as phones, laptops etc., this can provide an edge to Company. It can also increase the support options for clients.

REFERENCES

1. https://docs.microsoft.com/en-us/power-bi/fundamentals/power-bi-service-overview
2. https://powerbi.microsoft.com/en-ca/desktop/
3. https://powerbi.microsoft.com/en-ca/report-server/
4. https://powerbi.microsoft.com/en-ca/power-bi-pro/
5. https://powerbi.microsoft.com/en-ca/power-bi-premium/
6. https://powerbi.microsoft.com/en-ca/mobile/
7. https://azure.microsoft.com/en-ca/services/power-bi-embedded/
8. https://www.tessellationtech.io/import-vs-direct-query-power-bi/
9. https://www.npgsql.org/doc/installation.html
10. https://youtu.be/MhC4zj2byBQ