how to do this so that you can prepare the terrain for your upcoming adventure with Power BI Desktop.

The Microsoft Self-Service Business Intelligence Solution

It is important to understand from the start that Microsoft's Self-Service Business Intelligence solution is a constantly evolving process. It has been assembled from a series of parallel technologies and it is in a continuous state of flux. Fortunately, this perpetual motion is now at a peak of readiness, and while it is still undergoing some enhancements and revisions, it is ready for immediate use.

So what exactly is Power BI? At its heart, it is a cloud-based service that lets you store and share essential business data in the form of dashboards and reports. However, before you can share dashboards, you need to create them—and this is where Power BI Desktop comes in. This easy-to-use tool is completely free. It is used to find, cleanse, and mash up data so that you can then develop telling metrics and deliver them in the form of stylish visualizations. Once your tables, charts, and maps are assembled into reports, you can then share them with a selected audience in Azure—the Microsoft Cloud (should you want to, of course). Yet the good news does not stop there. Your public can view your insights on just about any Windows, iOS, or Android device using the free Power BI apps that Microsoft has made available for these platforms.

So all that you have to do is to create dashboards with Power BI Desktop, share the output in Azure, and then view and interact with the results using the Power BI apps. It really is that simple. Moreover, up to a certain limit on file sizes, it is completely free.

There is more—much more—in the Power BI universe, but this short description will suffice to get you started. In any case, Chapter 16 provides more detail on the way that Power BI Desktop fits into the Microsoft Self-Service Business Intelligence solution. In the meantime, let's move the focus back to Power BI Desktop. To begin, what exactly will you be using this application for? There are three answers:

- Import data
- Model data
- Create dashboards

Let's take a quick look at some of the things that these may entail.

Import Data from Diverse Sources

The first step on the path to delivering concrete business intelligence is to find and import all the data that you need for your analysis. Power BI Desktop lets you

- Import data from a wide variety of sources. This covers corporate databases to desktop files, social media to big data.
- Merge data from multiple sources and shape it into a coherent structure.
- Cleanse your data to make it reliable and easy to use.
- Break down the data into the columns and records that suit your requirements.

There was a time when these tasks required dedicated teams of IT specialists. In fact, it was considered so complex that it earned its own acronym, ETL, short for **E**xtract, **T**ransform, and **L**oad. Well, this process no longer needs specialists. With Power BI Desktop, you can mash up your own data so that it is ready to use as part of your self-service BI solution.

Model Your Data

Power BI Desktop is not just a data store for your information. It also lets you extend and develop the cleansed data. More specifically, it allows you to

- Create a data model by joining tables to develop a coherent data structure from multiple separate sources of data. This data model is then used in dashboards.
- Enrich the data model by applying coherent names and data types.
- Create calculations and prepare the core metrics that you want to use in your analyses and presentations.

It is worth noting that you can load data into Power BI Desktop directly without going through the data cleansing and modeling stage. If the source data is already in good shape, then you can start using it straightaway.

Creating Dashboards and Reports

I think of creating dashboards and reports as the "jewel in the crown" of self-service business intelligence. A truly dynamic analysis and presentation approach lets you deliver business intelligence composed of

- tables
- matrixes
- charts
- maps
- gauges
- images

and many other types of visualization.

Not only that, but it is incredibly fast and highly intuitive. It provides advanced interactivity so that you and your users can "slice and dice"" the data "on the fly" in real time using

- slicers
- filters

Power BI Desktop Files

Power BI Desktop lets you create multiple pages in a single file. Each collection of pages that is based on the same underlying data is called a *report*. A Power BI Desktop file therefore contains all the dashboards and all the data that is needed by each element (called a *visualization*) on each page. So, a Power BI Desktop file is completely self-contained.

Power BI Desktop is built to handle vast quantities of data. Fortunately, however, it compresses the data that you load in an extremely efficient way. This means that Power BI Desktop files often take up only a fraction of the space that they would if they contained only the raw source data.

This compression also applies to the data that Power BI Desktop uses when you are modeling data and creating dashboards. This is because Power BI Desktop loads all the data that you are using into memory, where it is compressed to make the most of the available memory. This means that Power BI Desktop is extremely fast to use and normally shows you the results of any changes that you make or any filters that you apply in fractions of a second. This instantaneous interactivity also applies to dashboards that you display in Windows, iOS, or Android apps.

Installing Power BI Desktop

The first thing that you have to do to create dashboards (or reports or pages of visualisations) is download and install Power BI Desktop. Although this process is really easy, you will save time if you ensure that the computer where you want to install Power BI Desktop has the capability to run this application. Currently, the minimum requirements are as follows:

- Windows 10, Windows 7, Windows 8, Windows 8.1, Windows Server 2008 R2, Windows Server 2012, or Windows Server 2012 R2
- Internet Explorer 10 or greater

■ **Note** Power BI Desktop Designer works on both 32-bit and 64-bit computers. However, if you intend to analyze large datasets, a 64-bit workstation with several gigabytes of memory could very well prove necessary.

Microsoft does not specify a minimum memory requirement, but you need to be aware that although the application itself is not a memory hog, it can let you load huge amounts of data into Power BI Desktop. Given that all of this data will be loaded into memory, you need to ensure that you have enough available memory if you intend to analyze large amounts of data—even if the data is compressed.

So, if you are sure that your PC or laptop is ready for Power BI Desktop, you can install it by following these steps:

1. Go to the Power BI Desktop download page on the Microsoft web site. This is currently *https://www.microsoft.com/en-us/download/details.aspx?id=45331*. You can easily find the right page by entering **Power BI Desktop download** in your favorite search engine. You should see a web page containing something like the information shown in Figure 1-1.

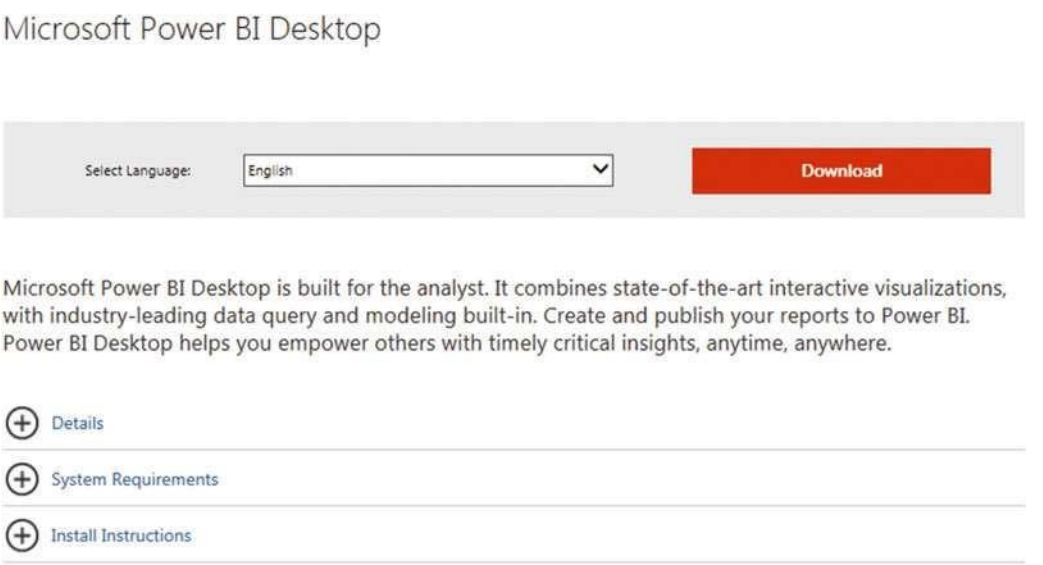

Figure 1-1. *The Power BI Desktop download page*

2. Select the download version (32-bit or 64-bit).
3. Click the Download button. You will be taken to the next page, where you should choose the type of download (32-bit or 64-bit), as shown in Figure 1-2.

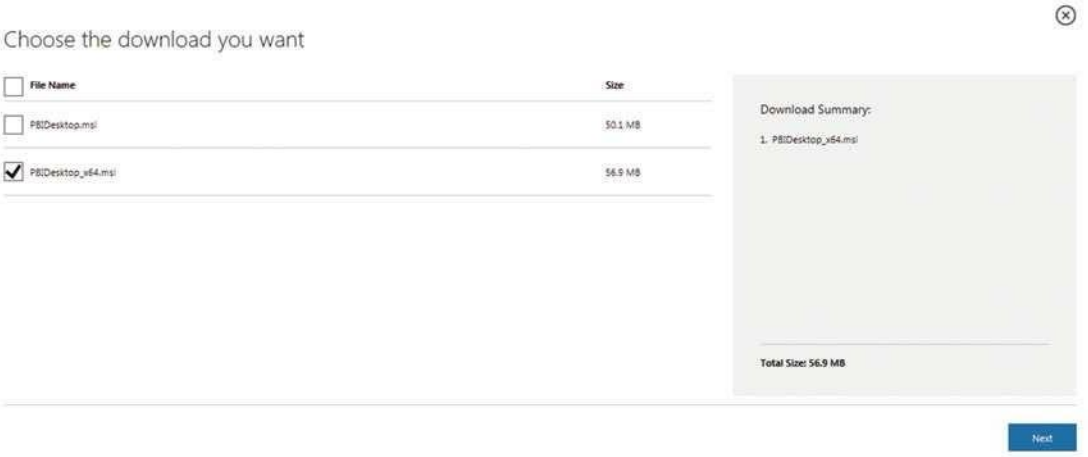

Figure 1-2. *The download selection page*

4. Click Next (this button only appears once you have selected the type of download that you want). The final download page is displayed. A pop-up appears, as shown in Figure 1-3.

Figure 1-3. *The save or run download popup*

5. Click Run. The Power BI Desktop installation package will download (probably in under a minute) and the initial is displayed, as shown in Figure 1-4. If you do not see this dialog once the download has completed, then click the toolbar icon (this will have appeared in the toolbar to make it show on top of any other open windows).

Figure 1-4. *The initial Power BI Desktop setup dialog*

6. Click Next. The Setup Licensing dialog will appear, as shown in Figure 1-5.

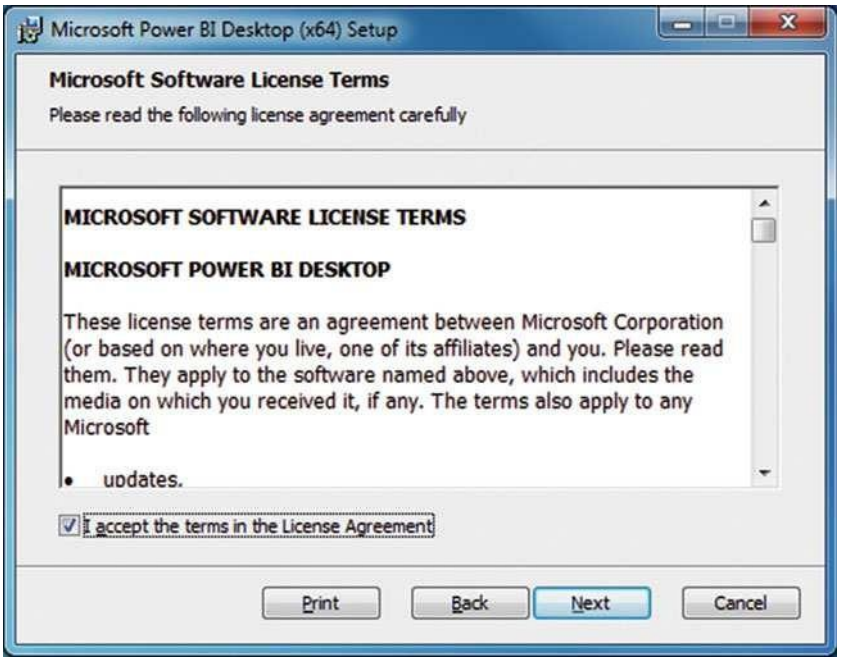

Figure 1-5. *The setup license dialog*

7. Ensure that the check box accepting the license agreement is checked and click Next. The setup destination dialog will appear, as shown in Figure 1-6. If you prefer to install the Power BI Desktop files in a different directory, then you can enter it here (or click the Change button and browse to select it).

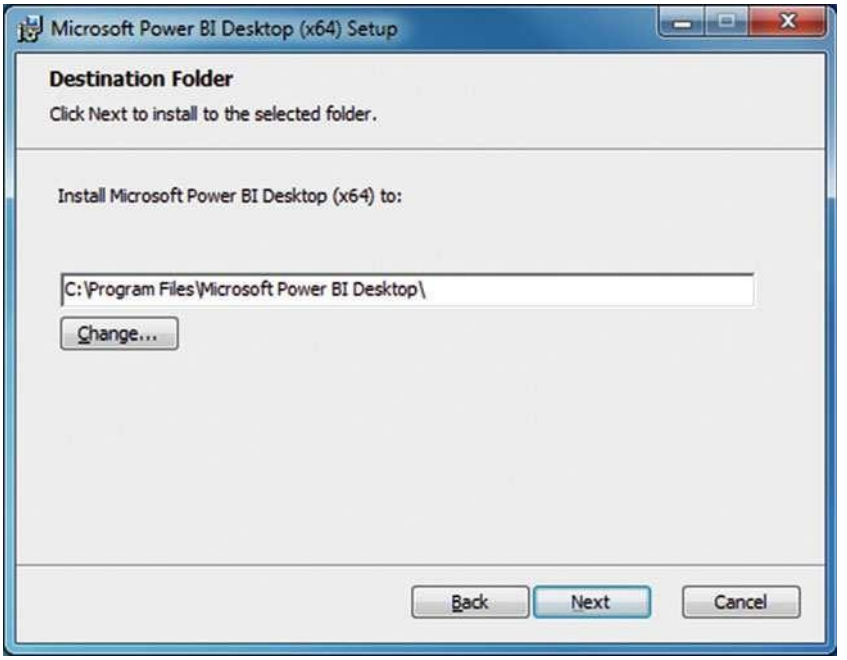

Figure 1-6. *The setup destination dialog*

8. Click Next. The final confirmation dialog will appear, as shown in Figure 1-7.

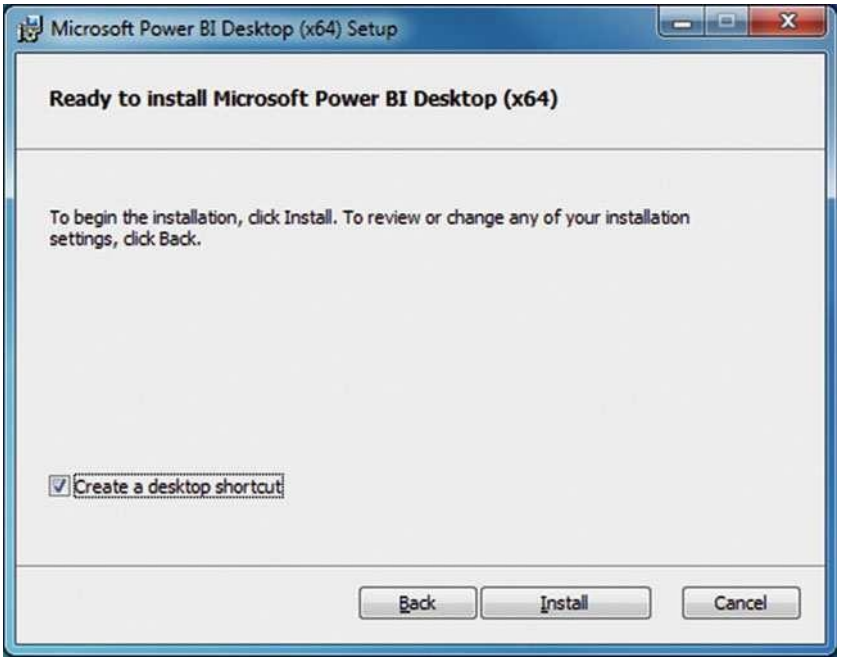

Figure 1-7. *The setup final confirmation dialog*

9. Click Install. The Power BI Desktop installation package will run and will complete the installation in a few seconds. You will see a progress dialog, as shown in Figure 1-8.

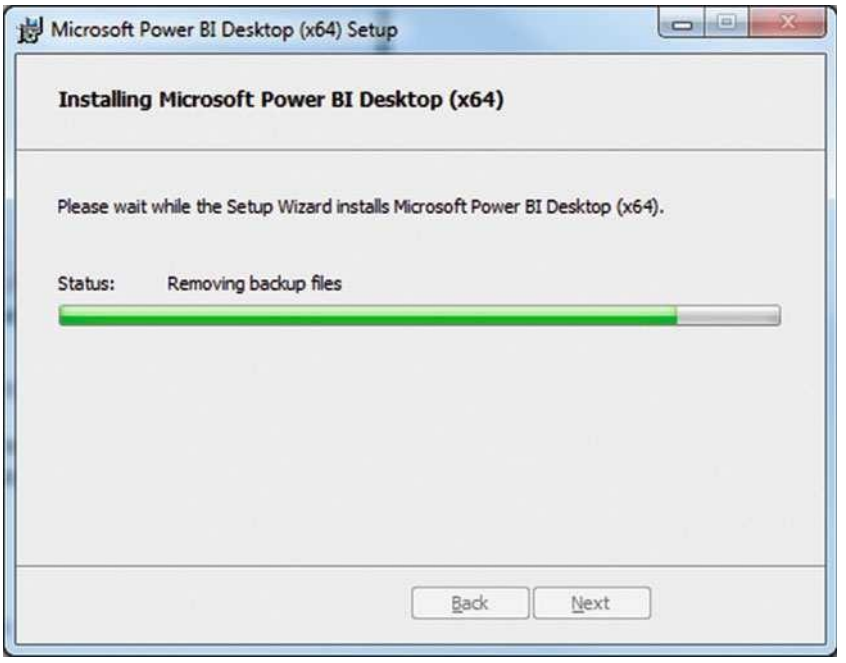

Figure 1-8. *The installation progress dialog*

10. Once the installation process has finished successfully, you will see the completion dialog, as shown in Figure 1-9.

Figure 1-9. *The final Power BI Desktop installation dialog*

11. If you want to run Power BI Desktop immediately, then leave the Launch Power BI Desktop check box ticked; otherwise, uncheck it and click Finish. The dialog will close and Power BI Desktop is now installed on your computer.

Removing Power BI Desktop

Should you ever want to remove Power BI Desktop from a computer where it has been installed, you have a couple of choices:

- Run the web-based installation process as described earlier. At step 4, you see a dialog asking you if you want to repair or remove Power BI Desktop from your computer. Click Remove and follow the process that is indicated to delete the application from your machine.
- Open the Windows Control Panel. In the Programs section, click Uninstall a program. Select Power BI Desktop from the list of currently installed programs to uninstall it.

Running Power BI Desktop

Once you have installed Power BI Desktop successfully, you are ready to start creating dashboards and analyzing your data. You can start your Power BI Desktop experience the program as follows:

> Click the Power BI Desktop icon that was created on the Desktop as part of the installation process. You will see the Power BI Desktop splash screen, as shown in Figure 1-10.

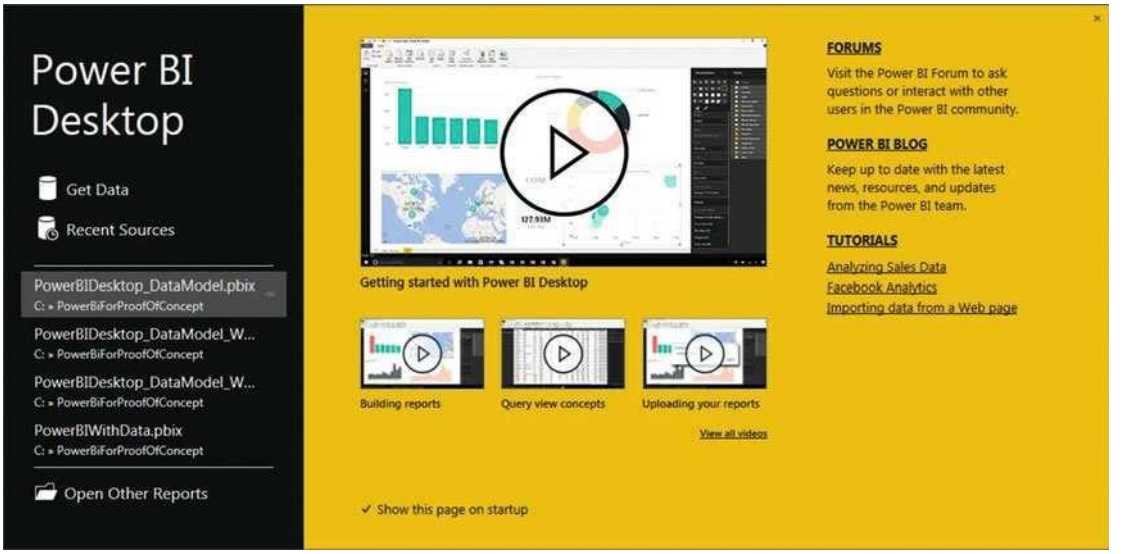

Figure 1-10. *The Power BI Desktop splash screen*

For the moment, however, it is time to stop and draw breath. You have successfully installed Power BI Desktop and you are ready to create your first dashboard with this exciting and revolutionary application.

A First Power BI Desktop Dashboard

This book takes you through an immense amount of detail that explains how to import, cleanse, and shape data from a multitude of different sources. You then learn how to carry out a variety of calculations that will help you to tease out the meaning from the data that you are analyzing. Finally, you see how to transform this analysis into telling visuals that make your insights intuitively comprehensible to your audience.

Yet before delving into all of this detail, it is perhaps more important to appreciate the really fundamental qualities of this amazing application. Despite the depth and reach of this piece of software, there are other qualities that make it stand out and that are possibly even more fundamental, including

- *Simplicity*: Anyone can learn to create stunning visualizations and carry out in-depth analysis of data without having to endure a steep or arduous learning curve.
- *Power*: Data from virtually any source can be loaded, manipulated, and combined with other data elements, and then modeled and extended without needing advanced knowledge of IT systems or data management.

Consequently, it is important to see just how easy it is to use the Power BI Desktop dashboard. Indeed, the fastest way to get you "hooked" on this particular tool is to let you see for yourself how fast you can go from zero to hero in delivering compelling dashboards. So let's see just how quick and easy it can be to take a data source (an Excel file in this instance) and transform it into a Power BI Desktop dashboard.

Loading the Source Data

Once you have launched Power BI Desktop, you are faced with the startup screen that you saw in Figure 1-10. Given that you are working with an application that lives and breathes data, it is not really surprising that the first step in a new analytical challenge is to find and load some data. So the following explains what you have to do (assuming that you have downloaded the sample data that accompanies this book from the Apress web site).

1. Click Get Data in the startup screen. The Get Data dialog will appear, as shown in Figure 1-11.

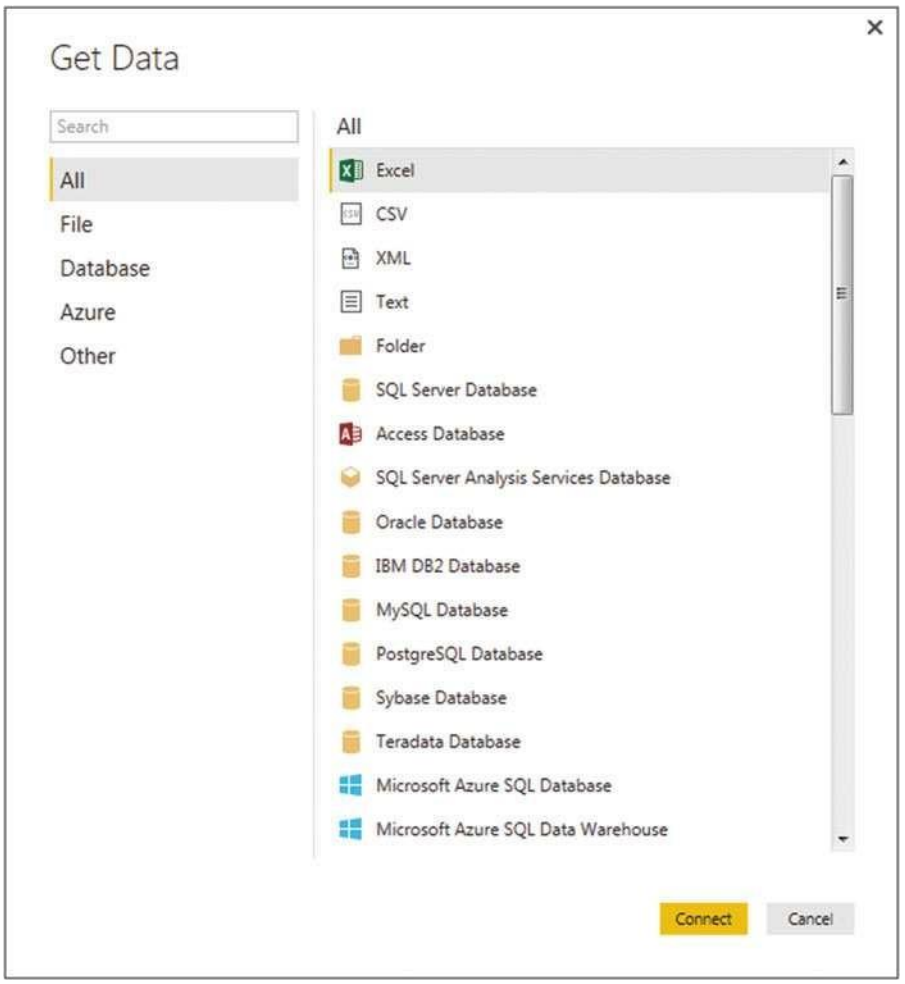

Figure 1-11. *The Get Data dialog*

2. In the list of all the possible data sources on the right of this dialog, click Excel, and then click Connect. The Windows Open File dialog will appear, as shown in Figure 1-12.

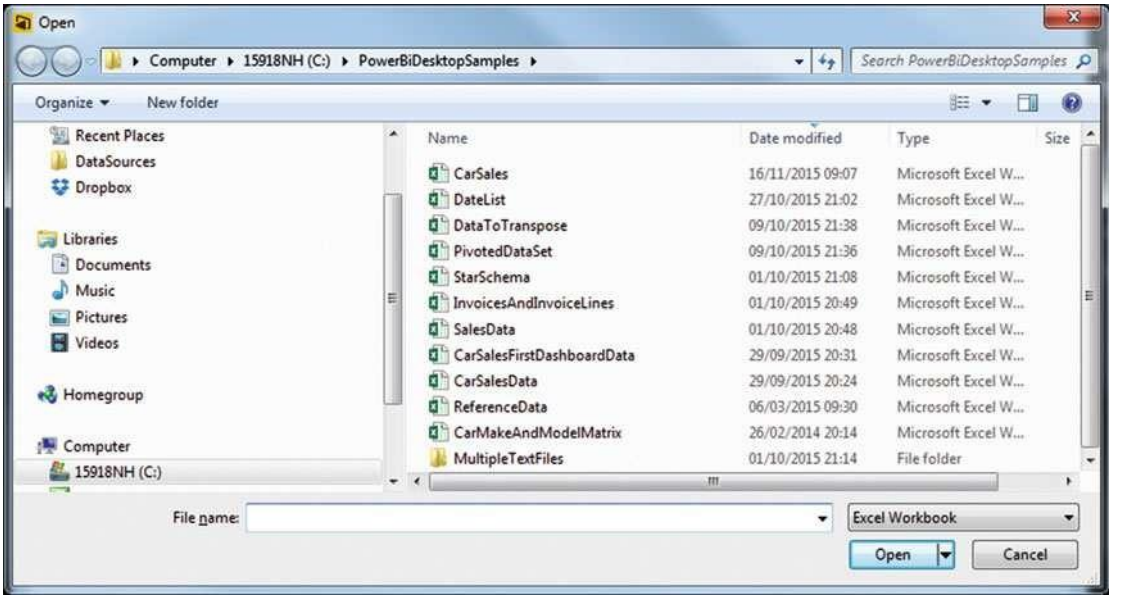

Figure 1-12. *The Windows Open File dialog when loading data from a file source*

3. Click the file C:\PowerBiDesktopSamples\CarSales.Xlsx.
4. Click the Open button. The Connecting dialog will appear for a second or two and then the Navigator dialog will appear.
5. You will see that the CarSales.xlsx file appears on the left of the Navigator dialog and that any workbooks, named ranges, or data tables that it contains are also listed. Click the BaseData worksheet name that is on the left. The contents of this workbook will appear in the data pane on the right of the Navigator dialog.
6. Click the check box for the BaseData worksheet on the left. The Load and Edit buttons will be activated. The Navigator dialog should look like Figure 1-13.

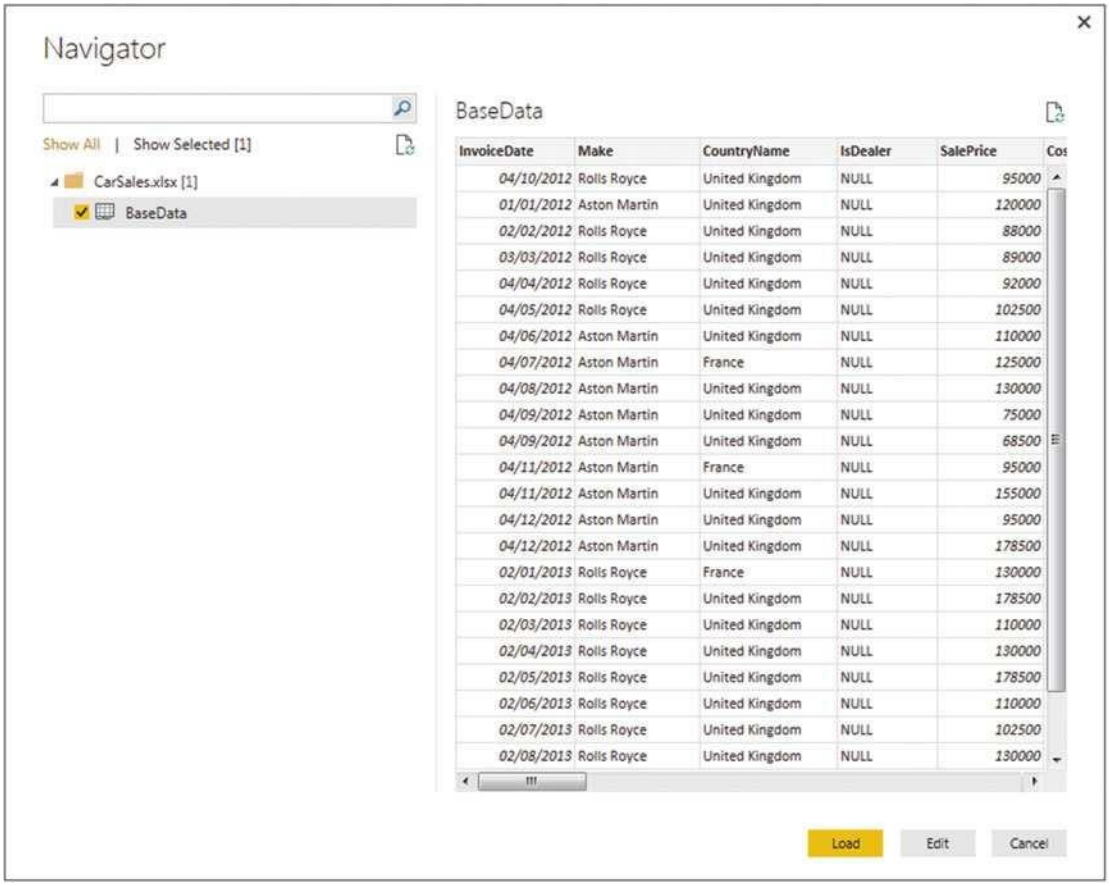

Figure 1-13. *The Navigator dialog with data selected*

7. Click Load. The data will be loaded from the Excel file into Power BI Desktop. You will see the Power BI Desktop report window, like the one shown in Figure 1-14.

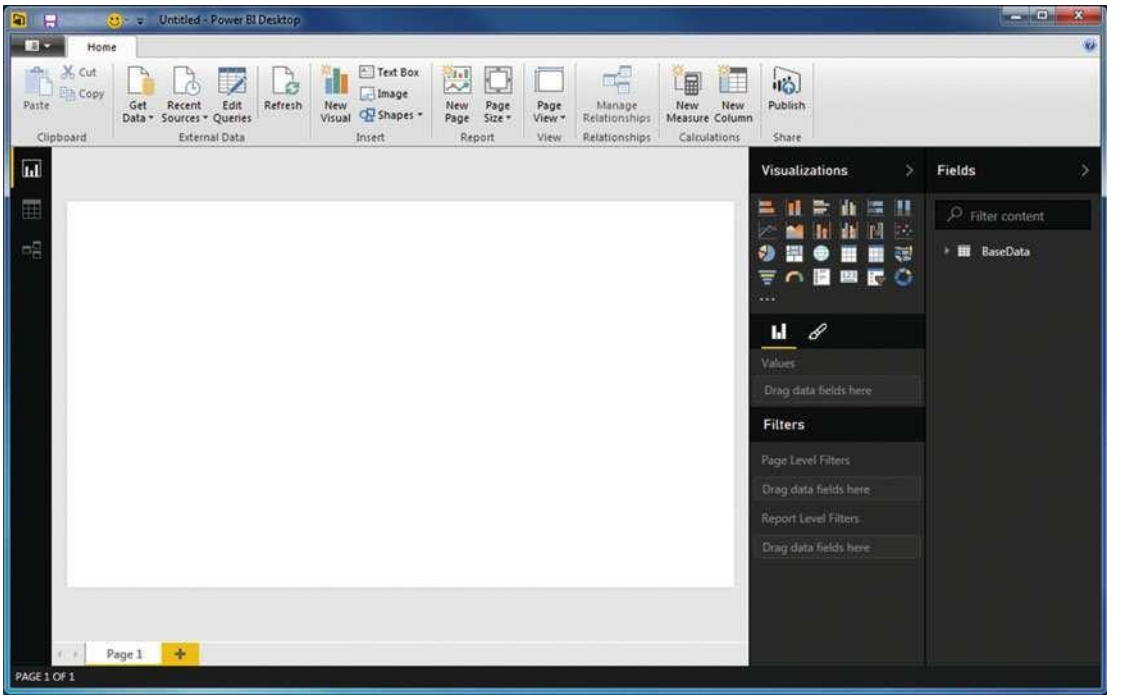

Figure 1-14. *The Power BI Desktop report window*

I imagine that loading this data took under a minute. Yet you now have a fully operational data model in Power BI Desktop that is ready for action. However, before moving forward and creating a dashboard, I would like to pause for an instant and explain exactly what you have seen so far. Of course, if you are itching to race ahead and actually create a couple of tables and charts, then you can always jump ahead to the "Your First Visualizations" section.

The Data Load Process

What you have seen so far is an extremely rapid dash through a Power BI Desktop data load scenario. In reality, this process can range from the blindingly simple (as you just saw) to the more complex (where you join, filter, and modify multiple datasets from different sources). However, it will always be the first step in any data analysis scenario when you are using Power BI Desktop.

In this short example, you nonetheless saw many of the key elements of the data load process. These included

- Accessing data that is available in any of the source formats that Power BI Desktop can read.
- Taking a first look at the data before loading it into Power BI Desktop.

What you did not see here is how Power BI Desktop can add an intermediate step to the data load process and edit the source data in Power BI Desktop Query Editor. This aspect of data manipulation is covered extensively in the following few chapters.

The Navigator Window

One key aspect of the data load process is using the Navigator window correctly. The Navigator window appears when connecting to many, but not all, data sources. It is there to let you

- Take a quick look at the available data tables in the data source.
- Filter multiple data elements that are available in a single data source.
- Look at the data in individual tables.
- Select one or more data tables to load into Power BI Desktop.

Depending on the data source to which you have connected, you might see only a few data tables in the Navigator window, or hundreds of them. In any case, what you can see are the structured datasets that Power BI Desktop can recognize and is confident that it can import. Equally dependent on the data source is the level of complexity of what you will see in the Navigator window. If you are looking at a database server, for instance, then you may start out with a list of databases and you may need to dig deeper into the arborescence of the data by expanding databases to list the available data tables and views.

You will see much, much more of the Navigator window in the following chapter.

The Navigator Data Preview

The Navigator Data Preview pane is, as its name implies, a preview of the data in a data source. It provides

- A brief overview of the top few records in any of the datasets that you want to look at. Given that the data you are previewing could be hundreds of columns wide and millions of rows long, there could be scroll bars for the data table visible inside the Navigator Data Preview.
- A list of the available columns in the data table. These are shown at the bottom of the Navigator Data Preview.

Power BI Desktop can preview and load data from several different sources. Indeed (as you can see from the list of possible data sources in the Get Data dialog in Figure 1-11), it can read most of the commonly available enterprise data sources as well as many, many others. What is important to appreciate is that Power BI Desktop applies a common interface to the art and science of loading data, whatever the source. So whether you are examining an SQL Server or an Oracle database, an XML file or a text file, a web page or a big data source, you will always be using a standardized approach to examining and loading the data. This makes the Power BI Desktop data experience infinitely simpler—and extremely reassuring. It means that you spend less time worrying about technical aspects of data sources and you are free to focus on the data itself.

■ **Note** The Navigator Data Preview is a brilliant data discovery tool. Without having to load any data, you can take a quick look at the data source and any data that it contains that can probably be loaded by Power BI Desktop. You can then decide if it is worth loading, so that you do not waste time on a data load that could be superfluous to your needs.

Modifying Data

Once you have one or more queries in Power BI Desktop that can connect to data sources and bring the data into this environment, you can start thinking about the next step—transforming the data so that it is ready for use. Depending on the number of data sources that you are handling and the extent of any modifications that are required, this could vary from the simple to the complex. To give a process some structure, I advise that you try to break down any steps into the following main threads:

- *Shape the dataset*: This covers filtering out records to reduce the size of the dataset, as well as removing any extraneous columns. It may also involve adding columns that you create by splitting existing columns, creating calculated columns, or even joining queries.
- *Cleanse and modify the data*: This is also known as *data transformation* (the T in ETL). It encompasses the process of converting text data to uppercase and lowercase, as well as (for instance) removing nonprinting characters. Rounding numbers and extracting date parts from date data are also possible (among many other eventual transformations).

For the moment, however, it is only important to understand that Power BI Desktop can do all of this if you need it to. T

The Power BI Desktop Window

Before we go any further, I would like to explain the Power BI Desktop window, since it is something that you will use a lot in this chapter from this point onward. The Power BI Desktop window contains the elements that are outlined in Figure 1-15.

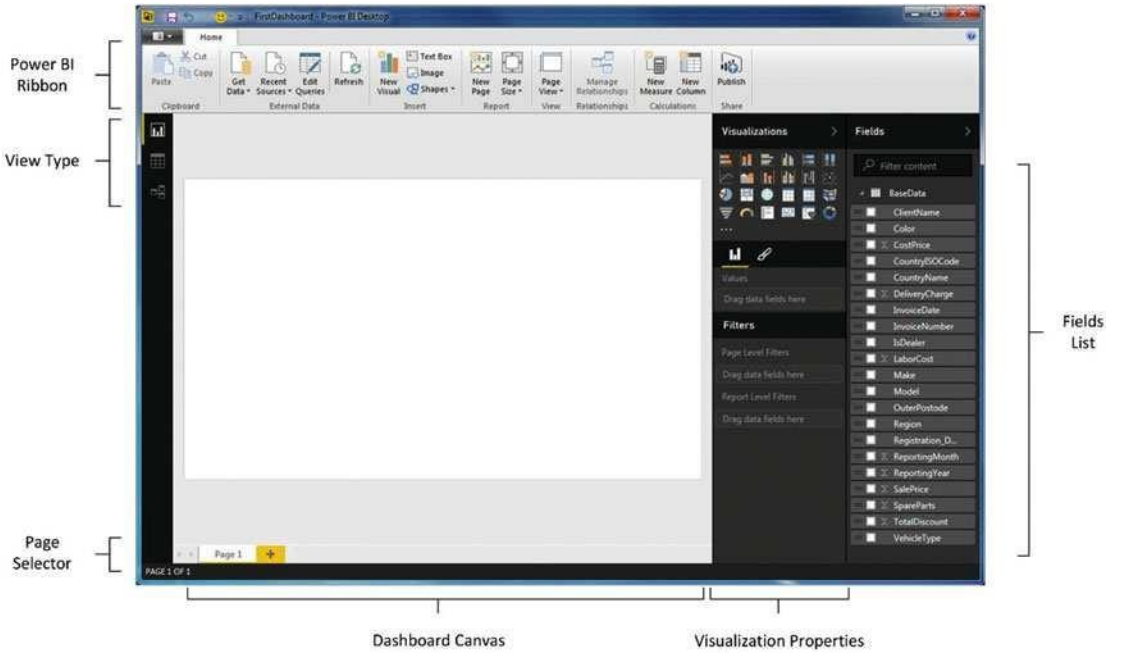

Figure 1-15. *The Power BI Desktop*

As you can see, the Power BI Desktop screen is simple and uncluttered. The various elements that it contains are explained in Table 1-1.

Table 1-1. *Power BI Desktop Options*

Option	Description
Power BI Ribbon	This contains the principal options that are available to you when developing dashboards with Power BI Desktop.
View Type	These three icons let you flip between Dashboard view (where you create dashboards and reports), Data view (where you add calculations), and Relationships view (where you join data from different sources).
Dashboard Canvas	This is the main area, where you add visualizations and design your dashboards.
Visualization Properties	This area of the application is specific to each type of visualization and lets you set the specific attributes of each element on a dashboard. It also allows you to filter dashboards, pages, and individual visualizations.
Fields List	Here you can see all the available fields from the source data that you can use to build your visualizations.
Visualization Palette	This area contains all the currently available types of visualization that you can add to a dashboard.
Page Selector	These are tabs that let you switch from page to page in a report.

Power BI Desktop—like most Microsoft applications—has several available ribbons. These are explained in the course of this book.

Your First Visualizations

With your data safely in place inside Power BI Desktop, you can now begin to create the tables, charts, maps, and other elements that you want to add to a dashboard, which you can use to present your first insights into Brilliant British Cars. As this is a first "taster" exercise, I am not looking at explaining all that can be done using Power BI Desktop. All I want to do is to show you how easy it is to create dashboards in minutes rather than hours. Indeed, I only hope that this first simple dashboard will leave you hungry to learn more—and so to move on to the rest of this book.

Before creating a few simple visualizations, let me clarify some of the terms that you will meet when working with Power BI Desktop.

- *Visualization*: Also known as *visuals*, these are the individual presentation elements that you create based on the underlying data. A visual can be a table, a chart, a gauge, a map, or many things indeed.
- *Dashboard*: A Power BI Desktop dashboard is a collection of visualizations on a single page. Indeed, I use the terms *page* and *dashboard* interchangeably.
- *Report*: This is a collection of pages (or dashboards) in a single file, all using the same dataset.

Display Available Fields

One of the first things to do is make sure that you can see the data that you will be working with in dashboards and reports. If you look at the right of the Power BI Desktop Report view, you see a vertical pane with the label *Fields* at the top. This is the Fields pane. It is from here that you access all the data that you will use in your visualizations and dashboards.

For the moment, however, all that you can see is probably the name of the data table that you imported previously—the BaseData table. Do the following to see all the fields that this table contains.

1. Click the small triangle to the left of the table name. The table will expand to reveal all the available fields that it contains. You can see what this looks like in Figure 1-16.

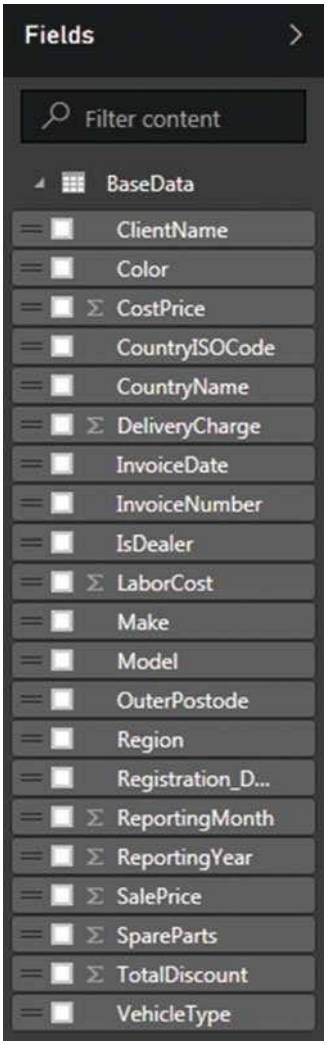

Figure 1-16. *The Power BI Desktop Fields list*

You can see that some of the fields have a sigma (∑) icon to their left. This indicates that the data in the field is numeric. As you progress through this book, you will see that there are other icons that Power BI Desktop uses to flag different types of fields.

Add a Matrix of Sales per Country by Year

It is now time to draw on the blank canvas that is your first dashboard. To begin, with let's start with a simple matrix of sales per country for each year that Brilliant British Cars has been trading.

1. In the Visualizations pane, click the matrix icon, as highlighted in Figure 1-17.
   A blank matrix will appear on the dashboard canvas.

Figure 1-17. *The matrix icon in the Visualizations pane*

2. Leaving the freshly created matrix selected, click the check box to the left of the CountryName field in the Fields list. The list of countries where cars have been sold will appear as the left-hand column of the matrix.
3. Drag the ReportingYear field into the Visualizations pane over the Columns fields area (this is called the *field well*). Figure 1-18 shows how to do this. This adds the model years as column headers in the matrix.

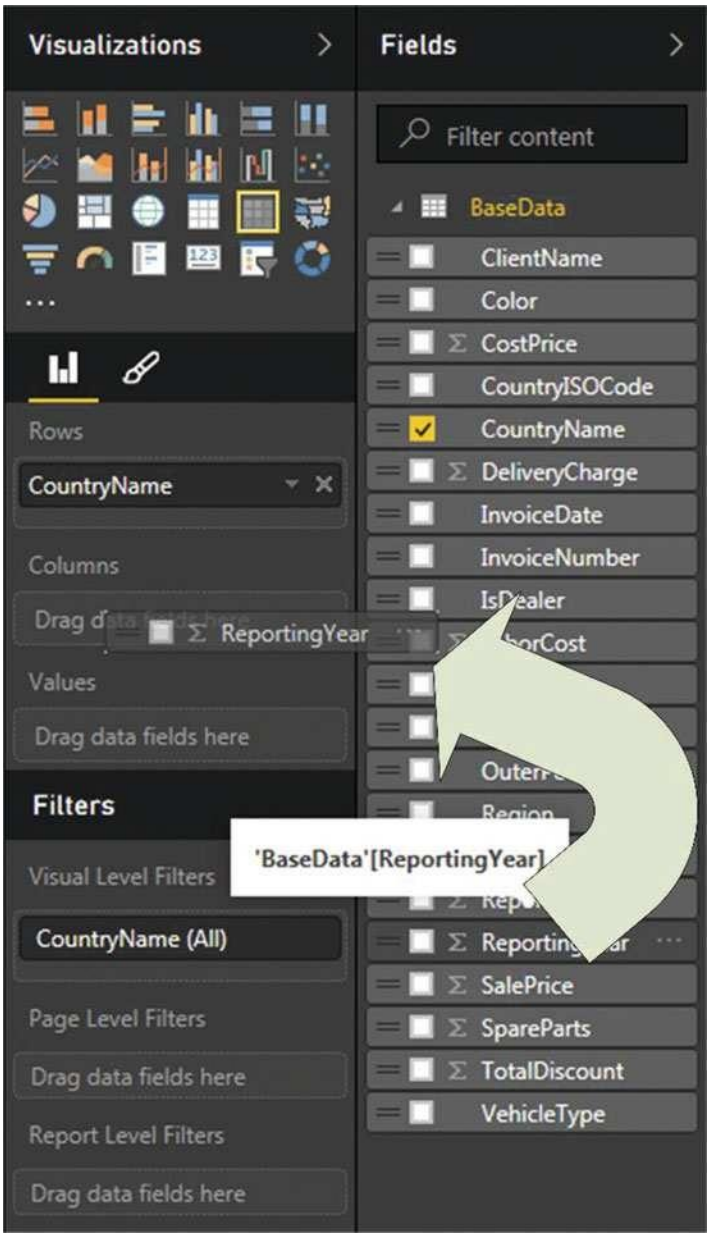

Figure 1-18. *Adding the Columns fields to a matrix*

4. Leaving the matrix selected, click the check box to the left of the SalePrice field in the Fields list. The aggregated sale price for all vehicles sold by country and by year will appear in the matrix.

5. Drag the corner handle of the matrix to resize it so that there is no spare white space inside the matrix itself. It will look like Figure 1-19.

CountryName	2012	2013	2014	2015	Total
France	248000	446950	193200	571950	**1460100**
Germany		75000		85000	**160000**
Spain		92000		86700	**178700**
Switzerland	88200	233625	103200	276125	**701150**
United Kingdom	1702890	3169000	1738190	3583800	**10193880**
USA	113200	162000	2548490	4892375	**7716065**
Total	**2152290**	**4178575**	**4583080**	**9495950**	**20409895**

Figure 1-19. *A matrix of sales per country*

It would be hard to make this any simpler. Within seconds, you have created a matrix of sales by year and country and the totals have been added automatically. Of course, there are many ways of extending and developing a matrix in Power BI Desktop—and you can discover them all in Chapter 10—but for now, it is time to press on and add a chart to your fledgling dashboard.

■ **Note** In this short exercise, you saw that you can both select fields from the Fields list or drag them to the field well to add them to a selected visual. An alternative is to drag a field from the Fields list onto the visualization itself.

Add a Column Chart of Delivery Charge by Model

Now that you have seen how easy it is to create a matrix in Power BI Desktop, the time has come to add some visual impact to your analysis. This time, you will use the available data to display the total delivery charge for each model of car sold.

1. Click an empty area of the dashboard canvas to unselect any visualizations.
2. Drag the Model field onto an empty area of the dashboard canvas. Power BI Desktop automatically creates a table displaying all the vehicle models sold.
3. Drag the DeliveryCharge field from the Fields pane onto the table that you just created. Power BI Desktop will calculate the total DeliveryCharge for each available make. The table will look like Figure 1-20.

Model	DeliveryCharge
Arnage	975
Azure	5175
Camargue	34140
Cerbera	150
Continental	27175
DB4	4850
DB7	12550
DB9	36950
DBS	3950
GT	550
Phantom	2225
Rapide	6450
Silver Ghost	12840
Total	239970

Figure 1-20. *A table of aggregated delivery charge per make*

4. Leaving the table selected, click the column chart icon in the Visualizations pane. This is the second icon on the left on the upper row of the selection of visualizations. Power BI Desktop will switch the table to a chart.

5. Drag the corner handle of the chart to resize it so that all the makes are visible on the bottom axis. The chart will look like Figure 1-21.

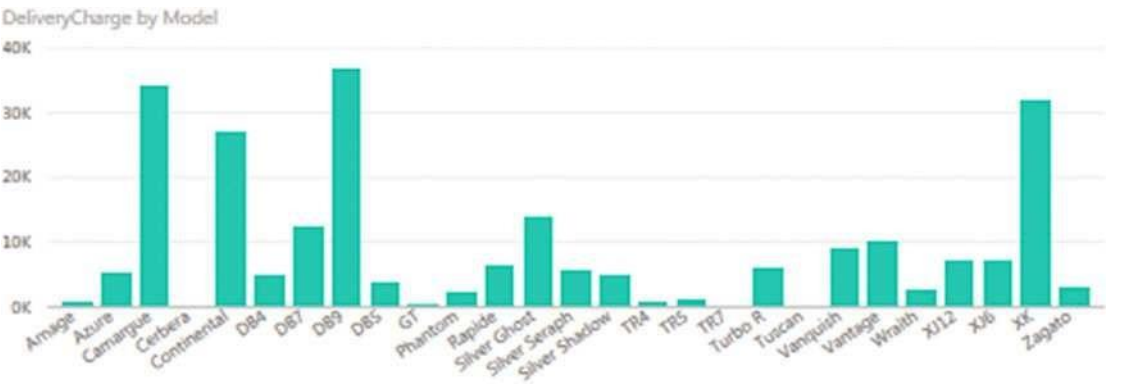

Figure 1-21. *A column chart of delivery charge by model*

Add a Map of Labor Cost by Country

Tables and charts are all very well, but nothing beats a good picture when it comes to illustrating a point or highlighting an insight. So, as we have a dataset that includes information for a range of countries, why not display some of our analysis as a map?

1. Click any empty part of the dashboard canvas to unselect any visualizations.
2. Click the filled map icon in the Visualizations pane. You can see this icon in Figure 1-22.

Figure 1-22. *Adding a Filled Map visualization to a dashboard*

3. Leaving the empty map visualization selected, click the check box to the left of the CountryName field in the Fields list. This will display a map of the world.
4. Leaving the map selected, drag the LaborCost field onto the map. This will highlight any countries where there are labor costs relating to vehicles sold.
5. Drag the colored European countries to the center of the map.
6. Using the mouse wheel, zoom in to the colored European countries. The finished map will look like Figure 1-23.

Figure 1-23. *A map of labor cost by country*

This time, and in only a few clicks, you have used your data to create a map that clearly illustrates the geography of your sales. Once again, this is only a rapid overview of all that Power BI Desktop can do when it comes to displaying mapping data. You will learn more about creating and modifying maps in Power BI Desktop in Chapter 12.

Add a Card Showing the Total Cost of Spare Parts

Sometimes you do not want to show a large amount of data but quite the opposite. You want to highlight a single figure to give it prominence on the dashboard. Power BI Desktop has a really effective way of doing just this. It consists of adding visualizations called *cards*, which are what you will now add to your dashboard.

1. Click the dashboard canvas to unselect any visualizations.
2. Click the card icon in the Visualizations pane, as shown in Figure 1-24.

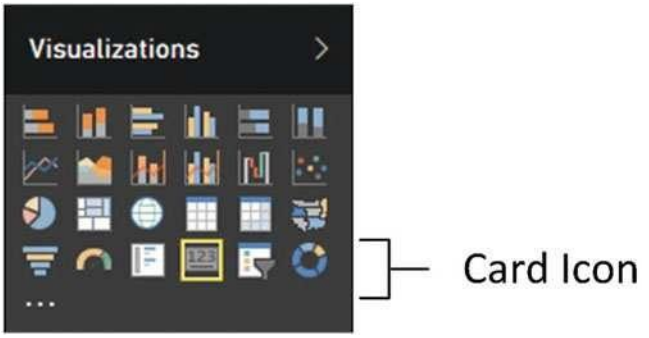

Figure 1-24. *Adding a card visualization to a dashboard*

3. Leaving the (slightly clunky) empty card visualization selected, click the check box to the left of the SpareParts field in the Fields list. This displays the spare parts total in the source data.

4. Drag the corner handle of the matrix to resize it so that there is no spare white space inside the matrix itself. It will look like Figure 1-25.

Figure 1-25. *A card showing the total cost of spare parts*

That is all you have to do. Three or four clicks and you have a clear visualization of a key metric for your audience. This is not the only way that you can create this particular visualization, but you have to wait for Chapter 10 to get all the details on adding cards to Power BI Desktop dashboards.

Add a Slicer by Make

As a final tweak, I want you to add some interactivity to the dashboard that you are building. What you will do now is to add a slicer (an interactive selection tool) that will let you—or any user of this dashboard—filter by any or all car models sold. Here is how you can do this.

1. Drag the Make field to a blank area on the dashboard canvas. Power BI Desktop will create a list of vehicle models.

2. Click the slicer icon in the Visualizations pane, as shown in Figure 1-26.

Figure 1-26. *Adding a Slicer to a dashboard*

3. Drag the corner handle of the slicer to resize it so that there is no spare white space inside the slicer. It will look like Figure 1-27.

Figure 1-27. *A slicer on the model of vehicle*

You can now test the slicer by selecting—or deselecting—any car model that is listed in the slicer. The other visualizations on the dashboard will instantly be updated to reflect the choice of models. You will soon get a first look at how this slicer can be used to filter data.