

Introduction to Power BI

What is it, how to get it, how to create reports with Power BI and how to publish them?

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Original version and updates can be found here:

<https://chandoo.org/wp/powerbi-introduction/>

What is Power BI?

Power BI is a software to create & publish reports and data stories from your data-sets. You can make highly interactive, engaging and powerful reports, dashboards or visuals with Power BI. You can connect to any data (Excel files, SQL databases, BI warehouses, Cloud data, APIs, web pages and more), mashup the data, link one table with others, create *clickable* visualizations and then share them with your audience securely thru Power BI.

Power BI is software to create reports and stories from your data and share it with others.

Who should use Power BI?

If your job / business or life depends on data, then you can use Power BI. There are two kinds of users for Power BI – Creators & Consumers.

Creators are people who make stuff in Power BI.

- Consumers are people who read / view things built in Power BI.
- Power BI Creators are typically:
 - Reporting professionals
 - Analysts
 - BI Developers
 - Visualization Specialists
 - Story tellers / Presenters
- On the other hand, almost anyone can be a Power BI consumer.

How is Power BI different from Excel?

So what, even Excel can create interactive reports. But there are several crucial differences between Power BI and Excel.

Power BI allows rich, immersive and interactive experiences out-of-box. You can click on a bar in bar chart & other visuals respond to the event and highlight or filter relevant data. You can show graphs & visuals that are very tricky (or impossible) to reproduce in Excel like maps, pictures and custom visuals.

Power BI works with large data sets There is no artificial limit of 1 mn rows in Power BI. You can hookup to a business data set and analyze any volume of data. The limit depends on what your computer (or Power BI server) can process.

Share and read reports easily You can create reports in Power BI and share them in formats that are universal (*i.e.* browser pages or apps). This means, your boss need not have Excel or Power BI installed to enjoy the beautiful reports you create.

Power BI is for story telling while Excel is for *almost anything*. We can use Excel to simulate pendulum motion, calculate Venus orbit, model a start-up business plan or many other things. Power BI is mainly for data analysis & story telling. If you try to replicate a large, intricate financial model or optimization problem with Power BI, you will either fail or suffer miserably. On the other-hand, if you use Power BI for making reports, running cool analysis algorithms (clustering, outlier detection, geo-spatial patterns etc.) you will wow your colleagues and bosses.

How to get Power BI Software?

Power BI Desktop software is free to download. Just head to **Microsoft Power BI website** and download the version for your computer.

Things to keep in mind when downloading and installing Power BI:

- **Power BI is always changing.** Almost every month, Microsoft releases a new version of the software. One simple way to stay on top is to install Power BI thru Microsoft Store (on Windows 10). This way, your computer will automatically update the software whenever there is a new version.
- **You do not need PowerBI.com account to use** Power BI Desktop. While Power BI may prompt you to login, you can use the software without registering for the online account. However, you can sign up for free PowerBI.com account.
- **Login to publish & share your work.** Although you can use PowerBI without logging in, you must log-in if you want to publish or share your reports with others.

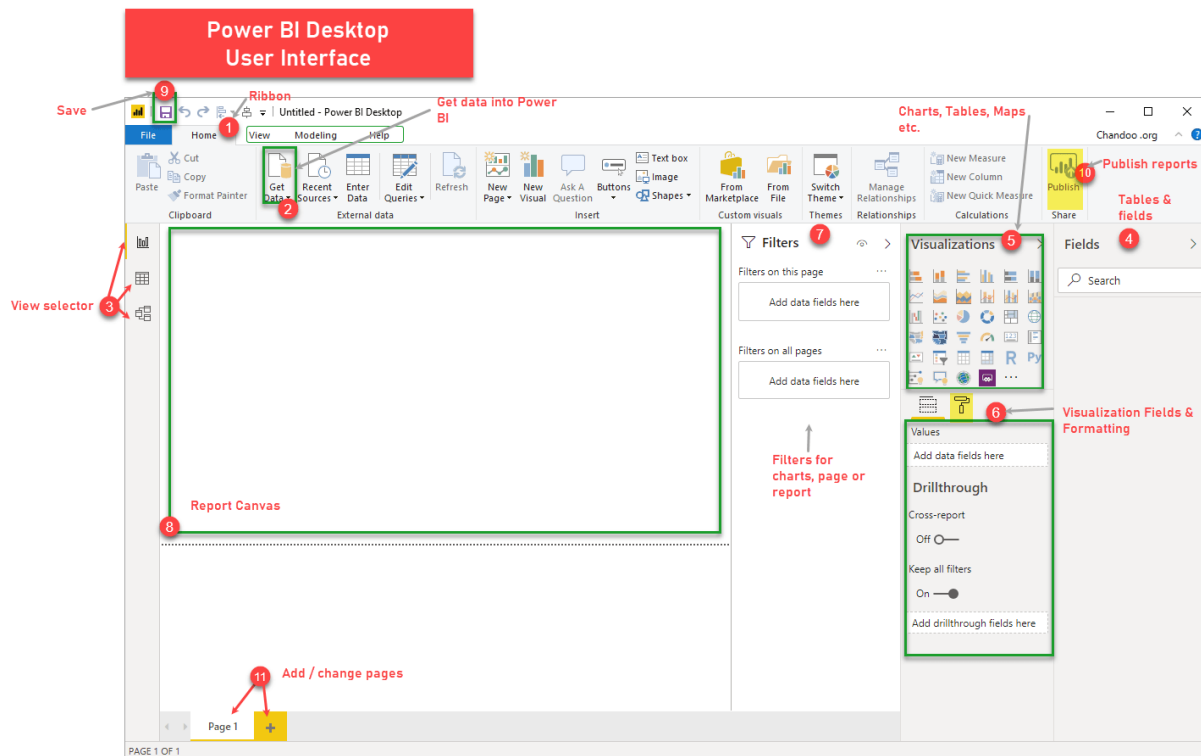
Building your first report in Power BI - Tutorial

Okay, so you have downloaded Power BI and eager to play with it. Here is a step by step tutorial to help you.

We will use sample employee data for this process. Open the file provided called “Tutorial Employee Data.xlsx”

#1 - Understanding Power BI Desktop UI

Open Power BI Desktop application. After you exit the welcome splash screen, you will see the blank Power BI application. Let's understand this screen. Here is an illustration explaining 11 important features / buttons in Power BI Desktop.



11 Important features of Power BI Desktop UI

1. **Ribbon.** Find most important and regular stuff in Home ribbon. Navigate to other ribbons for specific functionality.
2. **Get Data.** Use this button to get data from almost anywhere – Excel files, websites, databases, APIs etc.
3. **View selection,** by default you will be on Report view. Change to data or model view to see behind scenes.
4. **Fields** Access the tables and fields (columns) of your data here. Use them in visuals (5) or filters (7) etc.
5. **Visualizations** add charts, tables, maps, filters etc to the report from here.
6. **Visual Fields,** Format and analytics use this area to set up and customize your visualizations (charts etc.) Note the paint-roller, use it to edit colors, fonts, settings etc.
7. **Filters** – set up chart, page, report level filters here. Anything you restrict will be removed from all the linked items.
8. **Canvas** this is where you construct your reports.
9. **Save your Power BI reports** by pressing CTRL+S or clicking on this button. They will be saved as PBIX files.
10. **Publish** the reports with this. You can publish them to online (either free PowerBI.com account or paid plans) so that others can access your reports.
11. **Add more pages** to your report using the + button.

#2 - Load data into Power BI

- Click on Get Data button.
- Select "Excel" as as source.
- Point to the downloaded sample data.
- Select "Table1" in the navigator screen and click on "Load" button.
- Done, your data is loaded.

Navigator

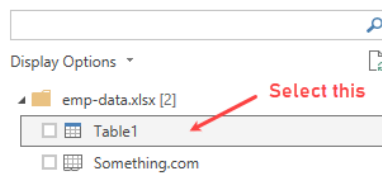


Table1

Preview downloaded on Wednesday, October 16, 2019

Name	Gender	Department	Age	Date Joined	Sala
Barr Faughny	Female	Procurement	39	2/6/2018	
Dennison Crosswaite	Male	Website	26	9/16/2017	
Gunar Cockshoot	Male	Website	31	5/11/2017	
Wilone O'Kielt	Female	Website	43	10/29/2017	
Gigi Bohling	Male	Sales	33	1/8/2017	
Curtice Advani	Male	Finance	30	8/5/2017	
Kaine Padiy	Male	Website	20	3/20/2017	
Ches Bonnell	Male	Website	37	11/22/2016	
Andria Kimpton	Male	Website	30	9/18/2016	
Brien Boise	Female	Website	31	10/12/2017	
Husein Augar	Female	Finance	30	1/12/2017	
Karlen McCaffrey	Female	Finance	34	3/20/2017	
Jan Morforth	Male	Finance	28	1/29/2016	
Dotty Strutley	Female	Website	31	5/10/2016	
Kelci Walkden	Male	Procurement	21	1/20/2018	
Marney O'Brien	Female	Finance	21	11/1/2016	
Rafaelita Blaksland	Female	Sales	38	12/30/2016	
Madelene Upcott	Male	Procurement	25	12/14/2017	
Beverie Moffet	Female	Finance	28	6/20/2016	
Oby Sorrel	Female	Finance	34	10/2/2017	
Mallorie Waber	Male	Procurement	30	10/15/2017	
Jehu Rudeforth	Female	Finance	34	8/20/2017	

and click on load

#3 - Adding Visuals

Working in Power BI feels like playing with your data. This is because of the drag-and-drop nature of report building process. To add a visual,

1. Click on the type of visual you want.
2. A blank visual will be added to available empty space on your report canvas.
3. Select fields from your data and add them to relevant places.
 - Axis
 - Legend
 - Values
 - Tooltips (optional)

How Power BI visualizations are different...

- Power BI visualizations are always interactive
- They are sorted by default (for ex: descending order for column charts)
- Value field will be the *number* of chart. You can change the calculation to SUM / COUNT / AVERAGE etc.
- You can even use DAX Measures in the value area of charts
- All visualizations support extra tool-tips (both simple and report-page type tooltips)
- Use Legend field (where available) to see 2nd level detail.
- When you add multiple fields to axis, Power BI adds drill-down buttons to see chart at various levels

#4 - Changing Calculations for the Visuals

You can use two methods to change the calculations for the charts.

- Use default options for calculations – SUM / COUNT / AVERAGE etc.
- Write your own calculations with Power Pivot measures
-

To change the calculation of a chart with default options, follow below steps.

1. Select the power BI visual
2. Go to Value field.
3. Click on the little down arrow symbol.
4. Select the type of calculation you want.
5. Done.

#5 - Understanding Power BI Interactions

Power BI visuals are interactive. This means, if you have more than one chart on a report page, when you click on a particular item on a chart, all other charts respond to the selection and change.

This is quite different from normal Excel charts, but once you get used to it, you will see the true power of Power BI visualizations.

Power BI interactions - FAQs

Here are some of the common questions you may have about Power BI report interactions.

Are all visuals interactive?

By default, all visualizations in Power BI report are **interactive**. The only exception is card visuals. They are not interactive. So if you click on them, nothing happens to other charts.

How to unselect ?

Simple, click or touch the selected item again. The interaction will be gone.

How to disable or change interactions?

Select any visual, go to Format ribbon. Now click on “Edit interactions” button. This will show interaction buttons on top of all your visuals. Click on do not interact button (looks like no entry sign ).

You need to do this for each visual.

I want to filter instead of highlight on interaction...

You can use the “Edit interactions” button to change the style of interaction. There are three possible interactions (as depicted below).



1. Filter
2. Highlight
3. No interaction (no entry sign – )

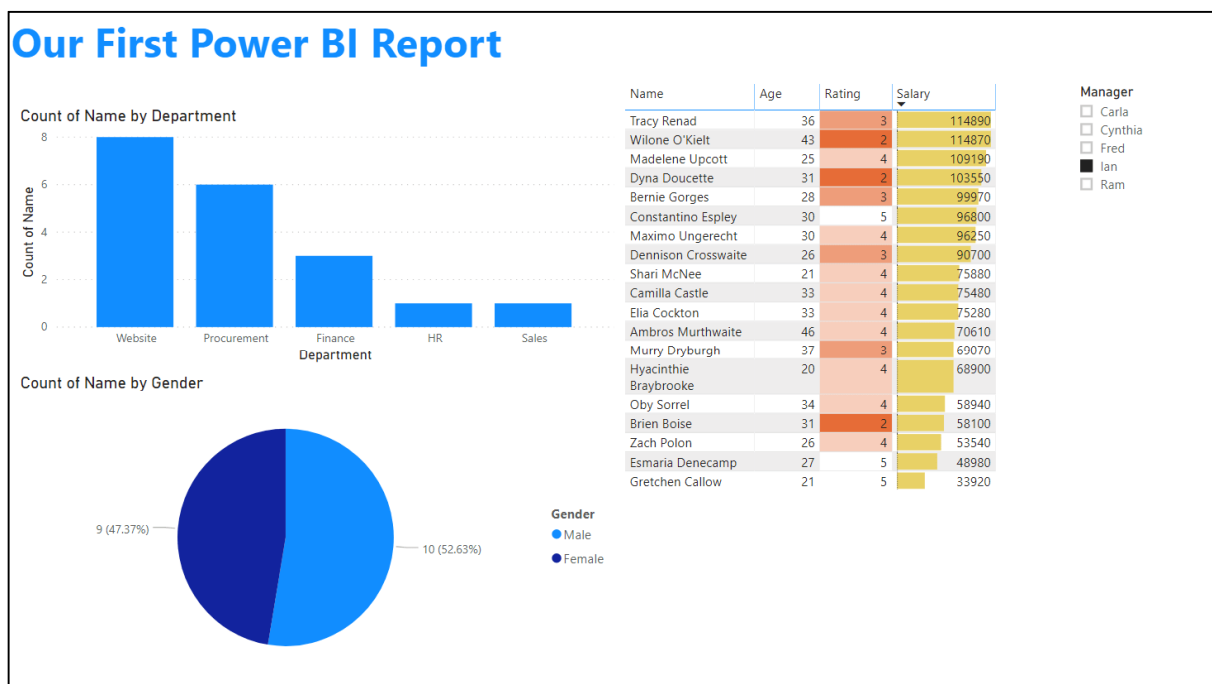
#6 - Putting it all together - Making a sample report in Power BI

Now that you have some understanding of Power BI, let's create our first Power BI report. The focus of this report will be:

- For a specific manager
- Show staff distribution by department
- Gender break-down
- All of their staff by salary and rating

This is a fairly simple report, but it does demonstrate the power, elegance and ease of working with Power BI.

Here is the final output we will create.



Step by step instructions for our first Power BI report:

1. Load the employee data into Power BI as described above.
2. Add a column chart.
 - Department on axis
 - Name (count of name) in values area
3. Add pie chart

- Gender as Legend
 - Name (count of name) in values area
4. Add a table with name, age, rating and salary fields
 5. Add a slicer with manager as field

Our report is almost ready.

Adding conditional formatting

Background colors on rating field:

Select the table. Click on down arrow symbol next to Rating and apply conditional formatting > Background color. Set up a color scale as shown below.

Background color - Rating

Format by **Color scale** [Learn more](#)

Based on field: Sum of Rating

Summarization: Sum

Default formatting: As zero

Minimum: Lowest value (Lowest value)

Maximum: Highest value (Highest value)

☐ Diverging

Data bar for Salary:

Click on conditional formatting for salary, set up data bars as shown below.

Data bars

Format cells with bars based on their values.

Base value: Salary

☐ Show bar only

Minimum: Lowest value (Lowest value)

Maximum: Highest value (Highest value)

Positive bar: Yellow

Negative bar: Light blue

Bar direction: Left to right

Axis: Black

OK Cancel

Adding title for the report

From Home ribbon in Power BI, click on Text box and type your report title in that. Format the text and position it on the top.

That is all, your first Power BI report is ready.

Play with slicer or charts to see powerful insights from this report.

#7 - Saving & Publishing your Report

To save your Power BI report, press CTRL+S. This will save a copy of your report on your computer. Power BI files use the .PBIX as extension.

How to share / publish your reports

You can publish your reports in various methods.

- **Email or share the file:** this is the simplest method. Just email or share the file with your audience. They will need Power BI Desktop to view the reports though. Also, they will need to access the source data sets to be able to refresh or update the reports.
- **Publish to Power BI online:** This is the recommended way to sharing your reports. But you do need PowerBI account (either paid or free) to be able to publish the files to online workspace. Once you publish your reports to the workspace, you can invite others to view them or pin parts of it to a dashboard etc.
- **Share to Mobile / Tablet via Power BI app:** Once you publish the reports to Power BI workspace, others can view the reports on web or on mobile / tablet apps by accessing the workspace.

#8 - Updating & Refreshing your Report

With Power BI, you **create once, use forever**. As your business data changes, all you need to do is, refresh the report. This will automatically fetch any new data from your source, update all calculations and visuals. If you publish the report again, this will replace the online version with new one so your colleagues or clients can access updated reports easily.

What if your data format changes?

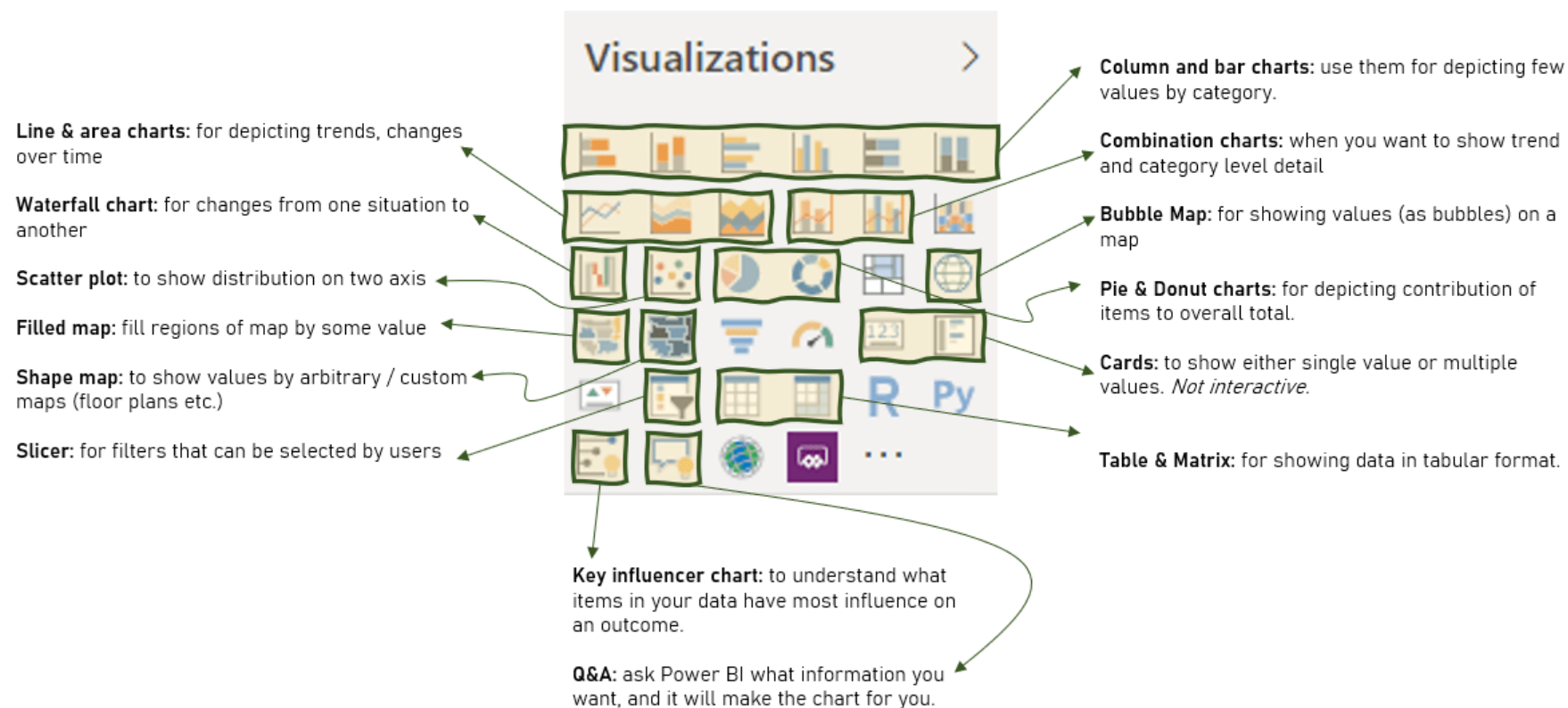
For example, if you add new columns or rename things, then you may need to rebuild some visuals or calculations. You will notice any broken items upon refresh and you can easily fix them.

When to use each of the Power BI visualizations

As of November 2019, Power BI has got 34 default visualizations. You can also install any of the 100s of custom visualizations from Power BI marketplace. All of this can be overwhelming. So I made this handy illustration and check-list to help you decide the right visualization for any situation.

Important Power BI Visualizations

And when to use them



Picking the right visualizations for your situation..

Compare one with another

- 2 items to compare: Use two cards or KPI visualization.
- Up to 12 items: use column or bar charts
- More than 12 items: Use tables with conditional formatting. Try column / bar charts with Top N filter if you want to see top few items.

Trends, changes over time

- Use line charts or area charts with time on x axis with oldest time to left.
- If you have just two points in time and want to compare the changes, consider the waterfall chart.
- You can also toy with ribbon chart to see if that provides any valuable insights.

Composition, how things add-up

- Use 100% stacked bar / column charts, area charts.
- When you have few values to see the composition, use pie chart or donut chart.
- As Power BI is interactive, you can get away with having too many (but definitely not 100s) of slices in your pie / donut charts.
- When you have lots of values with few clear outliers, try the tree-map visualization.

Spacial distribution

- Use Maps for geographical distribution of data.
- Bubble map: when you have data about specific locations
- Filled map: when you have data for regions
- ESRI maps: for maps with additional reference layers (say population, crime rate, GDP etc.)
- For distribution by floor / store shelves or something else, use shape maps.

Distribution

- For one-dimensional distribution, use line or area charts
- For two-dimensions, use scatter plot
- More than two-dimensions, you may want to avoid the visualizations altogether as they can be quite hard to explore. If you must, try a table.

Outliers, what is different?

- Use column, bar or table charts with conditional formatting to bring out the differences.
- You can also try the key influencer visualization to let Power BI analyze your data and tell you what is the most significant item impacting outputs.

Simple numbers, messages and indicators

- Use card visualizations or KPI visualization.

For updates to this document, subscribe at: <https://chandoo.org/wp/powerbi-introduction/>

Notes....

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.