Making Connections, Making a Difference

Making Connections 2024

The National Transit Workforce Conference

November 11 – 13. 2024 · Baltimore. MD

TWC Transit Workforce Center

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TWC
TRANSIT WORKFORCE CENTER

Transit Workforce Center – Mission

Operated by the **ITLC**, the **Transit Workforce Center** (TWC) is **FTA**'s first ever national technical assistance center for transit workforce development.

mission

The ***TRANSIT WORKFORCE CENTER*** is the Federal Transit Administration's first ever national technical assistance center for transit workforce development. Its mission is to help urban, suburban, tribal, and rural public transportation entities throughout the U.S. recruit, hire, train, and retain a diverse workforce for now and into the future.

Safety Briefing

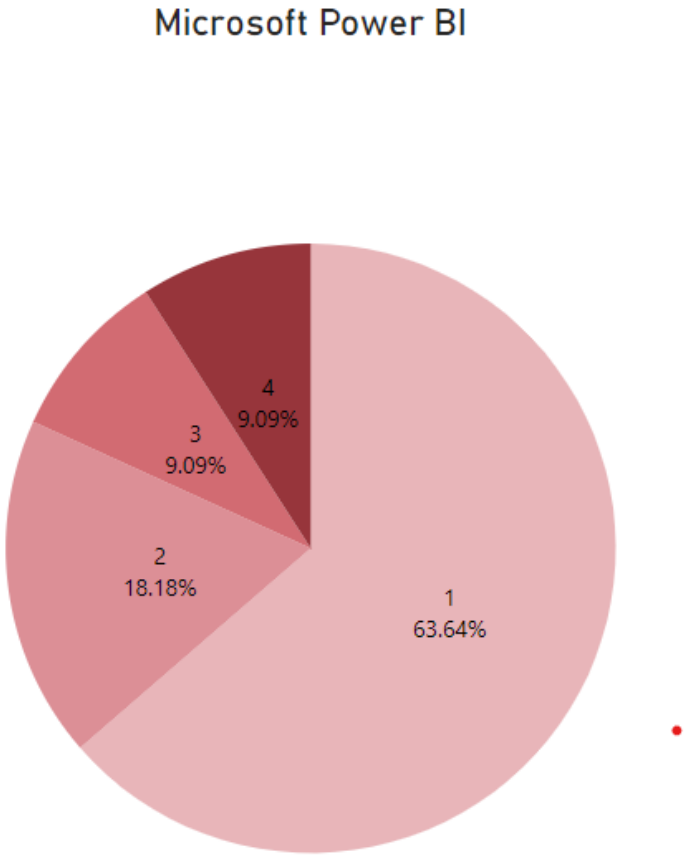
- Note your location: Hilton Baltimore Inner Harbor, Floor 1.
- Identify your nearest exits.
- Automated system will alert attendees if we need to evacuate the building.
  - Use stairs, not elevators. Anyone unable to use the stairs will be assisted by fire department at the stairwell.
  - Our assembly point is Northwest Warehouse, 333 West Camden Street, just behind the Sports Legend Museum and adjacent to the ballpark.
- In the event of medical emergency, call 911 from a cell phone (if no cell phone, use house phone). Security (443-683-8801) will also assist. Hotel has qualified staff to perform first aid and operate CPR.
- To report emergencies to the hotel, dial 65 on a house phone.

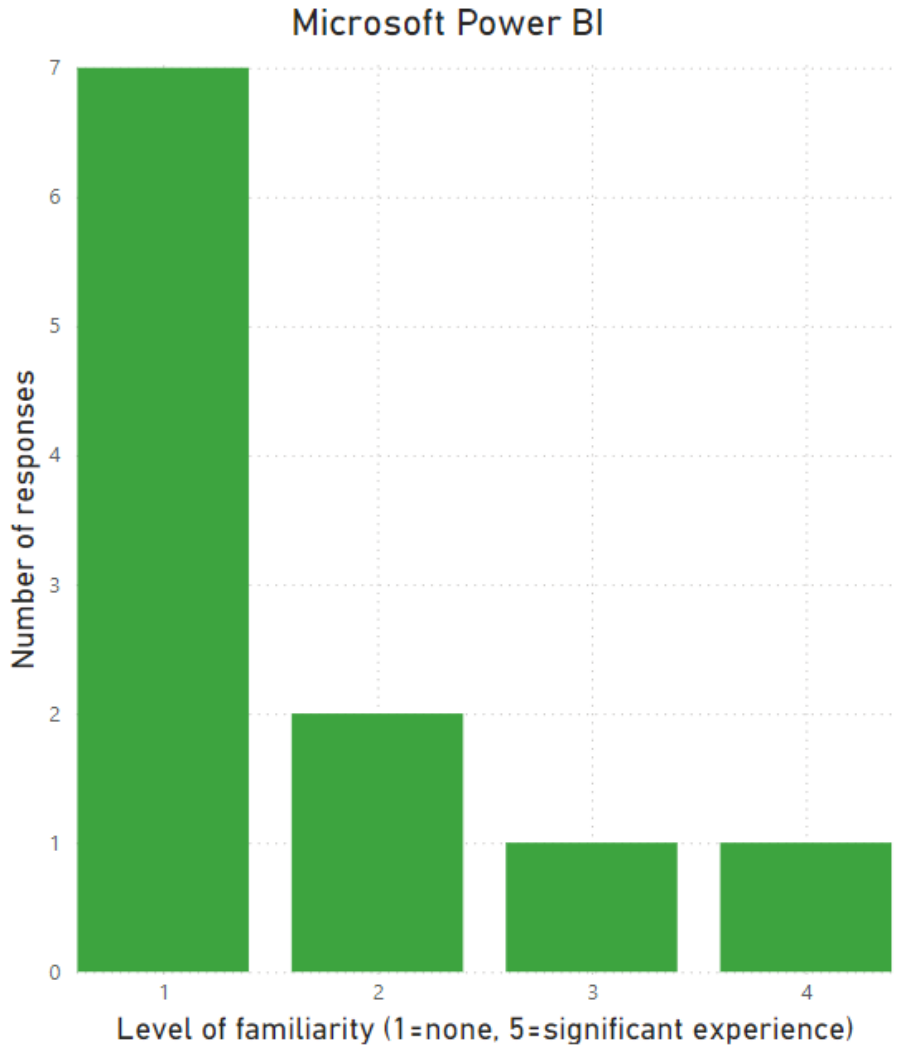
Elevating Your Workforce Data

The Power of Interactive Visualizations for Analyzing

Making Connections 2024 TWC

Introductions and Survey Responses





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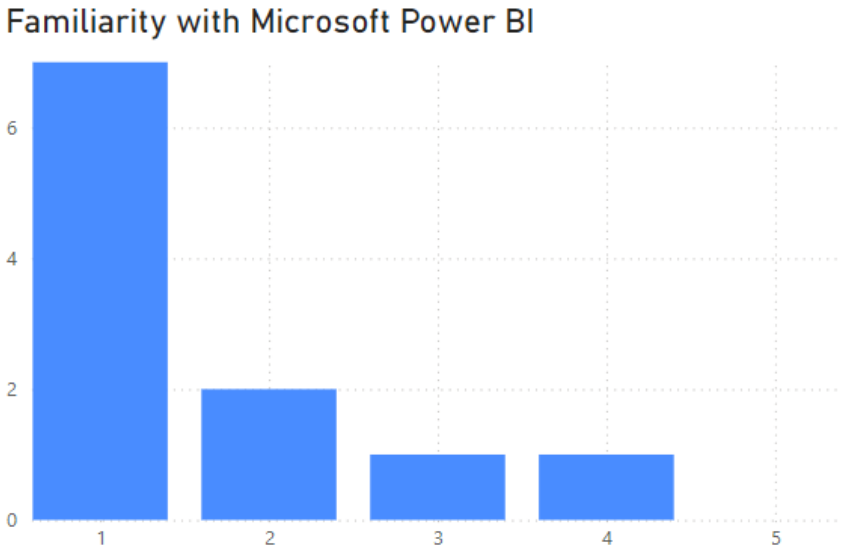

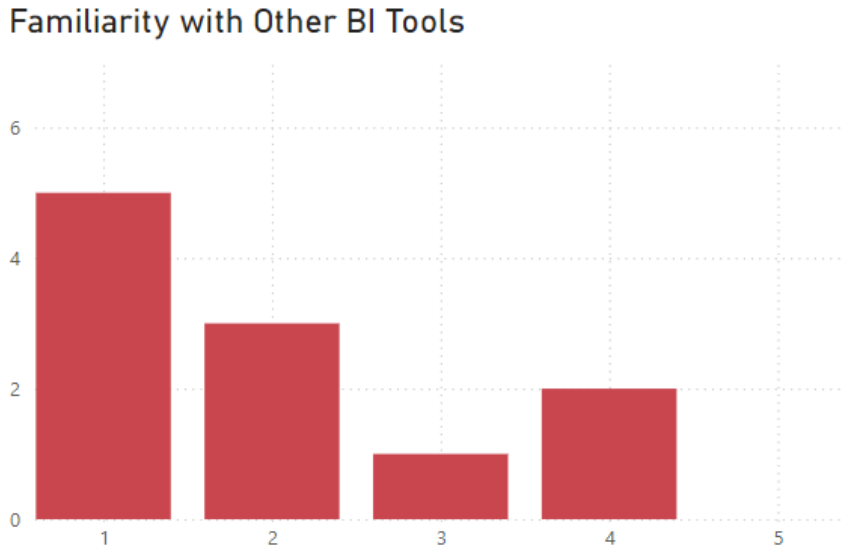

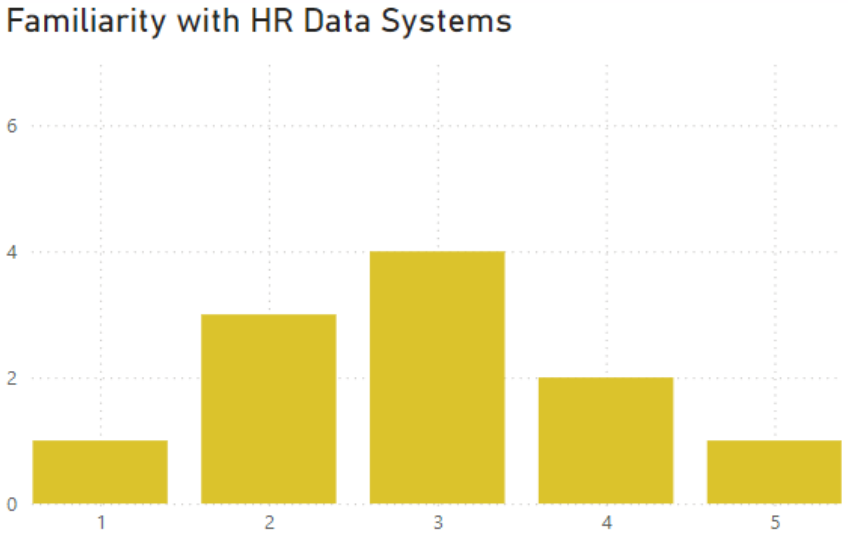

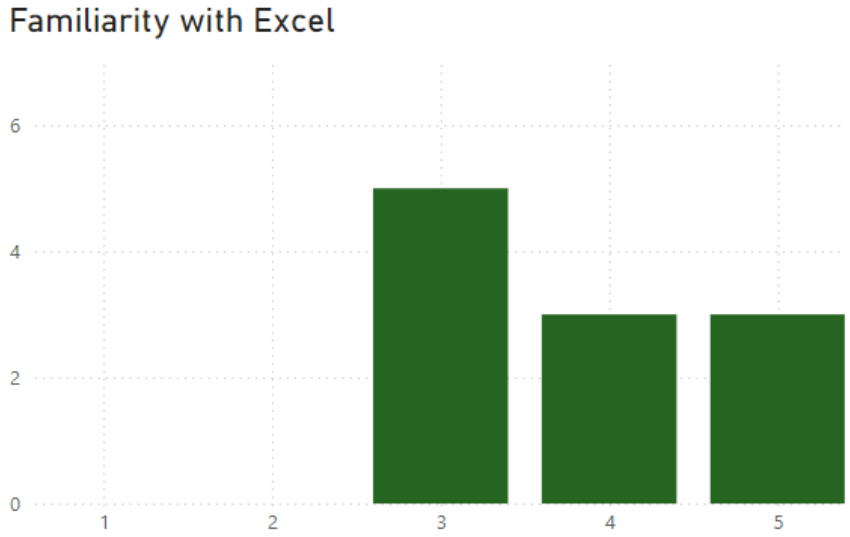

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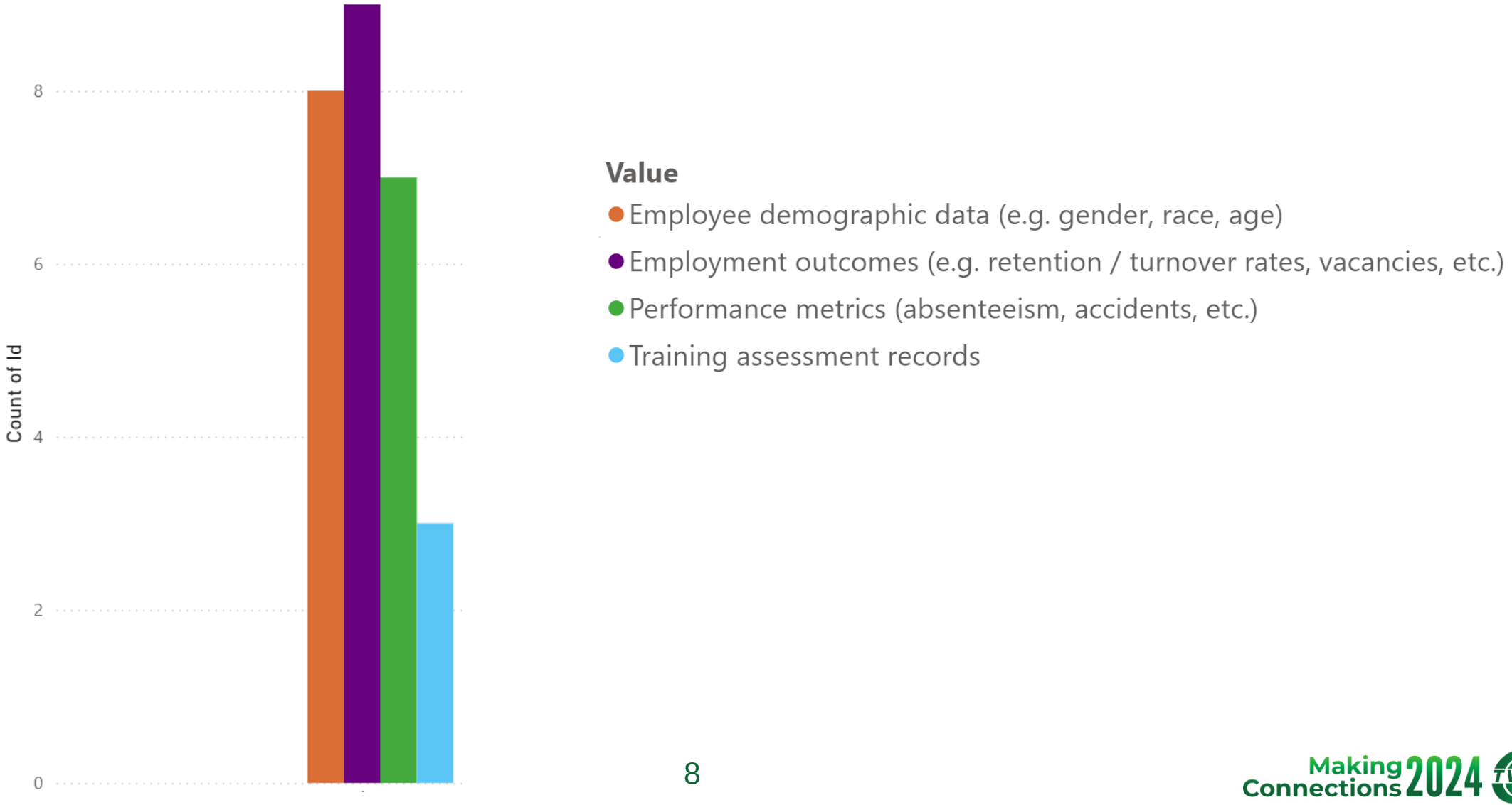
Introductions and Survey Responses



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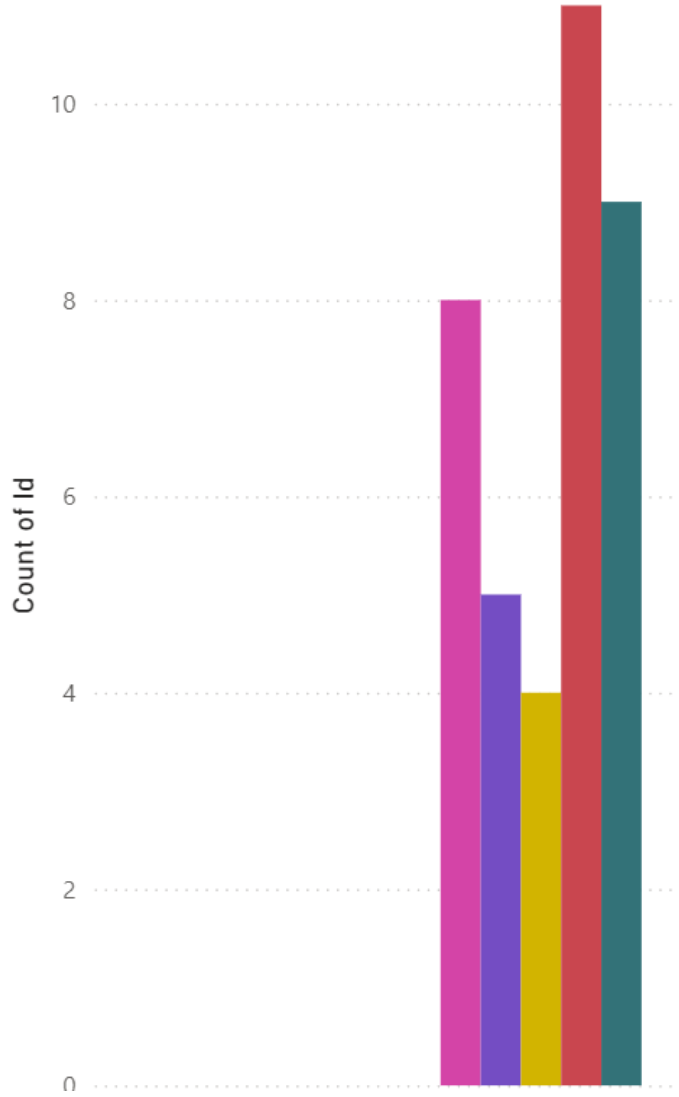
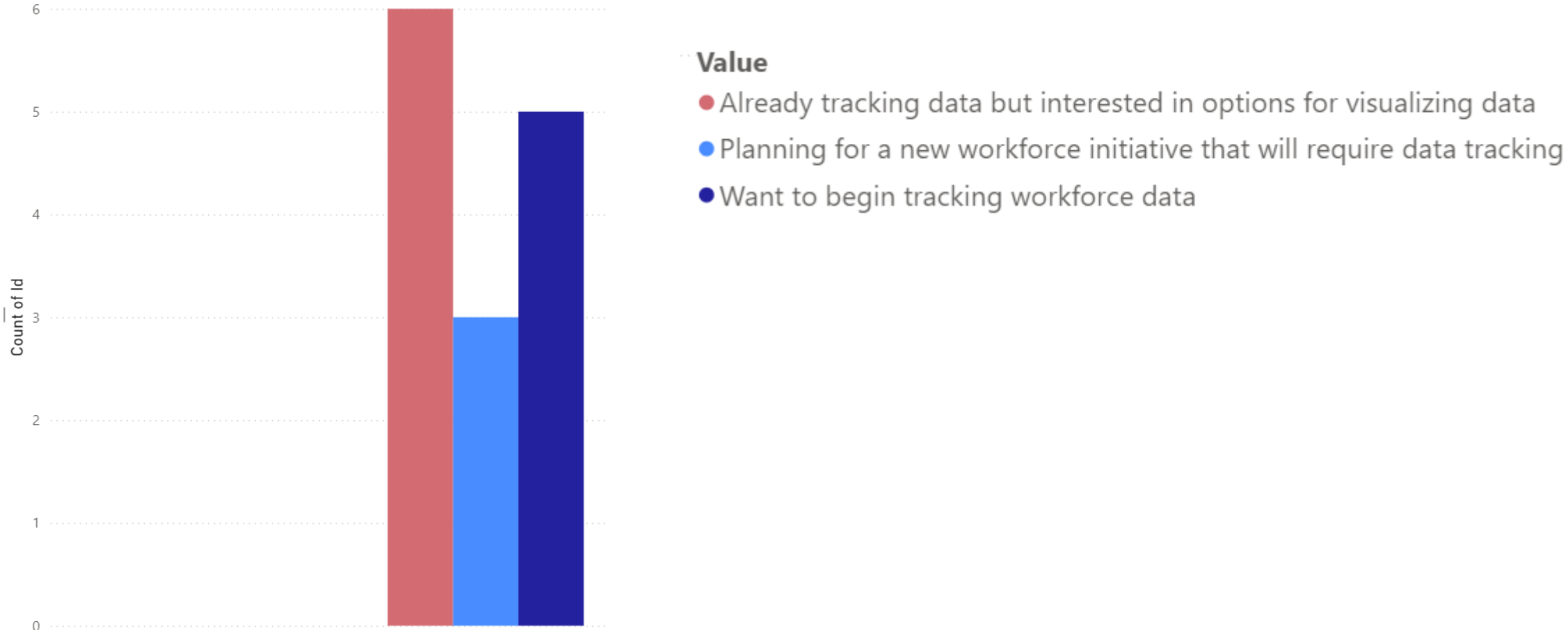


Value

- Foundation in dashboard design
- Foundation in data cleaning and analysis
- Improve existing dashboard / BI (business intelligence) skills
- Learn from fellow attendee colleagues about workforce data practices
- Learn new data visualization skills

Why Did You Register for This Intensive?



Andrew Carpenter

Director, National Center for Applied Transit Technology

Making Connections 2024 TWC

The Importance of Data Dashboards

The National Center for Applied Transit Technology (N-CATT)

Making Connections '24 | November 11, 2024

The National Center for Applied Transit Technology

- Walking small transit agencies through the technology landscape
- Producing resources on adopting emerging technologies
  - Data literacy, scheduling/dispatching software strategies, fare payment technologies
  - Lessons learned, trends, strategies
- Providing in-depth technical assistance to adopting new tech
  - Technical Assistance Teams
  - State Technology Summits
  - Hands-On Workshops

STTATs

- One-on-one technical assistance with N-CATT staff and consultants.
- Support in identifying and making progress on technology goals.
  - Assess current processes and tech opportunities for improvement.
  - Develop roadmaps for achieving tech goals, alternatives assessments, tech specifications, procurement strategies.
  - Provide support for implementation plans and procurements.
- These have led to:
  - AV Feasibility Study
  - Microtransit Deployment Strategies
  - Alternatives analyses and technical specifications for upgrading fare payment systems.

The Data Literacy Initiative

Survey Data Literacy	Provide Training	Provide Expert TA	Create Resources
• Identify critical areas of improvement • Understand capacity to develop knowledge within small-urban, rural, and tribal agencies	• Develop training on collecting, managing, and making decisions from data • Developed in concert with NTI, AASHTO, and other FTA-funded TA Centers	• Help agencies deliver their desired results in improving mobility and transit	• Produce readily accessible online resources • Emphasize benefits of emerging tech, investment/partnership opportunities, and legislative changes

Contextualize Dashboards

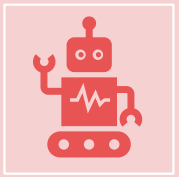
What is a data dashboard?

- A quick-reference, usually real-time, dynamic visualization of key performance indicators
- "summary of different but related data sets, presented in a way that makes [that] information easier to understand" – Tableau

Why are they important?

- Spot problems in their early stages to begin addressing them
- Quickly communicate important information
- Analyze trends to inform decisions

Why Data Dashboards?



Real-time information to manage day-to-day operations

High-level information to inform strategic insights, business performance, and long-term planning

In-depth analysis to uncover trends and patterns to inform decision-making

Operations and Performance Management

Purpose: Provide real-time insights into operational processes to manage day-to-day activities

Audience: Operational managers, Supervisors, Dispatchers, Passengers

Example Use Cases: On-time performance tracking, customer service response

Strategic and Business Intelligence

Purpose: Offer high-level strategic insights, overall business performance and long-term planning

Audience: Management, Boards, Funders

Example Use Cases: Assessing market trends and overall agency health

Analytical and Diagnostic

Purpose: Enable in-depth analysis to uncover trends and patterns for informed decision-making

Audience: Planners, Analysts

Example Use Cases: Identifying anomalies, future route planning

Considerations for Dashboards

Either time- or tech-intensive if you want regularly updated information

Doesn't displace more intense analyses for long-term planning

How to Create a Data Dashboard

1

Define your audience and goals

2

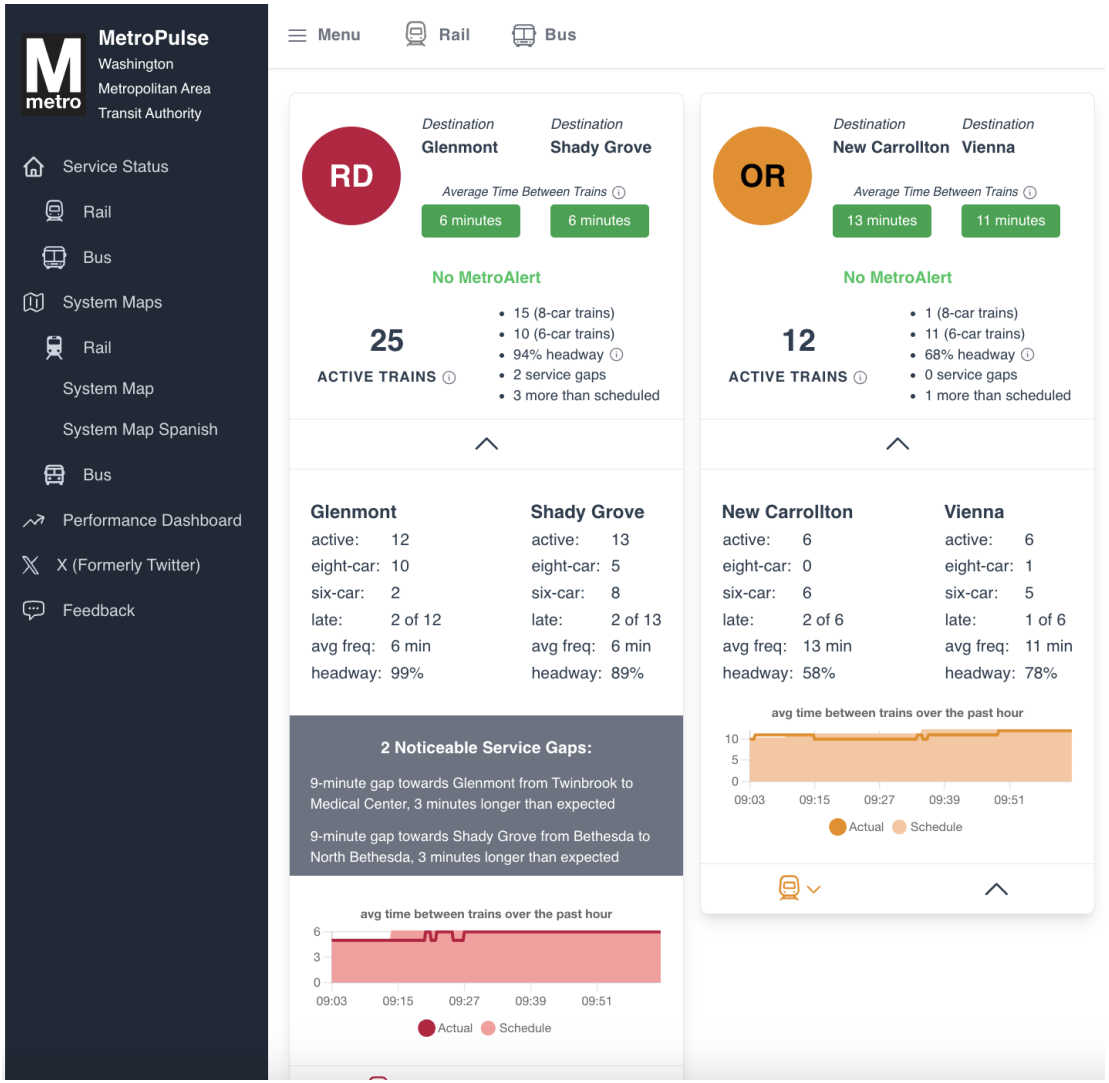
Choose your data

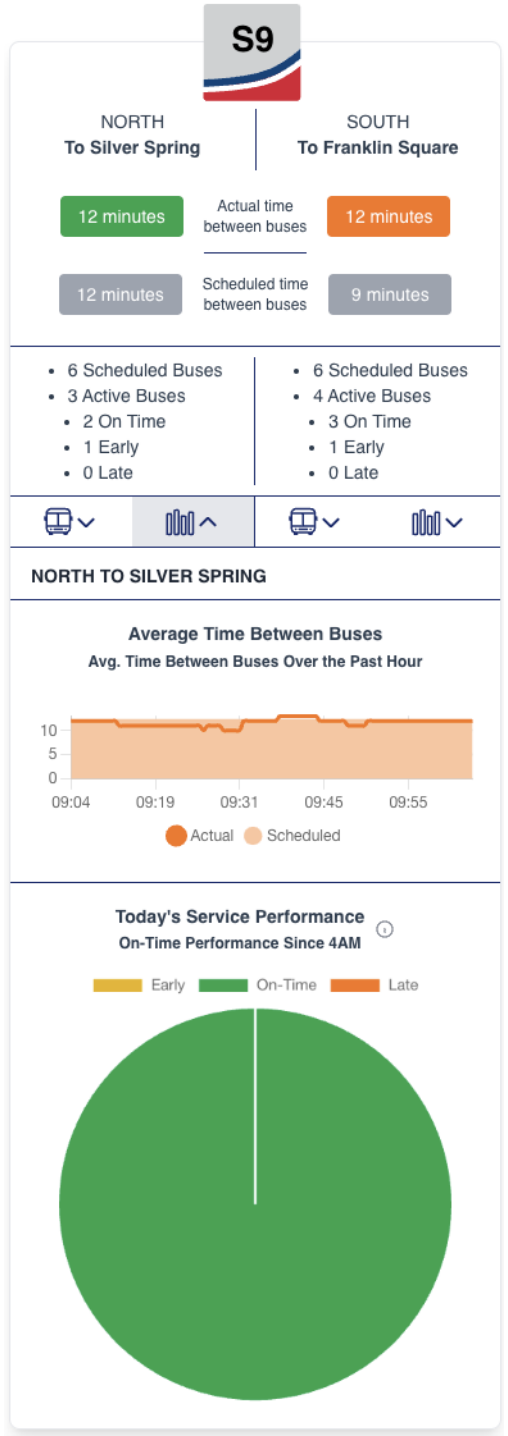
3

Choose your visualizations

What do you want to measure?

What does a good dashboard look like?





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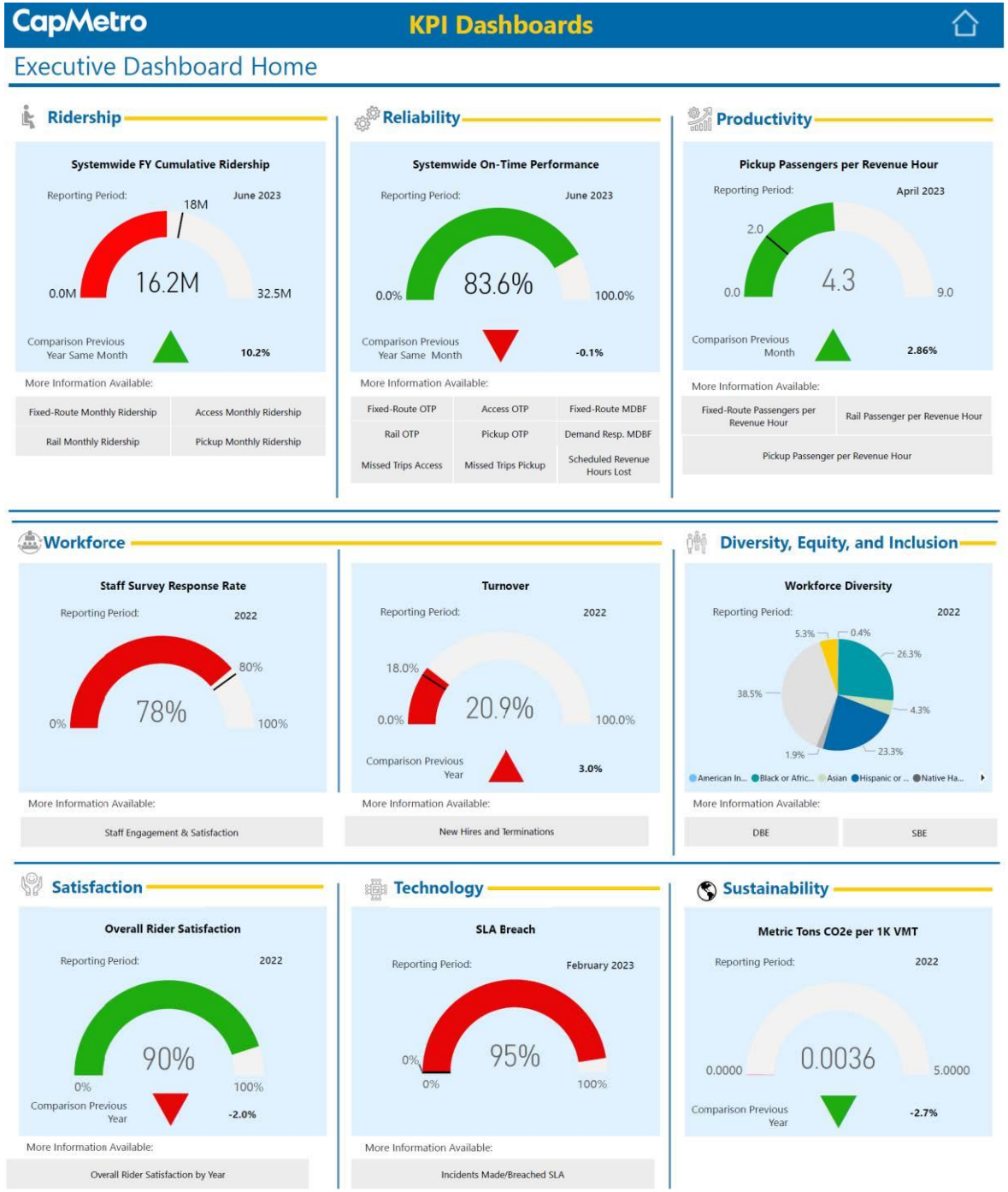

Newsletter

LinkedIn

STTATs

Questions?

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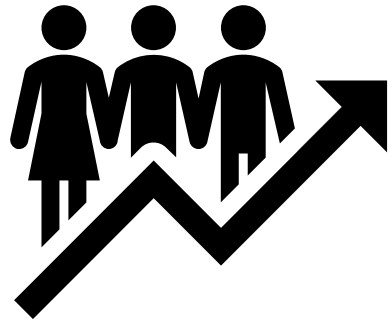
N-CATT Staff

What Can Go in Your Dashboard?

Characteristics of your workforce

- Worker demographics
- Number / percent of employees by occupation
- Hours worked; full-time vs. part-time employees



Compensation and advancement

- Wages (averages / range; overall and by occupation)
- Promotions and career trajectories

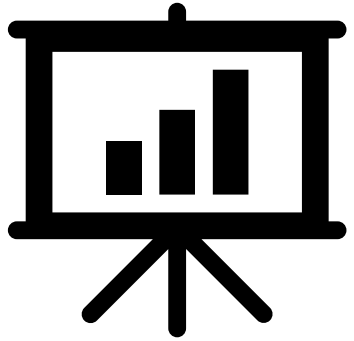
What Can Go in Your Dashboard?

Retention and turnover

- Number of vacancies (overall, over time, by occupation)
- Separations (retirements, quits, fires)
- Retention / turnover rate, espec. before and after implementation of a workforce development program

Mentorship / training effectiveness

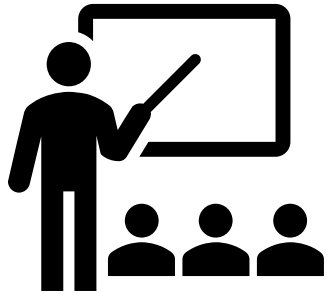
- Absenteeism, attendance
- Grievances, complaints, compliments
- Accidents, moving violations



What Can Go in Your Dashboard?

Effectiveness of training / apprenticeship / other workforce programs & related cost savings

- Program entry v. completion metrics
- Pre- & post-test knowledge scores, exam pass rates
- Mean distance between failures
- Parts and labor costs
- Bus spare ratios
- Worker satisfaction scores (on programs or overall)



Discussion: example metrics

GLOBAL
Stakeholder buy-in
Time to implement
Cost to implement
Full return on investment
Sustainability
RECRUITMENT
Time to fill position
New-hire turnover within the first year
Offer-to-acceptance ratio
New-hire turnover during initial training
New-hire performance ratings
Recruiting cost ratio
RETENTION
Employee voluntary turnover rate
Cost to fill open positions
Diversity turnover
Employee engagement
Impact of turnover on employee knowledge

TRAINING AND DEVELOPMENT
Pre- and post-training knowledge/skill testing
Employee performance post-training
Percent of employees rating training as job-relevant
Impact of training on system operations, safety, and customer service
Percent of trainees satisfied with training
Recency of training materials
PROFESSIONAL CAPACITY BUILDING
Timeliness of task completion
Timeliness of scheduled activities
Percentage of employees who participate in employee development opportunities
Percentage of jobs filled internally
Percentage of operational supervisory positions filled by frontline personnel
Employee involvement in organization's decision making
Percentage of positions with an up-to-date job description

Which of these metrics do you think are most valuable?

Would it be feasible in your organization to combine these metrics into a report or dashboard?

Source:

TCRP Report 162: Building a Sustainable Workforce in the Public Transportation Industry — A Systems Approach (2013)

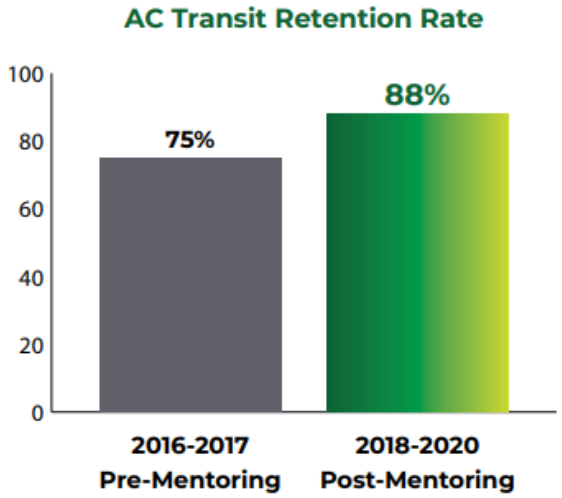
Discussion: example metrics

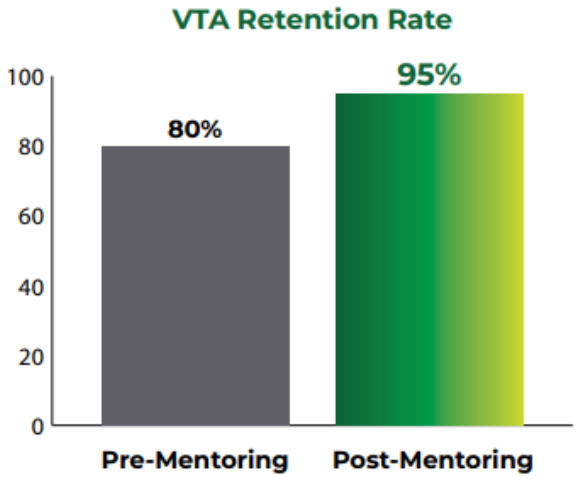
How / where are workforce data stored?

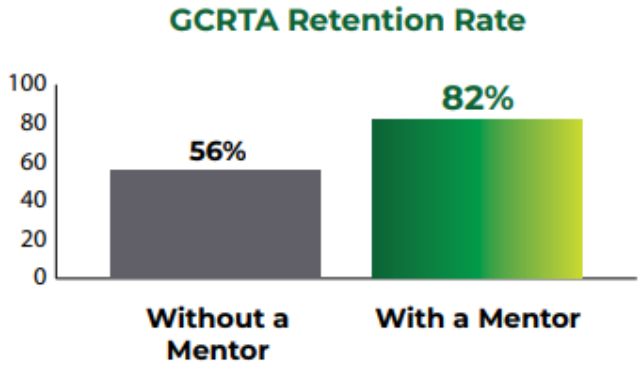
What other data systems does your organization use?

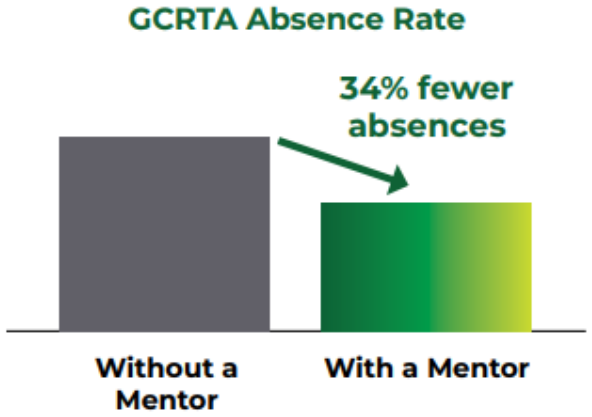
Are these systems connected?

How Could You Visualize Trends?



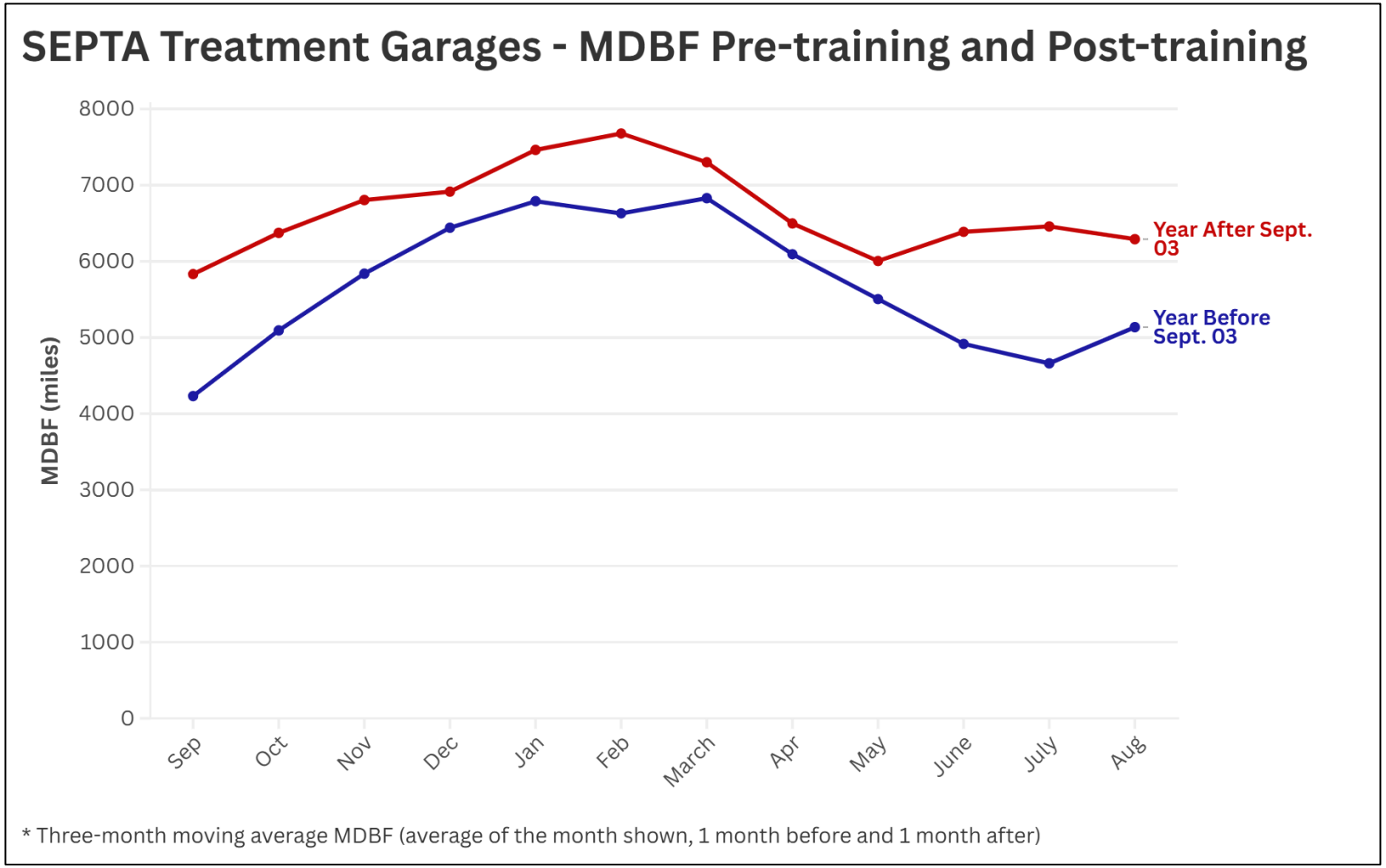






Source: TWC Transit Mentorship Metrics Fact Sheet

How Could You Visualize Trends?



Source: ITLC Metrics of Success Report

TWC Transit Workforce Data Dashboard

Making Connections 2024

Data Visualization and Business Intelligence (BI) Platforms

Microsoft Excel

- Included in Microsoft Office
- Easy learning curve

Google Sheets

- Free
- Easy learning curve

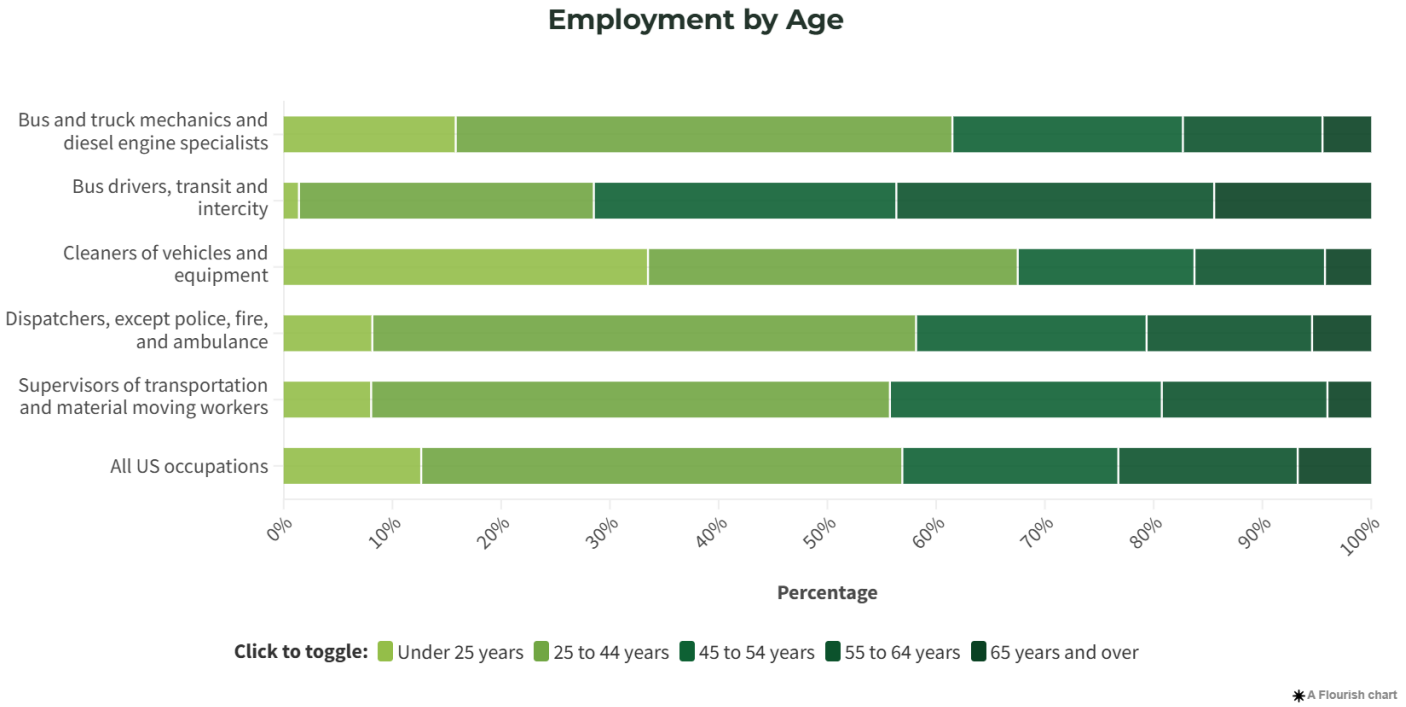
Data Visualization and Business Intelligence (BI) Platforms

Flourish

- Free version available
- Easy learning curve
- User-friendly interface
- Wide variety of standard and unique chart options

Datawrapper

- Free version available

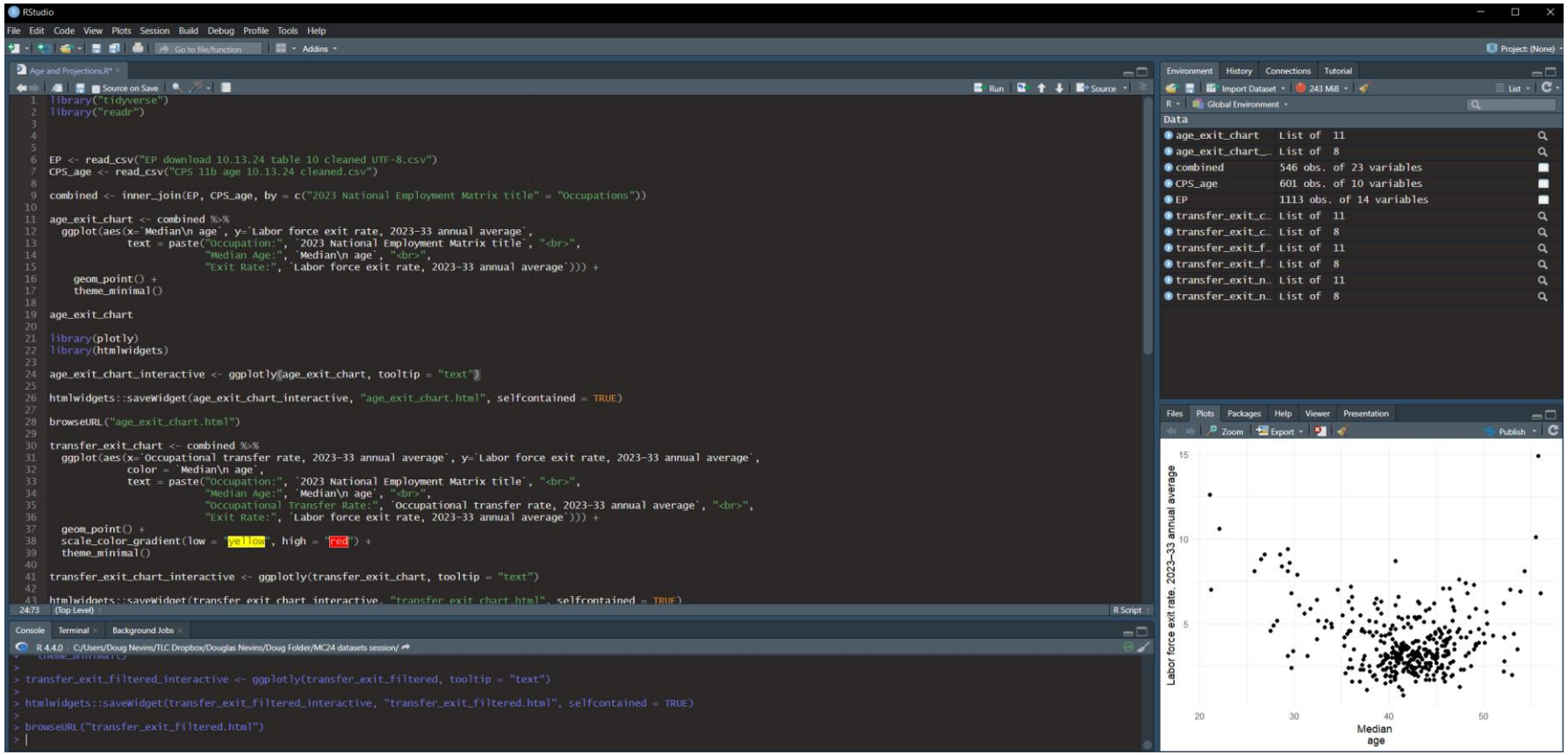


Source: TWC analysis of U.S. Bureau of Labor Statistics, 2023. Labor Force Statistics from the Current Population Survey. Employed persons by detailed occupation and age [Annual averages for 2023]. Retrieved from: https://www.bls.gov/cps/cpsaat11b.htm, February 20, 2024

Data Visualization and Business Intelligence (BI) Platforms

R or Python

- Free
- Coding required
- Can be used with other tools, like Plotly
- More powerful in terms of options and flexibility



Data Visualization and Business Intelligence (BI) Platforms

Tableau

- Paid

Power BI

- Free version included in Microsoft Office

Looker / Looker Studio

- Free version available

Quick 15-minute break

Discussion: workforce data in your organization

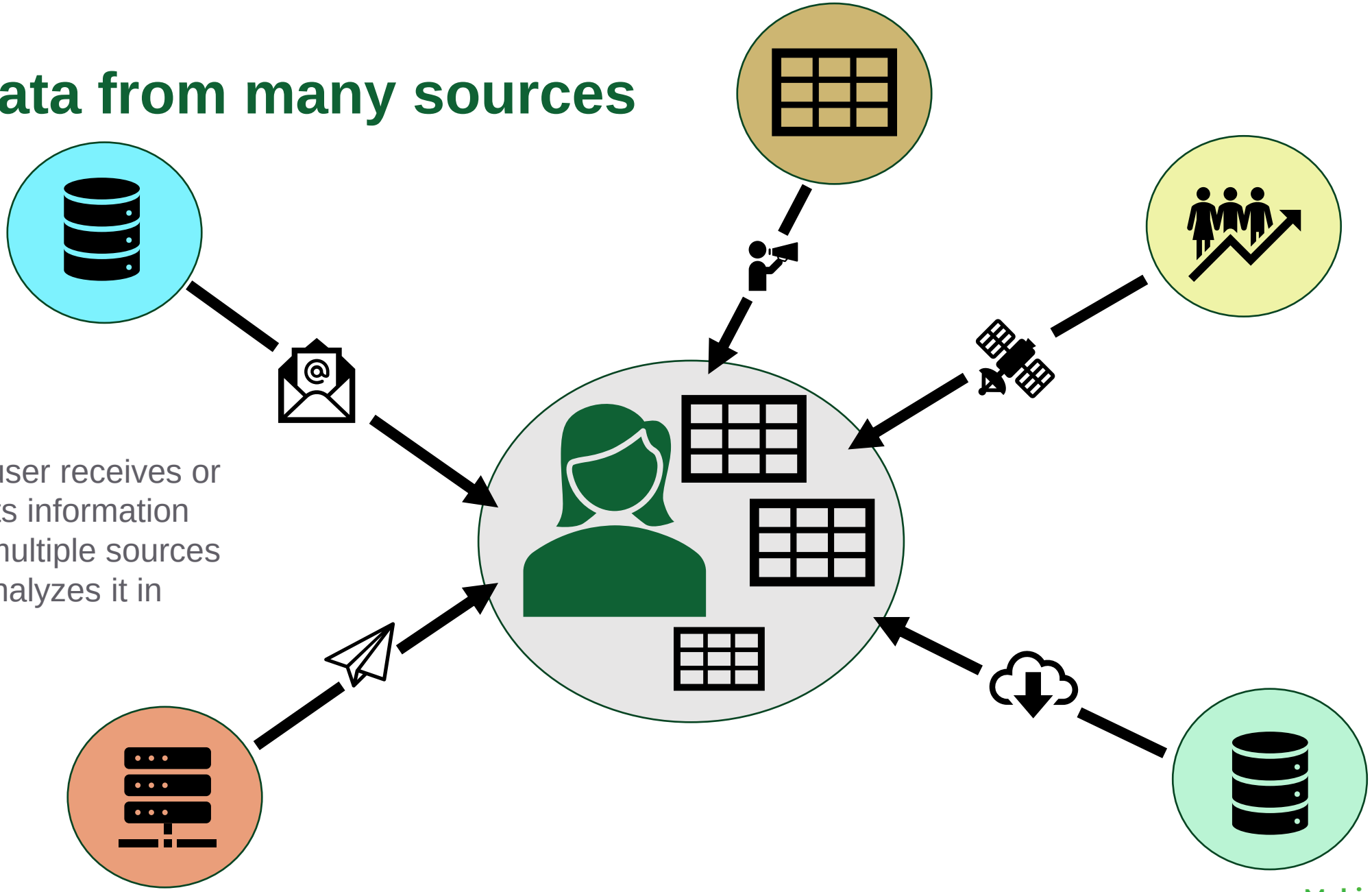
What workforce programs, if any, are you tracking and analyzing data for?

What types of visualizations, charts, or other summaries of data do you find most effective?

Least effective?

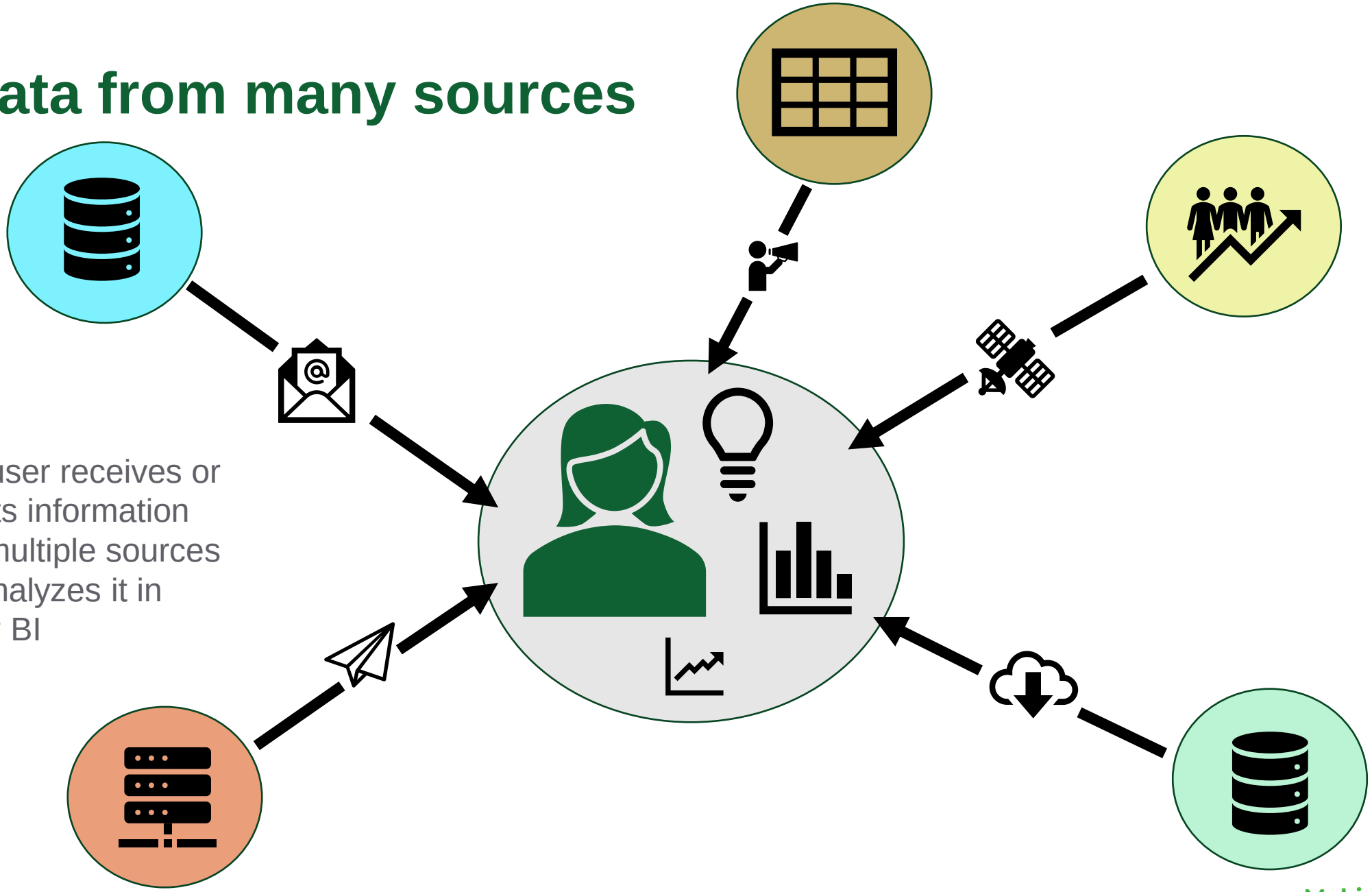
Any examples?

Data from many sources



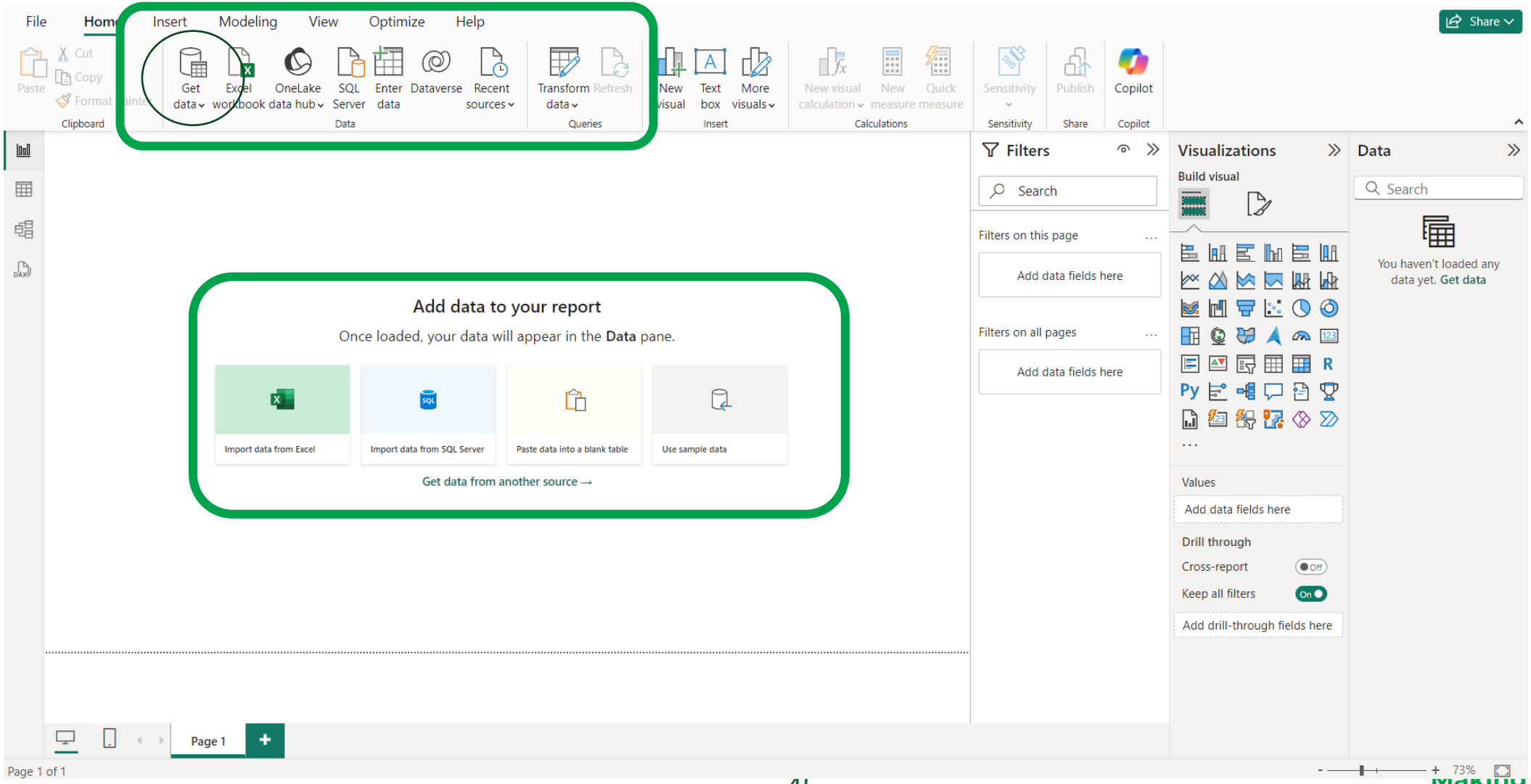
Data user receives or collects information from multiple sources and analyzes it in Excel

Data from many sources



Data user receives or collects information from multiple sources and analyzes it in Power BI

Accessing data sources in Power BI



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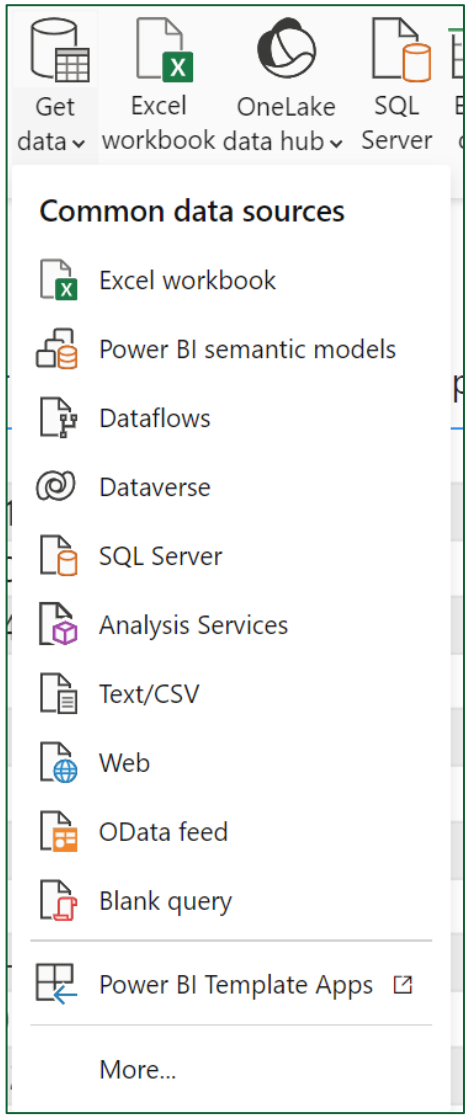
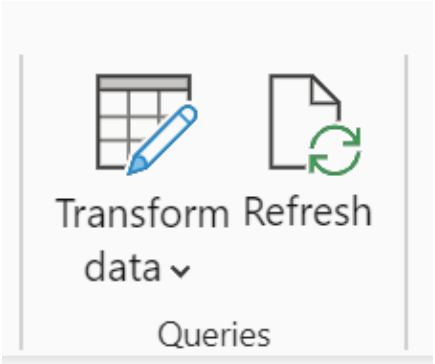
Accessing data sources in Power BI



Power BI can pull data from many sources including data stored online (shared documents in the cloud, databases, websites)

Data stored online or in a file can be refreshed to reflect changes

And transformed to ensure a clean format for further analysis



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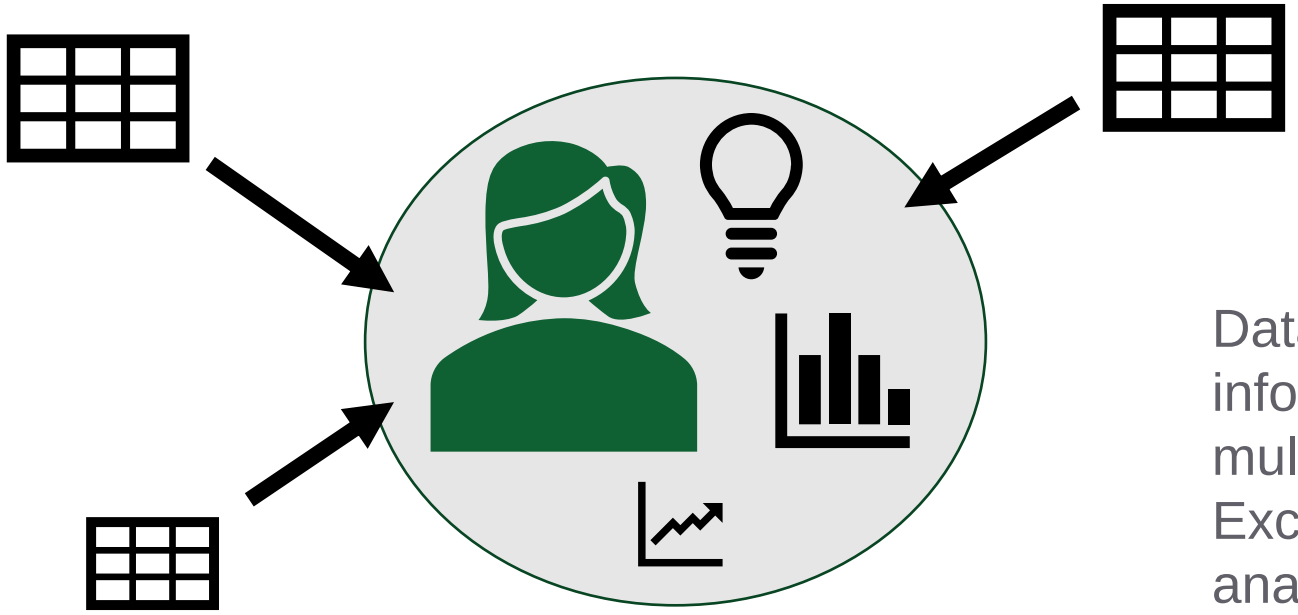
Scenario for today



Data user receives information from multiple sources in Excel format and analyzes it in Power BI

Scenario for today

Our protagonist

- Managing a workforce initiative
- User of data collected by other stakeholders and stored in multiple systems
- Currently analyzes available data in Excel and cannot easily combine data from multiple sources

Sample Data

Employee info

First Name	Last Name	Employee ID	Role	Start Date	End Date	Birth date	Garage
firo	dimplefrost	7742	Bus operator	1/1/2014	5/12/2014	12/21/1975	Starlight Harbor
sagramor	farfoot	2884	Bus operator	1/1/2014		4/27/1965	Foggrove Post
coneth	hammerroar	4462	Bus operator	1/1/2014	10/24/2021	9/6/1978	Maplepoint Camp
itior	eagleshadow	9688	Bus operator	1/1/2014	4/3/2014	10/21/1985	Shadow Outpost
bear	silvermuddle	3488	Bus operator	1/1/2014		5/16/1983	Foggrove Post
wuzin	alpenswallow	4660	Bus operator	1/1/2014	11/30/2014	6/30/1969	Foggrove Post
bero	longfoot	9557	Bus operator	1/1/2014		1/16/1975	Foggrove Post
ofaris	shadevale	8071	Bus operator	1/1/2014	2/18/2015	8/17/1976	Maplepoint Camp
flix	blackfoam	2511	Bus operator	1/1/2014	9/3/2019	10/16/1987	Starlight Harbor
lul	hopesinger	4087	Bus operator	1/1/2014		5/10/1973	Foggrove Post
dhiwix	fusethorne	5975	Bus operator	1/1/2014	4/18/2014	1/6/1983	Maplepoint Camp

Incidents

Issue ID	Date	Time	Incident type	Employee ID	Bus ID	Injury	Hospital	Severity of collision (1-5)	Preventable
346669	3/19/2014	19:05	Near collision	9688	669	No	No		No
760082	4/25/2014	22:35	Passenger issue	4462	961	No	No		No
133152	5/15/2014	23:20	Near collision	7742	345	No	No		No
487915	6/10/2014	11:40	Passenger issue	3488	669	No	No		No
953907	7/7/2014	7:30	Passenger issue	4660	323	No	No		No
693413	8/4/2014	15:50	Collision	2884	664	No	No	1	No
167164	8/14/2014	11:40	Complaint	9557	961	No	No		No
452609	9/1/2014	19:40	Near collision	9746	294	No	No		No
664491	9/16/2014	20:10	Complaint	4462	961	No	No		No

Sample Data

Absences

Date	Employee ID
2/1/2014	7742
2/9/2014	9688
3/1/2014	4978
3/9/2014	8497
3/25/2014	5975
3/31/2014	8713
4/3/2014	8582
5/1/2014	2874
5/6/2014	7900
5/16/2014	5832
5/22/2014	1882
5/31/2014	5626

Assessments

Employee ID	Pre-test score (0-100)	Post-test score (0-100)	Pre-training self-assessment (0-10	Post-training self-assessment (0-10)	Satisfaction score (0-10)
3638	59	77	6	7	6
2343	62	72	4	9	8
9253	35	63	1	4	5
2945	54	67	4	6	6
1733	63	78	4	7	8
9592	37	79	5	9	10
6070	52	57	6	6	3
9760	48	96	3	8	10
2768	52	80	5	7	7
7040	36	83	3	9	9
6350	42	69	4	6	6
4739	53	90	1	8	10
3805	37	91	6	10	10

Sample Data

Maintenance

Month Year	Miles traveled	Mechanical failures
Jan-14	2,243	8
Feb-14	2,200	9
Mar-14	2,129	13
Apr-14	2,174	14
May-14	2,044	8
Jun-14	2,155	13
Jul-14	2,118	12
Aug-14	2,155	13
Sep-14	2,264	10
Oct-14	2,024	13
Nov-14	2,231	6
Dec-14	2,000	14
Jan-15	2,267	12

Monthly Statistics

Month Year	New employees	Employees leaving	Employees at start of Month	Employees at end of Month
Jan-14	52		52	52
Feb-14			52	52
Mar-14			52	52
Apr-14	2	4	52	50
May-14	4	3	50	51
Jun-14	1		51	52
Jul-14	1	1	52	52
Aug-14		1	52	51
Sep-14	3	4	51	50
Oct-14	3	4	50	49
Nov-14	3	4	49	48
Dec-14	2	2	48	48
Jan-15	7		48	55

Data Cleaning Steps

- Remove missing data (but first figure out why it's missing)
- Remove duplicate rows
- Remove outliers (maybe!)
- Recode variables if needed
- Basic visualizations—does what you're seeing make sense?
- Tidy your data

Tidy Data

Data are tidy when:

- Each variable is a column; each column is a variable
- Each observation is a row; each row is an observation
- Each value is a cell; each cell is a single value

Messy

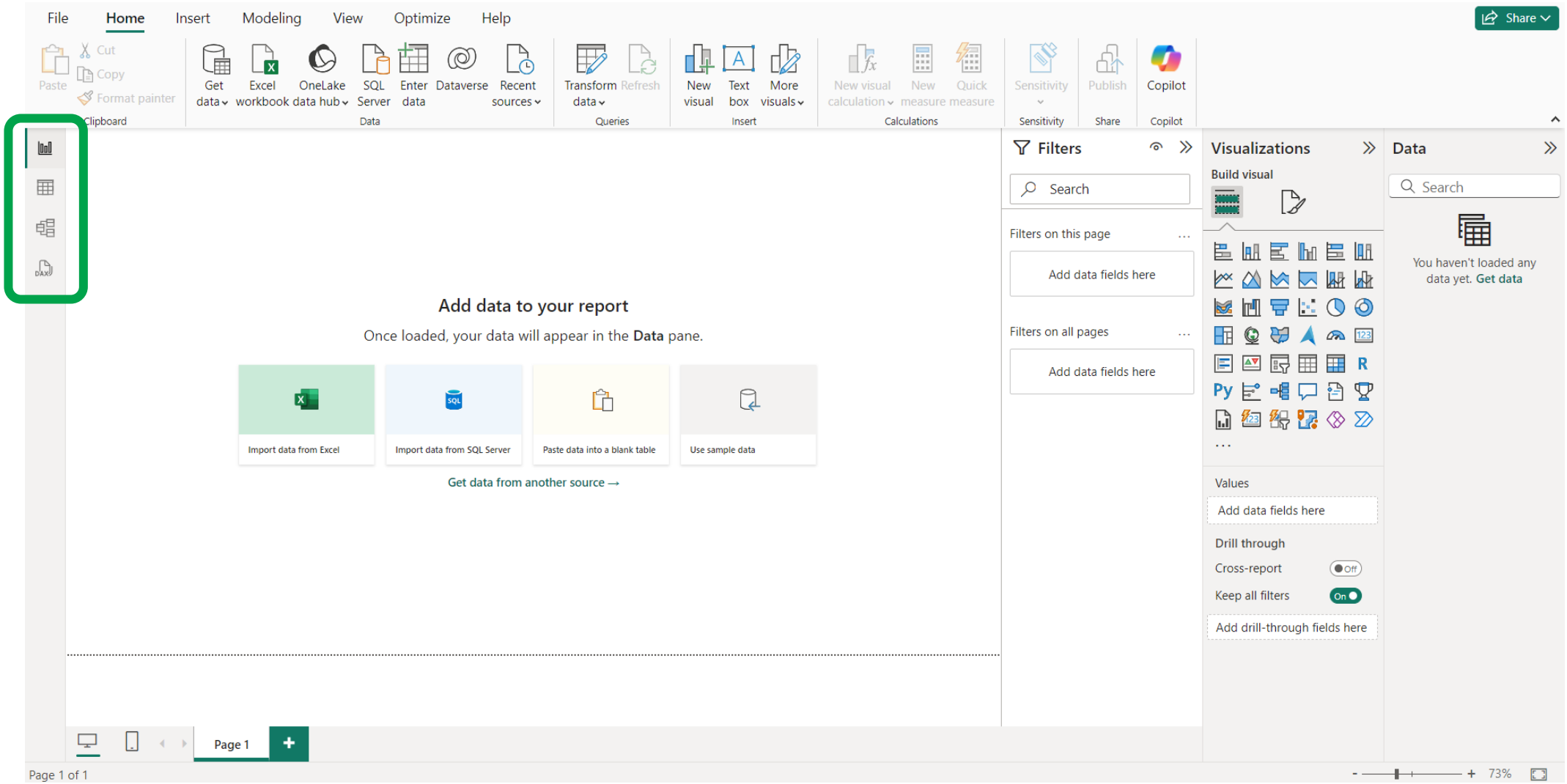
Country	1999	2000
Afghanistan	19987071	20595360
Brazil	172006362	174504898
China	1272915272	1280428583

Tidy

Country	Year	Population
Afghanistan	1999	19987071
Afghanistan	2000	20595360
Brazil	1999	172006362
Brazil	2000	174504898
China	1999	1272915272
China	2000	1280428583

Sources: CRAN, Stack Exchange

Power BI Home Page

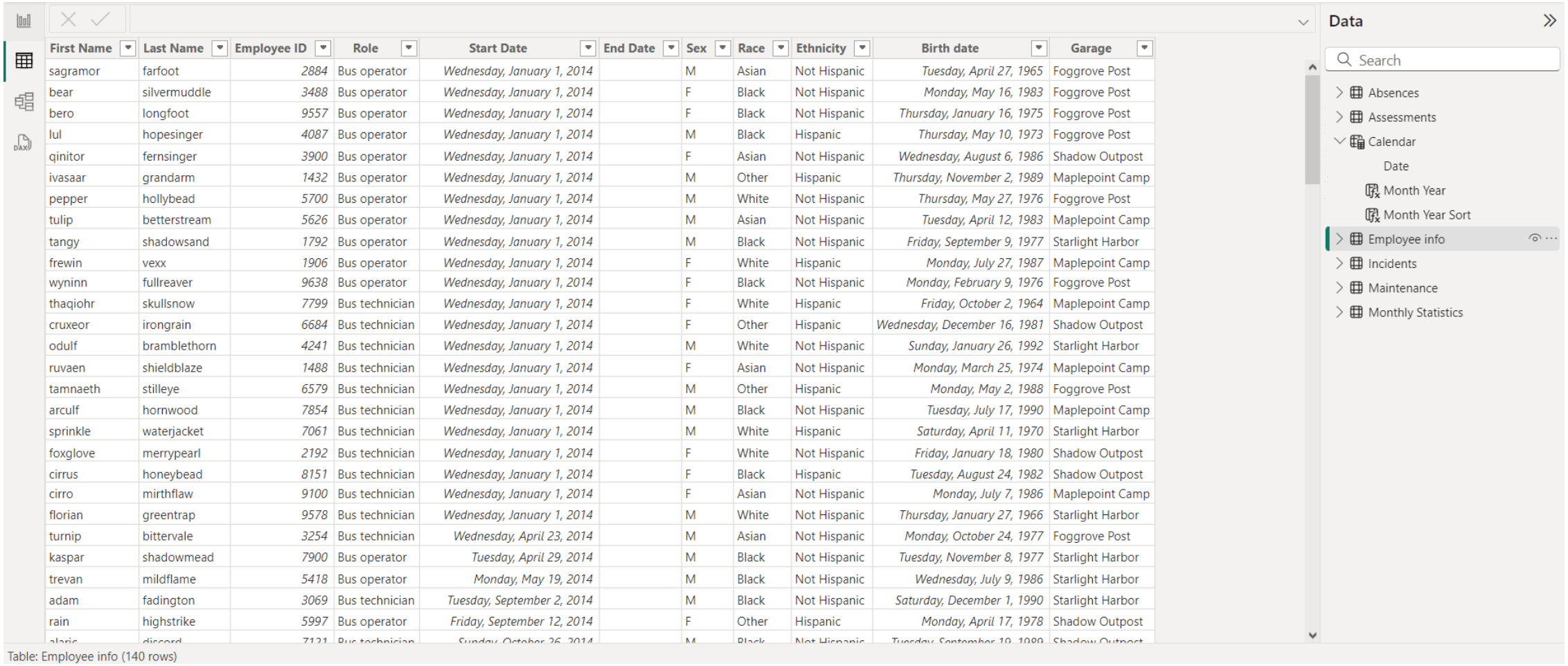


Making Connections 2024 TWC

Different views

Report view	In the report view, you can develop and edit the visualizations, filters, buttons, etc. in your dashboard.
Table view	In the table view, you can view your datasets as tables and add columns based on the existing data.
Model view	In the model view, you can see relationships between your datasets and create/edit “connections” or linkages between columns (if the same variable appears in multiple datasets).
DAX query view	In DAX query view, you can use Power BI’s coding language to perform more complex calculations and data manipulations with your datasets.

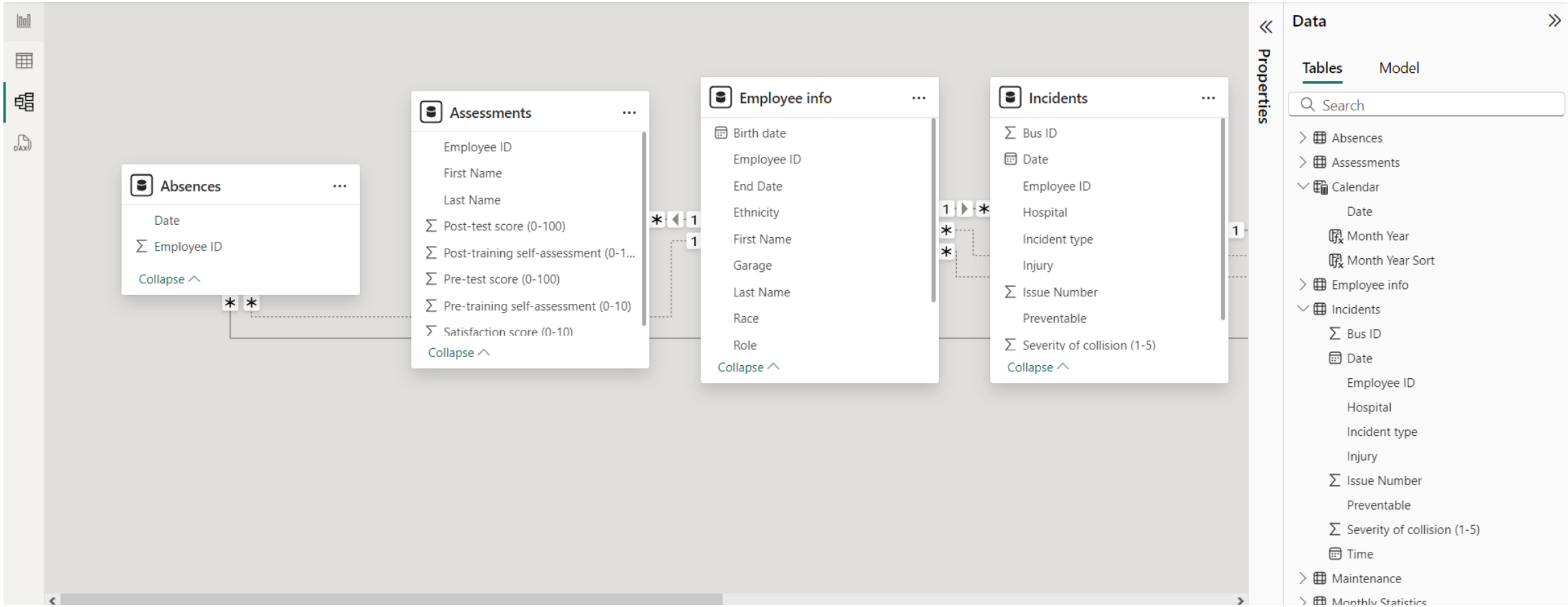
Table View



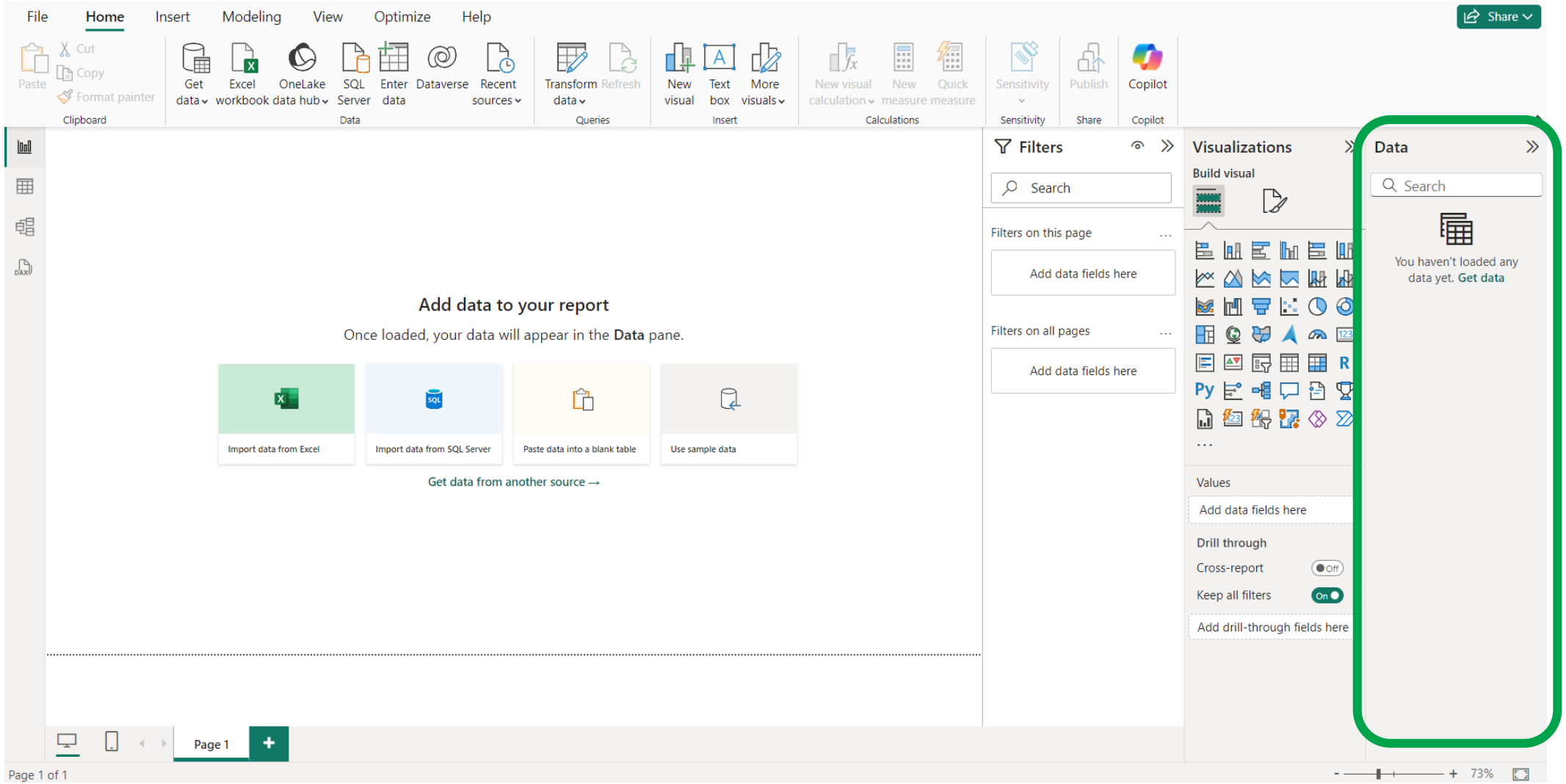
First Name	Last Name	Employee ID	Role	Start Date	End Date	Sex	Race	Ethnicity	Birth date	Garage
sagramor	farfoot	2884	Bus operator	Wednesday, January 1, 2014		M	Asian	Not Hispanic	Tuesday, April 27, 1965	Foggrove Post
bear	silvermuddle	3488	Bus operator	Wednesday, January 1, 2014		F	Black	Not Hispanic	Monday, May 16, 1983	Foggrove Post
bero	longfoot	9557	Bus operator	Wednesday, January 1, 2014		F	Black	Not Hispanic	Thursday, January 16, 1975	Foggrove Post
lul	hopesinger	4087	Bus operator	Wednesday, January 1, 2014		M	Black	Hispanic	Thursday, May 10, 1973	Foggrove Post
qinitor	fernsinger	3900	Bus operator	Wednesday, January 1, 2014		F	Asian	Not Hispanic	Wednesday, August 6, 1986	Shadow Outpost
ivasaar	grandarm	1432	Bus operator	Wednesday, January 1, 2014		M	Other	Hispanic	Thursday, November 2, 1989	Maplepoint Camp
pepper	hollybead	5700	Bus operator	Wednesday, January 1, 2014		M	White	Not Hispanic	Thursday, May 27, 1976	Foggrove Post
tulip	betterstream	5626	Bus operator	Wednesday, January 1, 2014		M	Asian	Not Hispanic	Tuesday, April 12, 1983	Maplepoint Camp
tangy	shadowsand	1792	Bus operator	Wednesday, January 1, 2014		M	Black	Not Hispanic	Friday, September 9, 1977	Starlight Harbor
frewin	vexx	1906	Bus operator	Wednesday, January 1, 2014		F	White	Hispanic	Monday, July 27, 1987	Maplepoint Camp
wyninn	fullreaver	9638	Bus operator	Wednesday, January 1, 2014		F	Black	Not Hispanic	Monday, February 9, 1976	Foggrove Post
thaqiohr	skullsnow	7799	Bus technician	Wednesday, January 1, 2014		F	White	Hispanic	Friday, October 2, 1964	Maplepoint Camp
cruxeor	irongrain	6684	Bus technician	Wednesday, January 1, 2014		F	Other	Hispanic	Wednesday, December 16, 1981	Shadow Outpost
odulf	bramblethorn	4241	Bus technician	Wednesday, January 1, 2014		M	White	Not Hispanic	Sunday, January 26, 1992	Starlight Harbor
ruvaen	shieldblaze	1488	Bus technician	Wednesday, January 1, 2014		F	Asian	Not Hispanic	Monday, March 25, 1974	Maplepoint Camp
tamnaeth	stilleye	6579	Bus technician	Wednesday, January 1, 2014		M	Other	Hispanic	Monday, May 2, 1988	Foggrove Post
arculf	hornwood	7854	Bus technician	Wednesday, January 1, 2014		M	Black	Not Hispanic	Tuesday, July 17, 1990	Maplepoint Camp
sprinkle	waterjacket	7061	Bus technician	Wednesday, January 1, 2014		M	White	Hispanic	Saturday, April 11, 1970	Starlight Harbor
foxglove	merrypearl	2192	Bus technician	Wednesday, January 1, 2014		F	White	Not Hispanic	Friday, January 18, 1980	Shadow Outpost
cirrus	honeybead	8151	Bus technician	Wednesday, January 1, 2014		F	Black	Hispanic	Tuesday, August 24, 1982	Shadow Outpost
cirro	mirthflaw	9100	Bus technician	Wednesday, January 1, 2014		F	Asian	Not Hispanic	Monday, July 7, 1986	Maplepoint Camp
florian	greentrap	9578	Bus technician	Wednesday, January 1, 2014		M	White	Not Hispanic	Thursday, January 27, 1966	Starlight Harbor
turnip	bittervale	3254	Bus technician	Wednesday, April 23, 2014		M	Asian	Not Hispanic	Monday, October 24, 1977	Foggrove Post
kaspar	shadowmead	7900	Bus operator	Tuesday, April 29, 2014		M	Black	Not Hispanic	Tuesday, November 8, 1977	Starlight Harbor
trevan	mildflame	5418	Bus operator	Monday, May 19, 2014		M	Black	Not Hispanic	Wednesday, July 9, 1986	Starlight Harbor
adam	fadington	3069	Bus technician	Tuesday, September 2, 2014		M	Black	Not Hispanic	Saturday, December 1, 1990	Starlight Harbor
rain	highstrike	5997	Bus operator	Friday, September 12, 2014		F	Other	Hispanic	Monday, April 17, 1978	Shadow Outpost

Table: Employee info (140 rows)

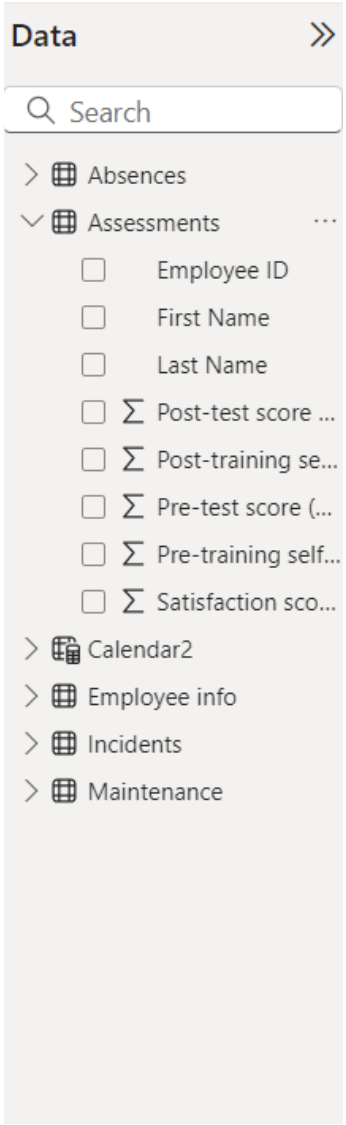
Model View


Absences
Date
Employee ID
Collapse
Assessments
Employee ID
First Name
Last Name
Post-test score (0-100)
Post-training self-assessment (0-1...
Pre-test score (0-100)
Pre-training self-assessment (0-10)
Satisfaction score (0-10)
Collapse
Employee info
Birth date
Employee ID
End Date
Ethnicity
First Name
Garage
Last Name
Race
Role
Collapse
Incidents
Bus ID
Date
Employee ID
Hospital
Incident type
Injury
Issue Number
Preventable
Severity of collision (1-5)
Collapse
Properties
Data
Tables
Model
Search
Absences
Assessments
Calendar
Date
Month Year
Month Year Sort
Employee info
Incidents
Bus ID
Date
Employee ID
Hospital
Incident type
Injury
Issue Number
Preventable
Severity of collision (1-5)
Time
Maintenance
Monthly Statistics

Power BI Home Page

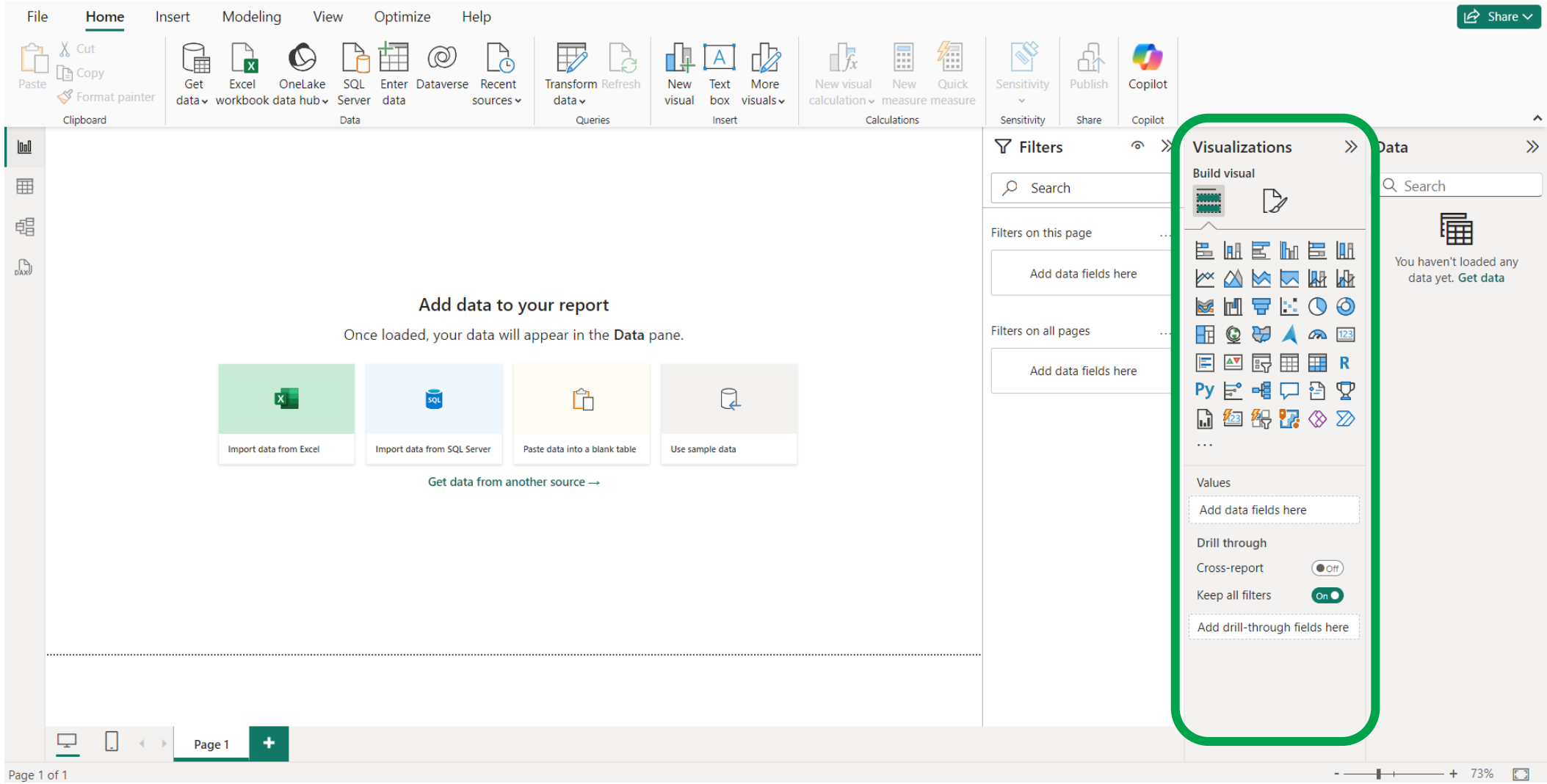


Data



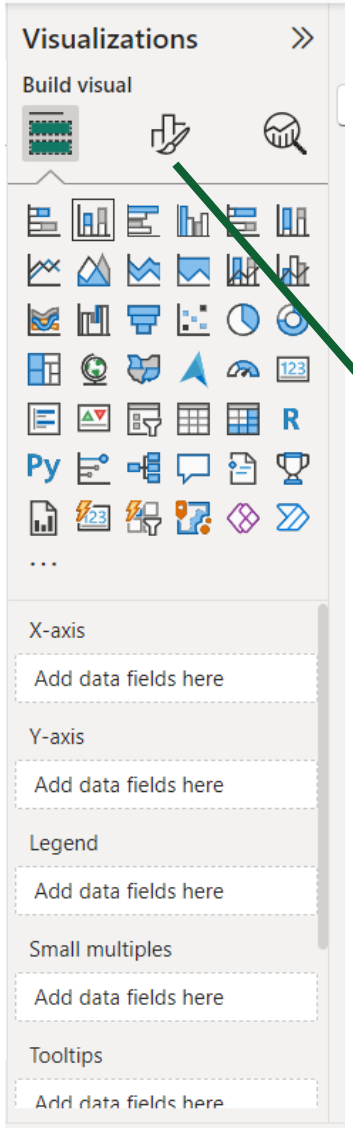
- The data sidebar shows all your datasets, which you can expand to view the variables/columns.
- You can select these column names when creating a visualization.

Power BI Home Page



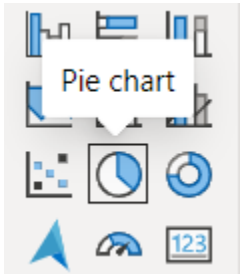
Making Connections 2024 TWC

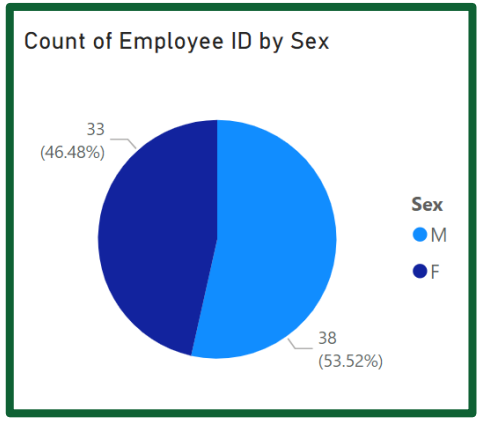
Visualizations

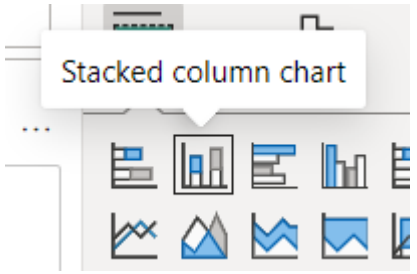


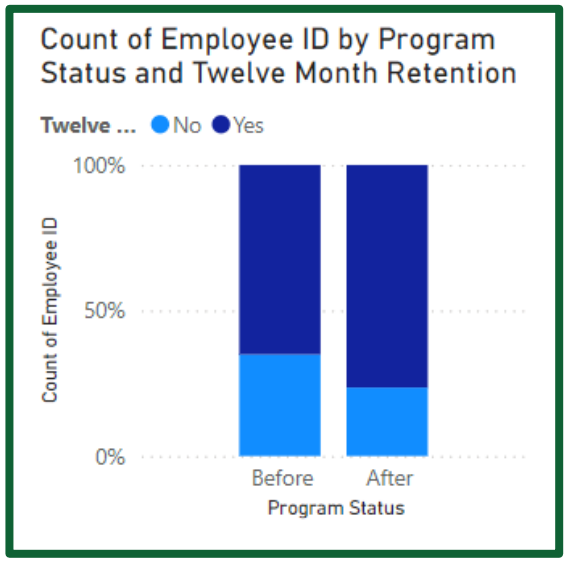
- Use the visualization sidebar to create and edit your charts and slicers (filters).
- Drag the column names from the data sidebar to the fields in the visualization sidebar (i.e. X-axis, Y-axis, etc.).
- Edit visual components of the charts in this section of the sidebar.

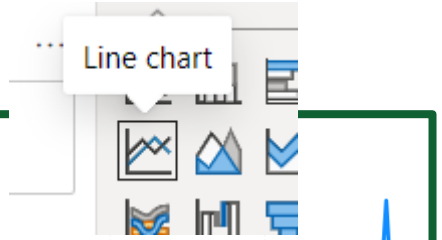
Common Visualizations

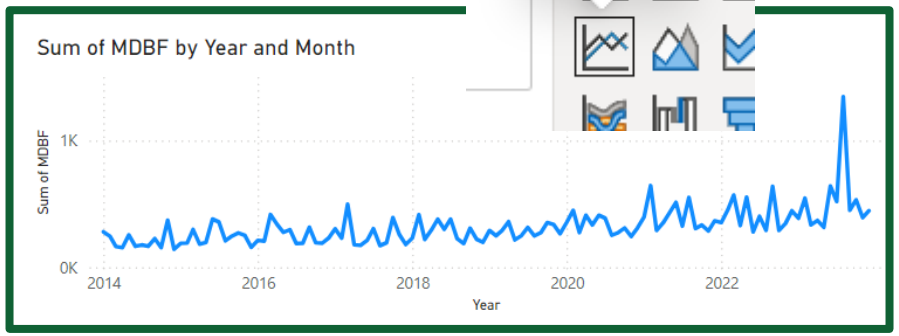


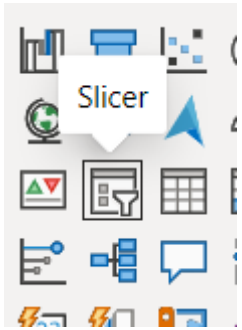


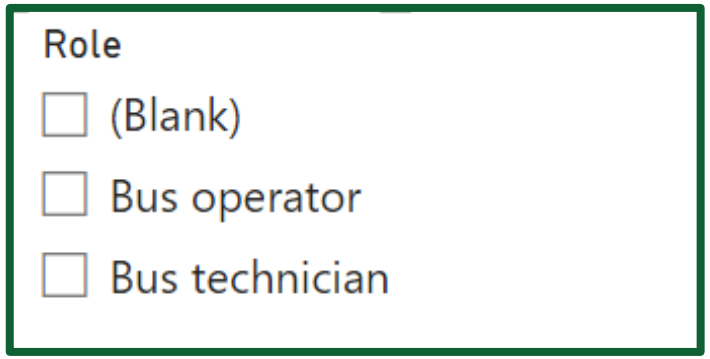




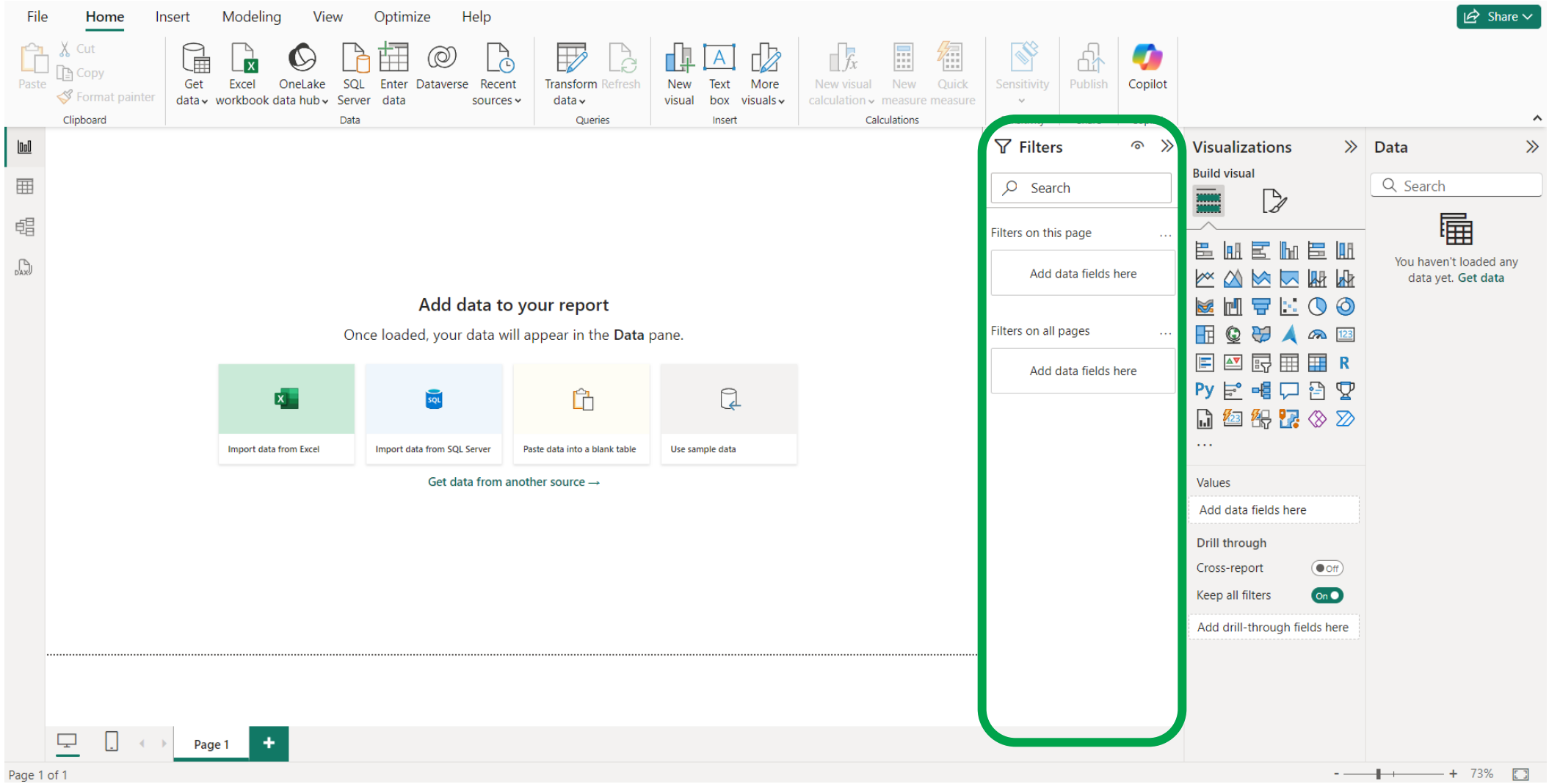






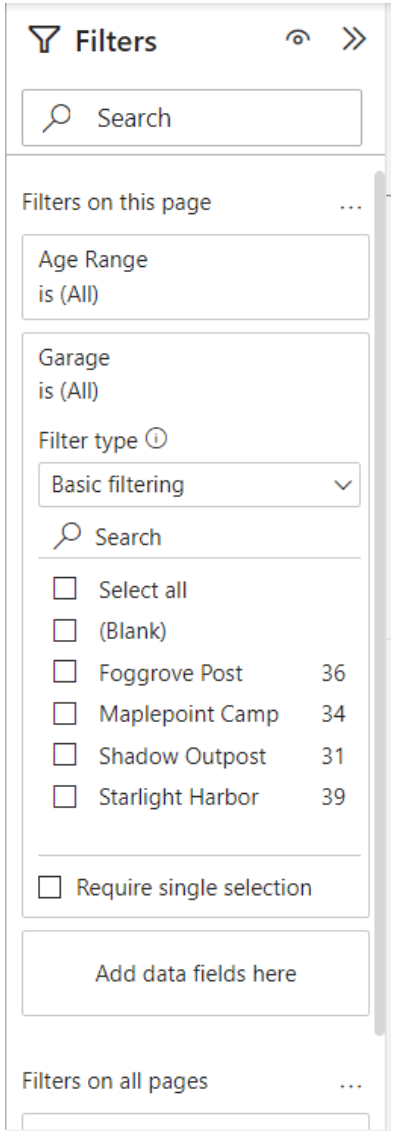


Power BI Home Page



Making Connections 2024 TWC

Filters



- Add columns to this sidebar to use those variables as filters on the page or all pages.
  - For example, if your data comes from multiple garages, you can filter all of the visualizations on that page by garage to show data for one or several of them at a time.
- If you have a visualization selected, this sidebar shows filters for that visualization.
- Slicers are filters that appear on the page itself. If you want to embed your dashboard on a site publicly with filters for the user, you may want to add slicers.

DAX Expressions

- DAX expressions are like functions in Excel which allow you to manipulate data to populate new columns or create aggregated measures.

```
Program Status = IF('Employee info'[Start Date] < DATE(2019, 1, 1), "Before", "After")
```

```
Days Employed = DATEDIFF('Employee info'[Start Date], 'Employee info'[New End Date], DAY)
```

```
MDBF = [Miles traveled]/[Mechanical failures]
```

Data visualization design principles

Data visualization design principles

Color!

Data visualization design principles

Color.

- Minimize intense or distracting color combinations
- Choose one color per category and use consistently
- Utilize data visualization checklists and accessibility tools to check accessibility of visualizations for people with colorblindness
- Color should not be the only means of communicating information
- Consider directly labelling data
- Work with graphic designers and IT staff if available to integrate brand colors and fonts into data viz platforms

Lunch (12-1:30)

Hands-on with Power BI

Quick 15-minute break

Using and sharing your report or dashboard

Considerations for dashboard functionality and dissemination:

- Power BI Desktop vs. online
- Power BI free vs. pro and other versions
- Static report vs. interactive dashboard
- Internal vs. external audience

Using and sharing your report or dashboard

Options for using and sharing:

Individual use by data user / program manager / decisionmaker

Dissemination of static reports within an organization

Interactive dashboard available to internal users

Interactive dashboard available to external audience

Others?

Using and sharing your report or dashboard

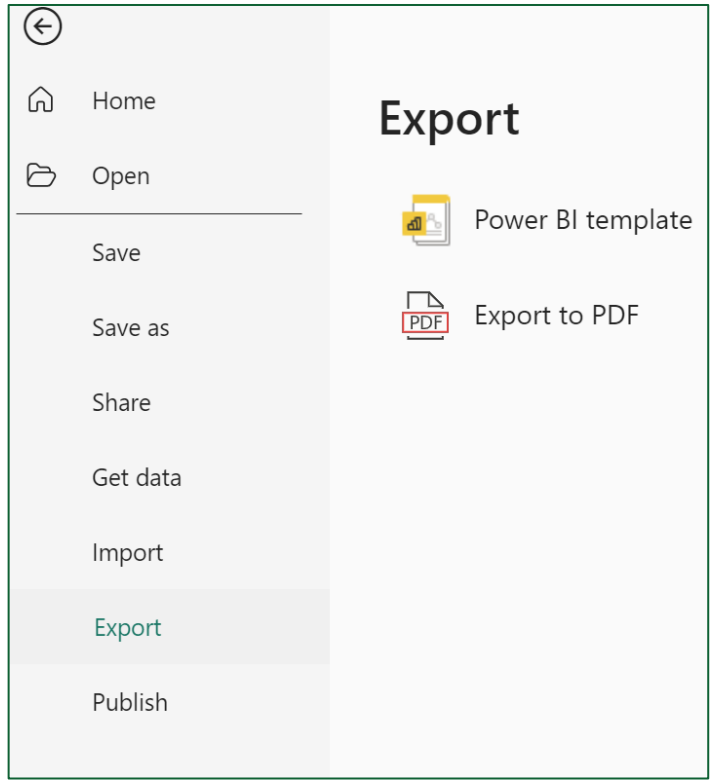
Individual use by data user / program manager / decisionmaker

- Power BI Desktop free version is sufficient
  - Can still store or back up data sources and .pbix files securely
- Enables tracking of trends and KPIs for decision-making purposes

Using and sharing your report or dashboard

Dissemination of static reports within an organization

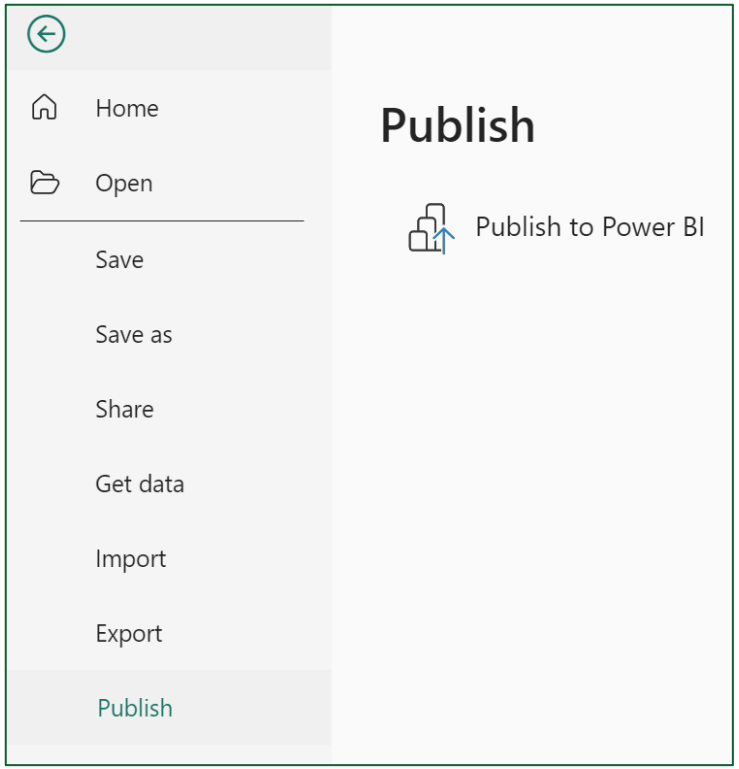
- Power BI Desktop free version is sufficient
- Go to File – Export – Export to PDF
- Considerations:
  - Dimensions of page
  - Simplicity and readability
  - Direct data labels on visuals



Using and sharing your report or dashboard

Interactive dashboard available to internal users

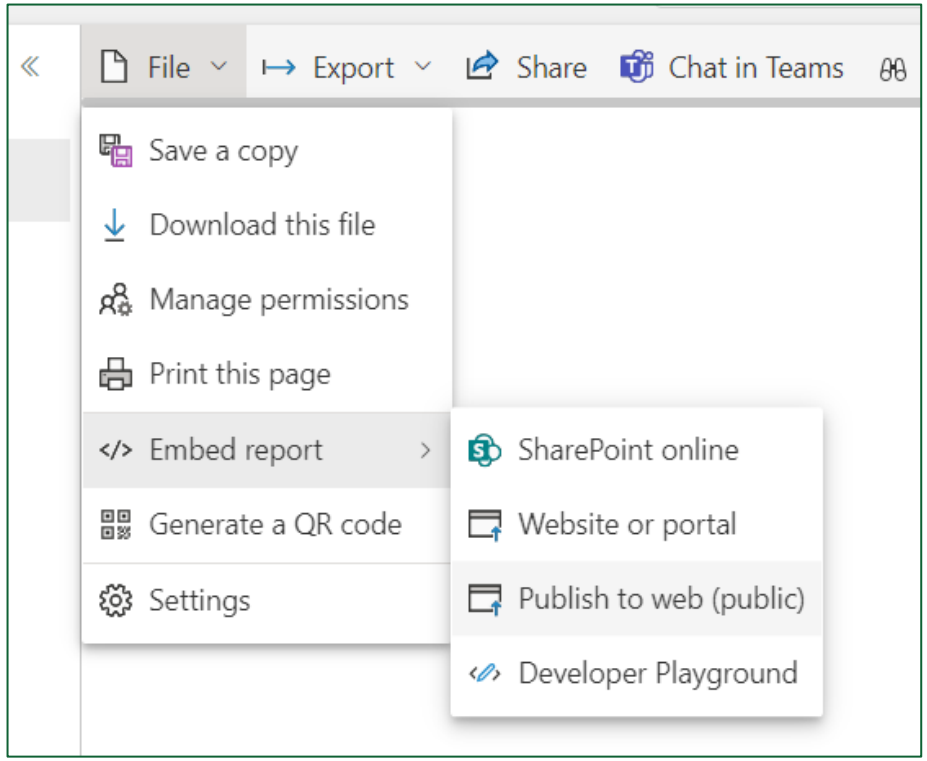
- Power BI Pro version required
- Go to File – Publish – Publish to Power BI
- Can be accessed via Sharepoint page, MS Teams
- Considerations:
  - Access permissions – IT coordination
  - Visibility of filters and other components



Using and sharing your report or dashboard

Interactive dashboard available to external audience

- Power BI Pro version required
- Generates embed link that can be added to public-facing website
- An example embedded dashboard (Password: MC24)



Free hands-on time

Experiment with:

- Changing titles, labels, colors
- Changing the axis ranges (e.g., y-axis on absences chart)
- Adding alt text to charts
- Trying out other Power BI features