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Introducing Power BI

In the “old days,” the kinds and sources of data available to us in the workplace were limited. Making data-driven decisions was a process of gathering enough reports, synthesizing that data into spreadsheets, and pivoting that data into various ways of slicing and dicing until you reached some level of clarity to proceed with a decision. Some folks were lucky enough to have data warehousing tools to assist them with that process, but more often than not, even they had to wrangle that data from the warehouse and pull it all together into multiple tables and charts side-by-side to try to make heads or tails of what was seen. And if someone had the audacity to ask, “What would happen if I changed this one variable?” or “How does this data category impact this other category?” then you’d be spending another week reloading, rearranging, and reformatting the results.

But things have changed dramatically even in the last decade. The simultaneous growth of processing power and data availability has been accompanied by applications that are designed to leverage that explosive growth. Data analysis tools now easily enable exploration of large volumes of data and provide a dynamic experience where one *can* quickly visualize, “What would happen if I change that one variable?” or “How does this data category impact this other category?” Enter Power BI: Microsoft’s game-changing data analysis service.

NOTE *All those efforts, tools, and infrastructure to gather data from the various sources that are available in order to provide good insights for making business decisions is what the industry calls business intelligence (BI).*

WHAT IS POWER BI?

Microsoft describes Power BI like this:

“Power BI is a collection of software services, apps, and connectors that work together to turn your unrelated sources of data into coherent, visually immersive, and interactive

insights. Your data may be an Excel spreadsheet, or a collection of cloud-based and on-premises hybrid data warehouses. Power BI lets you easily connect to your data sources, visualize and discover what’s important, and share that with anyone or everyone you want.”

<https://learn.microsoft.com/en-us/power-bi/fundamentals/power-bi-overview>

Power BI has three primary components: a Windows desktop application, an online service, and a mobile application.

The desktop application is used to create reports and build datasets (from which reports can consume data). While Power BI reports can be created online in the Power BI Service (more to come on that in a little bit), Power BI Desktop (see Figure 1.1) allows you to take advantage of all the features available in report creation and data modeling (Chapter 6 will cover what in the world that means).



Power BI Desktop

FIGURE 1.1: Power BI Desktop

HOW DO I GET POWER BI DESKTOP ON MY COMPUTER?

There are two primary ways to install Power BI Desktop: through the Microsoft Store (<https://aka.ms/pbidesktopstore>) or through the Microsoft Download Center (www.microsoft.com/en-us/download/details.aspx?id=58494).

The advantage to using the Microsoft Store is that your desktop version will continue to stay updated to the latest version. Microsoft releases a new version of Power BI Desktop every month with new features or enhancements as well as bug fixes. Staying on top of the latest version ensures you have the best experience using Power BI.

The downside to staying up-to-date on the latest version would be if you are working with another person who is unable to use the Microsoft Store and has to use the Download Center; in that case, if you used a new feature that came out this month, published a report using that feature, and then asked your colleague to work on that report, they would be forced to update their installed version.

You may wonder, “Isn’t that an odd situation? Shouldn’t everyone just stay up-to-date on the latest version?” And you wouldn’t be out of bounds to think that—it *is* a best practice to use the Microsoft Store version so that you can stay up-to-date. *However*, I have found that many of our customers work in large enterprises that have what are referred to as *managed desktops*. This means most of the users do not have the ability to install software on their Windows computers. In those situations, the central IT department manages which version of software is available. In this case, the IT department would indicate which version of Power BI Desktop they would want to be used.

You might also be wondering, “Wouldn’t my colleague and I automatically have the same version then?” You wouldn’t be off your rocker to think that! Again, *however*, I have run into scenarios where some individuals have elevated privileges on their Windows computers and some of their colleagues do not.

So, the first lesson to be learned is: take some time to learn within your organization what version of Power BI Desktop they would prefer you to use. And, . . . ask to use the Microsoft Store version! The second lesson would be to consider whether you’ll be working within a team of people who will all be creating Power BI reports and talk about how you’ll plan on staying in sync and which version of Power BI Desktop you’ll use as a group.

With Power BI Desktop you will import data from your different sources, arrange it in ways that make business sense, and then create reports on top of that imported data. (You won’t always have to *import* data, but in this book that is the approach we will take.) Once you have a report in a state that you think is useful enough to share, then you will publish that report to the Power BI Service (see Figure 1.2).



FIGURE 1.2: Publishing to the Power BI Service

The Power BI Service is a cloud-based service (sometimes you’ll hear it referred to as *software as a service*, or SaaS) that serves as a central repository for all of your reports and datasets and those others have created in your organization. The Power BI Service’s main job is to serve up the reports that you published. The service enables you to share content with others. Here you’ll organize your reports and datasets into workspaces. While workspaces give you the ability to organize like-for-like, more importantly, they give you a space in which to collaborate with other people developing reports with related content. Furthermore, workspaces give you the ability to say *who* and *how* others can access your reports. This is called *governance*. While it’s great that you can share your insights and allow others to gain insights, you always have to think, “Who should have access to reports and data in this workspace, and what should they be able to do in this workspace?”

The third component of Power BI is the mobile application (see Figure 1.3). Unlike the Desktop version, there *is* a version for iOS as well as Android. The mobile application is similar to the online version but behaves much like you would expect a mobile application to behave and has a modern look-and-feel. When you create reports, you are able to create a separate view of the same report as it will be displayed in the mobile application. This means that it will fit well into a mobile format.



FIGURE 1.3: Power BI Mobile

There are three kinds of individuals who interact with Power BI: report creators, report consumers, and Power BI admins, as shown in Figure 1.4. We will skip talking about Power BI admins, because that is beyond the scope of this book, but just know that there is a wide array of options available to your organization to manage and control the use of Power BI.

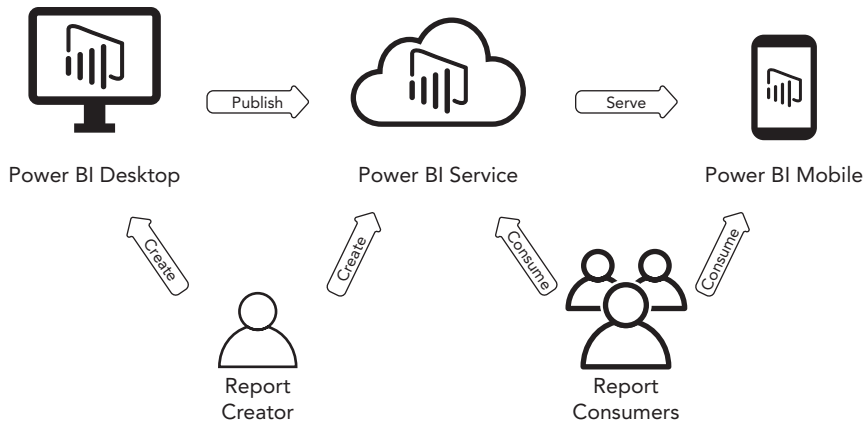


FIGURE 1.4: Report creators, report consumers, and Power BI admins interact with Power BI

Report creators are those who, well, . . . create reports! Presumably that would be you. Report creators can fall into two categories: business users and IT professionals. IT professionals are sometimes referred to as *data engineers*. These are individuals who get paid to do this! Data engineers are familiar with writing sophisticated code to extract data from a plethora of sources, bringing that data into a centralized location (maybe in the cloud in a *data lake* or into a database on a server located in an on-premises data center), and then arranging that data so that it is readily consumed by business users. They often will also make very complex reports that retrieve this data and present it in a Power BI report or with some other reporting tool. On top of all this, they often are dealing with volumes of data on a scale of not just millions of rows but possibly billions of rows!

You, on other hand, may have a whole set of responsibilities that make up your job, and just one aspect is figuring out how to wrangle the data you work with into something that can help *you* or someone else make heads or tails of the data you use on a daily basis. What is interesting, though, is that the methods (and consequent skills) you will learn in this book are based on the same proven methodologies that those data engineers use day in and day out. That should give you a level of confidence as you proceed down this journey with Power BI!

That other group of individuals, *report consumers*, are your customers. They may be customers internal to your organization, like your boss! Or, they may be external customers. They are the ones for whom you are making Power BI content to consume to gain insights and make decisions. Frankly, you may be your own customer! You may be wanting to learn Power BI just so that you yourself can glean insights in better ways than you have before.

But then again, you may still be wondering, “Why would I use Power BI?” or “How do others use Power BI?”

WHY WOULD I USE POWER BI?

The ways Power BI is used by thousands of organizations around the world is innumerable. But if you’re new to Power BI, it might be difficult to begin to see how you might use it. In my years of consulting with many customers, I have seen Power BI used in many creative ways. Some of these have involved sophisticated data extraction routines and leverage enterprise data warehouses and even artificial intelligence capabilities. But I’d like to describe three *common* usages. These are three real-world scenarios that involve using the same tools and methods that you will learn how to use yourself within this book.

An international gas supplier maintains a Google spreadsheet of a couple thousand contracts including the terms and lengths of the contracts. They want to be able to know when these contracts are coming close to the time they need to be renewed. They also want to know how much that customer normally purchased. That info was not stored in the spreadsheet, but in SAP. With Power BI they were able to bring both sources of data together and not only be able to visually demonstrate which contracts would need to be renegotiated within the next 90 days but were also able to prioritize those based on their sales volume.

A state-based education center exists to ensure success for all students. They collect student test data as well as training records for staff. There are more than 300 attributes that need to be tracked and correlated across multiple aspects. This center imported their collected data into Power BI and was able to identify patterns and areas of concern across the state, by school districts, or within specific schools.

An HVAC distributor has sales goals for their account reps. These goals exist at the regional level as well as for each rep. This company connected Power BI to Salesforce and was able to retrieve sales data, goals, and account information and was able to create custom dashboards that display actual sales performance against goals by day, month, quarter, and year. In addition, an account rep can quickly see which are their top customers and *only* their customers, but their regional manager can see which are the top performing account reps and the highest volume purchasers across the region. And while the regional managers are restricted to their regional data, the vice president of sales is able to see all data across the regions and is able to drill down into the lowest level of sales detail.

BUT WHY?

You may be reading this book as someone who has been using Microsoft Excel for years and have figured out all kinds of ways to push its analytics capabilities. And to be sure, Excel makes the business world go round. Powerful functions such as `VLOOKUP()` or `INDIRECT()` combined with pivot

tables and macros make Excel's limitations almost seem to be nil. But there are plenty of limitations on Excel that have brought many customers to the breaking point, and they end up calling consulting groups like the one I work for and pleading with us to come up with a more robust solution. Let me give you a couple examples.

- An injection-molding manufacturer has several plants around the country. Each location has a financial controller responsible for gathering month-end accounting and financial data as well as other important metrics that the company wants to track. Each controller uses a template Excel spreadsheet that corporate provides and requires the controller to fill out and submit. The controller will post general ledger data for the month as well as enter the metric data. The Excel template has prebuilt pivot tables that aggregate the data by accounts. Once the controller has finished their prep work, they execute a macro stored in the template, which will further manipulate the data and copy it to a central file location. At corporate, another controller will utilize an Access database, which connects to all of the submitted Excel workbooks, extracts the data, and then lands the data in a parent Excel workbook. That parent workbook then arranges the data further for different levels of reporting needs. The workbook is quite sophisticated in its use of advanced Excel formulas, but the whole process is fraught with potential for human error. Furthermore, the company came to us asking for help because the process was grinding to a halt since the Excel workbooks were hitting size limits and experiencing significant performance issues.
- A health insurance company received monthly actuarial data from an outside firm and would use Excel to marry that data with their claim data. They had to upgrade to the 64-bit version of Excel to accommodate size restrictions, but they also began running into other challenging limitations. For them to prepare monthly reports for executives, they would take several days for data manipulation and to update formulas across several pivot tables that needed to be synchronized side by side. Instead of putting their efforts into analyzing the data they had at their fingertips, they paid their data analysts to spend 25 percent of their month just preparing data for analysis. This was alongside all their other job responsibilities.

Beyond the intricacies of managing complex reporting processes, there are other limitations of Excel. These limitations might not have occurred to you because you've just learned to live with them. I'm thinking about two areas: disconnected data and fixed formulas.

Disconnected Data

Imagine you have built a complex Excel workbook that has multiple related worksheets of pivot tables of data. Then on one worksheet you have multiple visuals bringing together the data from your different worksheets. And let's imagine you have a couple of charts and a handful of tables that display data from the different worksheets. If you wanted to filter out just one aspect of data that is related to each of the visuals and tables, you would have to go to each pivot table or visual and find the related data and use Excel's Hide Selected Item function (see Figure 1.5). Naturally, as you see the impact of your filtering, you'll analyze whether there is any impact by removing other data. Consequently, you'd repeat the cumbersome tasks of filtering throughout the workbook. Your worksheets of data are related to each other in a logical way in your head, but they're not connected in a technical way such that Excel "knows" they're connected.

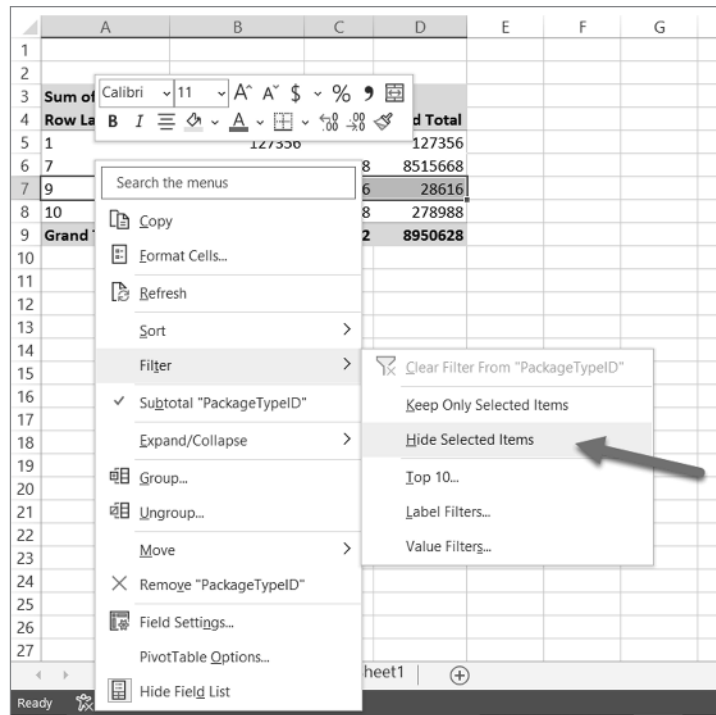


FIGURE 1.5: Excel's Hide Selected Item function

Power BI addresses this challenge with ease. First, in the previous example, the data in those worksheets are related to each other in some way, logically. In Power BI, those worksheets would be represented as tables, and those tables would have relationships defined between them. By you simply telling Power BI how those worksheets/tables relate to each other, you enable Power BI to do dynamic filtering across those related tables all from one spot. In the previous scenario, you would simply “exclude” the data as you see it on your report page, and it would automatically filter the data across all the related tables.

Fixed Formulas

A second common limitation of Excel is not as much a limitation as it is an impediment. Excel has the ability to create incredibly complex formulas using statistical calculations or aggregations that would take much manual effort to produce. However, once you create a formula to perform such calculations, you create it where you want to use it, and that formula is a fixed formula that can be used *just in that cell*. If you want to repeat using that formula in a different location in your workbook, then you must copy and paste the formula where you'd like to use it and then update the formula's cell references every time you want to reuse that formula.

Power BI addresses this encumbrance with a formula language called Data Analysis Expressions (DAX). If you're comfortable with writing Excel formulas, you will really come to love the DAX language. In the previous example, you would write the complex formula one time and use that

formula wherever you need to without having to adapt it for each location. As Rob Collie has called it, they're "portable formulas."¹ Furthermore, if your formula is one of those formulas that your colleagues say, "Hey, I want to use that formula in my report!" then with Power BI you can just share your dataset with its great formulas in such a way that others can build their reports using those formulas. So not only is your formula portable within your dataset, but your dataset with all of its amazing formulas is shareable as well!

We've seen a handful of reasons why Power BI will take your report building solutions to the next level. I want to show you that Power BI will not just improve your ability to build reports but will transform your work.

Ten Reasons Why Power BI Transforms Your Work

These are the reasons:

- *Security, security, security.* Power BI gives you the ability to make sure that only the right individual or group has access to your reports. In addition, Power BI gives you the ability to control within a report *what* data they can see. For example, you can control whether one salesperson can see only their regional data. There simply is no way to implement this kind of security inherent in Excel.
- *Exponential storage capabilities.* If you've spent much time working with Excel building very large workbooks, sometimes with millions of rows, you know that when you need to make a change, sometimes you need to go get a cup of coffee while you wait for it to finish applying your change. With Power BI, as long as you design your datasets with the methodology I'll teach you in this book, you will see the file size of your Power BI reports be exponentially smaller than the size of your Excel files (or other sources of data). I recently was able to import two database tables with a combined 30 million rows that consumed 20 GB of storage. Power BI compressed that 20 GB to 45 MB: a percent change of 99.76!
- *Faster performance with your large datasets.* Not only will you see incredibly smaller storage size on your files, but when you follow the methods I'll teach you in this book, you'll also see insanely fast performance compared to that very large Excel workbook. This small storage size and fast performance is a result of the way Power BI is designed to store and operate on data.
- *Data sources just keep coming.* If you have used Excel's Get Data feature (see Figure 1.6), you know that the list of sources from which you can retrieve data is quite extensive.

But with Power BI, the list of sources available continues to grow monthly, far surpassing what Excel and many other reporting tools provide. Just check out this page from Microsoft, and you will see that the list is very impressive: <https://learn.microsoft.com/en-us/power-bi/connect-data/power-bi-data-sources>.

- *Collaboration.* With Excel, if you want to share your files, you can place them into a network-accessible location or use something like Dropbox or SharePoint, but collaborating on a spreadsheet is not simple. Power BI excels at collaboration allowing you to organize your files into workspaces and determine who can work in that workspace with you and how they can use that workspace.

¹Rob Collie and Avichal Singh, *Power Pivot and Power BI: The Excel User's Guide to DAX, Power Query, Power BI & Power Pivot in Excel 2010-2016 Second edition* (Holy Macro! Books, 2021).

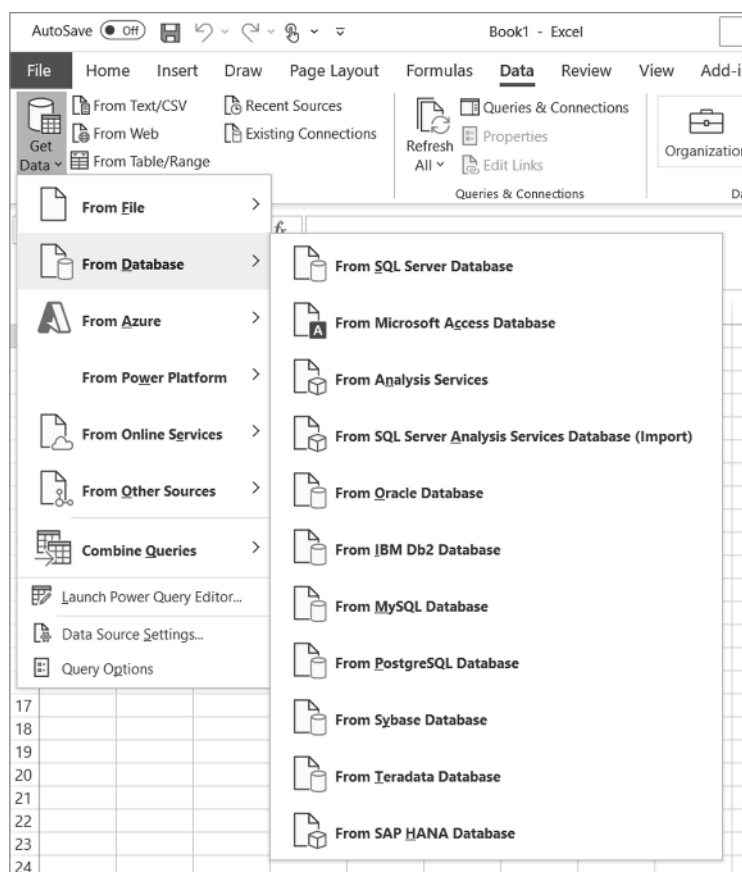


FIGURE 1.6: Excel's Get Data feature

- *Your Excel files don't have to go away.* It's quite likely that you have several Excel workbooks that drive your day-to-day business. Those workbooks can be the basis of source data for your Power BI reports. So all that effort you have fine-tuned into a science to prepare for month-end reports does not have to go away. You can connect Power BI to that month-end Excel report and use it to give your users a whole new level of analytical insights.
- *Refresh your datasets while you're away.* Once you publish your Power BI Reports to the Power BI Service, you'll have the ability to schedule that report to refresh its data automatically. That means your report will contain data that you import from some source. That source may be a file, a database, a web service, or something like that. If you schedule your report to be refreshed automatically, this means your report will be able to go out to the original source(s) of data and automatically retrieve and import your data. If you're used to working in Excel, this is like you opening your monthly report and copy-and-pasting new monthly data into your report from other sources—except now it's automatically done for you.

- *Subscriptions and alerts.* Beyond just getting your data refreshed, once your data is refreshed automatically, wouldn't it be great if people could set up subscriptions to receive your report with the refreshed data? And what if you had a particular business metric that you want to monitor to make sure you know when it changes below or above a certain level (like making sure you know when stock levels get too low)? Power BI does both of those things for you! Subscription and alerts let your users control for themselves when they receive automatic notifications about your data.
- *Visually appealing analytics.* One of the things that often drives people to Power BI is the wide array of visually stunning ways of presenting data to your users, ways that far surpass the abilities that Excel provides. In addition to the built-in visuals (such as interactive charts, tables, and graphics), Power BI provides a marketplace where you can find third-party visuals that others have built using the tools that Microsoft provides to create custom visuals within Power BI.
- *Basic AI capabilities.* Power BI also introduces some built-in artificial intelligence (AI) capabilities. Features such as key influencers, decomposition trees, anomaly detection, natural language querying, trending and time-series forecasting, and automatic insights give you the ability to leverage serious computing horsepower to drive deeper insights into your data.

We won't cover all of these features in this book since we're all about *beginning Power BI* here, but know that these features of Power BI truly are transforming the way people work with data in their day-to-day.

WILL I STILL USE EXCEL?

You may be wondering at this point whether you'd ever need Excel again or maybe that I'm arguing that Excel should go away, but that is not the impression you should have. Excel will likely continue for many years to be the de facto standard for businesses as *the* spreadsheet tool. I want to briefly show you four ways you'll still continue to use Excel.

- While Power BI can most certainly handle complex math formulas in its DAX language, you will find that Excel is conducive to quickly building complex mathematical calculations in stepwise fashion and seeing those results immediately as you work on your formulas. In fact, you may use Excel as a scratchpad to determine how you want to build your DAX formulas in Power BI.
- Excel is still the tool of choice if you're needing to do manual data editing of simple file data (like comma-delimited files or text files, often called *flat files*) or of Excel files that you use as the data source for your Power BI reporting. Once data is imported into a Power BI dataset, you are not able to directly edit that data. So, if your data comes from something like flat files and you have a need to update that data before it gets imported, then Excel is an excellent choice.

- Once you've published a Power BI Report to the Power BI Service, if you have a Power BI Pro subscription (more on what that means in just a few pages), you can connect to your Power BI datasets from Excel and explore the data that “lives” there. This has a couple of caveats, but in general if you have a paid subscription and have the right permissions to the report dataset, then you can use Excel to connect to the underlying data. (You can read about the other exceptions here, but understanding what those mean may be difficult until you work through this book: <https://learn.microsoft.com/en-us/power-bi/collaborate-share/service-connect-power-bi-datasets-excel#prerequisites>).
- While there are other good reasons to use Excel, the final reason I'd like to share is related to the previous bullet point about connecting to Power BI datasets with Excel. You'll find that with Power BI it is easy to apply as many filters and calculations against a set of data as you can imagine. Sometimes you'll want to take a filtered dataset and then do further analysis on top of that. That is difficult to do without having expert DAX programming skills. However, that's where Excel might come in handy for you. Because you *can* connect to that filtered dataset with Excel and then further explore the filtered data within Excel.

WHERE DID POWER BI COME FROM? (A LITTLE HISTORY)¹

While we're on the topic of Excel, it may interest you to know that Power BI's roots are found in Excel.

Back in the mid-1990s, Amir Netz, who started Panorama Software, developed a novel way of analyzing massive amounts of data quickly. Microsoft acquired his company and invested in his team of developers so they could take the software to a whole new level.

In the late 2000s, the market was starting to morph toward “self-service business intelligence.” The idea was to enable the business users to drive after their own analytical questions without having to rely on IT departments to prepare reports for them—not just to do the analysis on their own but to be able to do it quickly. One secret to doing it quickly, as Amir saw others were doing, was to figure out how to use the memory on computers instead of accessing the data on computer disk since that is so much slower.

But the challenge of how to work with very large datasets still presented itself. Together with Cristian Petculescu, Amir invented² a way to compress data in a completely different way than traditional database engines had done for decades. The extent to which they compressed the data and the speed of the queries they were able to gain was so shocking that some people, as Amir put it, “Thought we were defying physics.” The strength of the underlying algorithm was such that it has only been slightly tweaked since 2008. They named this new analytical engine Vertipaq.

Besides performance, Amir realized that they needed an interactive experience like what Excel users were used to. When Excel users build complex workbooks with formulas and lookups, they know that if they change one value, it can ripple through

continues

(continued)

immediately in their workbook. Amir's team at Microsoft decided to focus on Excel users with this Vertipaq engine and create a new interactive analytical experience. Along the way, they also realized that they needed a query language to easily use this engine; this resulted in the invention of DAX.³ Next to come along was the ability to interactively slice and dice the data model with charts. The final key element of the data analysis tools was the Power Query tool designed to help the user import data and transform the data.

Microsoft packaged up all these tools into Excel add-ins starting in 2010: PowerPivot, Power View, and Power Query. These three add-ins were packaged together and released as Power BI for Office 365 in 2013, but they were still embedded within Excel. Microsoft realized that as long as these tools were tied into the Excel worksheet experience, they would be limiting the possibilities of Power BI. In early 2015, Microsoft announced the acquisition of Datazen whose visual analytics service operated in the cloud. Datazen provided the initial base of impressive visualizations that would be able to take advantage of the Vertipaq engine. So, in July 2015, Power BI was released as an application separate from Excel with a desktop and web experience. Since then, constant refinement and new features have been applied to the Power BI suite every month!

¹ This history was summarized from an interview with Amir Netz and Kasper de Jonge: www.kasperonbi.com/the-rise-and-history-of-power-bi-with-amir-netz/

²<https://patents.google.com/patent/US8626725B2>

³<https://patents.google.com/patent/US20110087954A1>

We're coming to the end of this introduction to Power BI, and if you are brand new to Power BI, you may be wondering how much this is going to cost and how do you get started. Let's deal with both of those in these last two sections.

HOW MUCH IS THIS GOING TO COST?

Power BI offers five levels of service offerings: free, Pro, Premium Per User, Premium, and Embedded. As you can imagine, the features that are available to you expand as you progress up those levels. And while you may think, "Free is for me!" you will quickly find that the free version will severely limit what you can do. The good news, though, is that most of what we will cover in this book will be possible to do with the free version. Please note that these service levels do not apply to the use of Power BI Desktop, but once you publish reports to the Power BI Service. Once reports are published, the service levels have different subscription pricing and accompanying feature sets, shown in Table 1.1.

TABLE 1.1: Power BI Service Levels

SUBSCRIPTION	COST	DESCRIPTION
Power BI (free)	Free	With the free version, you use Power BI Desktop to create content for yourself. While you can publish to the Power BI Service, only you can view that content online.
Power BI Pro	\$10/ month	The Pro subscription allows you to take the content you’ve created with Power BI Desktop and share that content with others who also have a Pro subscription. With Pro, you are able to create live dashboards from your report content that can bring data together from multiple reports. This level works great for many business users, but it does have some limitations, including a data size limitation as well as a model size limitation. You can also set automatic refreshes of your data, but only eight times per day.
Power BI Premium Per User	\$20/ month	Premium per User has everything that Pro provides but unlocks features such as advanced AI, handling for much bigger volumes of data, and the ability to connect to your data from other tools besides Power BI. As with Pro, only users with a Premium Per User subscription can view and use content created by someone else with a Premium Per User subscription.
Power BI Premium	Starting at \$5,000/ month	Premium has the features of Premium Per User but removes the need for report users to each have their own subscription. Report creators will need a Power BI Premium Per User or Pro subscription, but report consumers do not need a subscription. It may seem like a very expensive entry point; however, if you have more than 250 report consumers, then it would be worth having a Premium implementation if you’re using bigger data volumes. If you’re just using Power BI Pro and have more than 500 report consumers, then this option would be worth considering.
Power BI Embedded	Starting at \$736/ month	Embedded is a unique subscription that allows application developers to embed Power BI reporting directly within their application.

Adapted from <https://learn.microsoft.com/en-us/power-bi/fundamentals/service-features-license-type>.

WHERE DO WE GO FROM HERE?

The goal of this book is to help you get started on the journey of using Power BI as a business user. But the bigger goal, the goal of that journey, is to help you learn how to turn data into insights. We want to use Power BI in a way that helps us see what we can't see on our own. The path to doing that with Power BI is straightforward: import data, prepare data, model data, visualize data, and analyze data. All these steps lead up to the goal of being able to *understand data* as a result of good analysis that comes from information presented well because it was organized logically. And you can't organize data well if it's a bit of a mess. And you can't clean up your data if you don't have it in hand. But before we start digging into the first step in that journey of *preparing data*, we'll start at the end of the journey to help understand our destination.