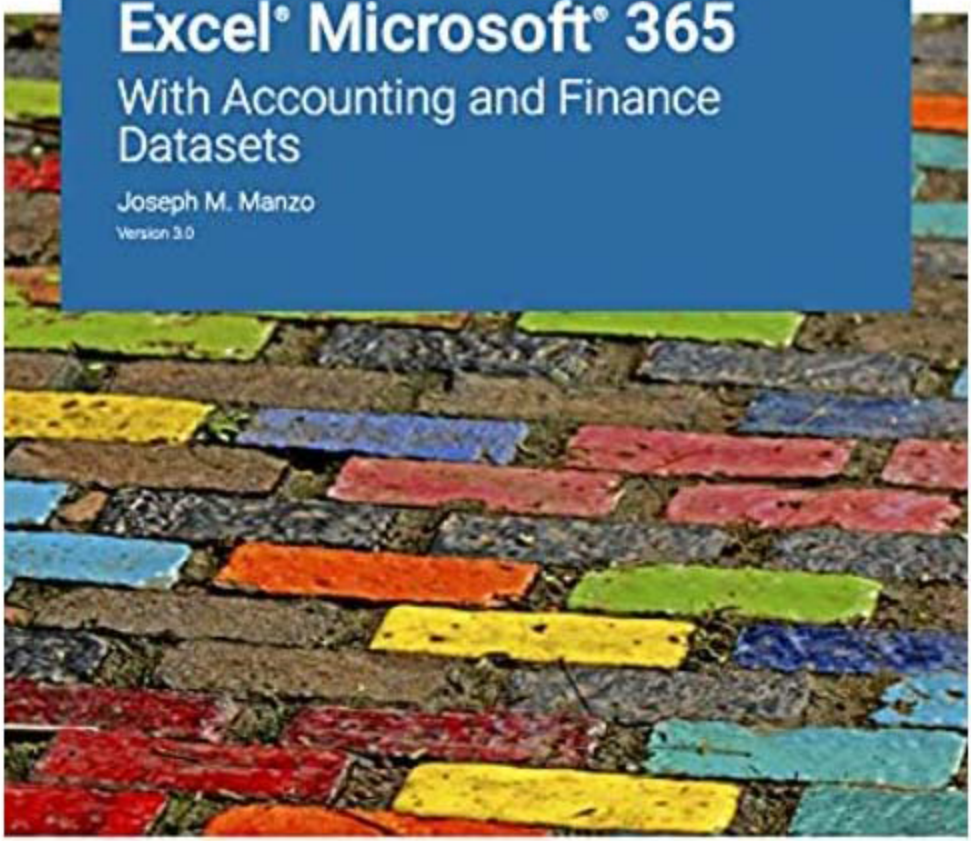
Data Analytics Using Excel® Microsoft® 365

With Accounting and Finance Datasets

Joseph M. Manzo

Version 3.0



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Data Analytics Using Excel Microsoft 365

With Accounting and Finance Datasets Version 3.0

Joseph M. Manzo

FlatWorld

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Version 3.0

Joseph M. Manzo

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About the Author

Joseph M. Manzo

Joseph M. Manzo (CMA and MBA Lehigh University) is a Professor of Practice in Accounting at Lehigh University's College of Business. He started teaching at Lehigh in fall 2002, where he developed and ran the Microsoft Excel Competency program for all first-year business students. He went on to teach several courses in both the undergraduate and graduate programs in the College of Business and since 2010 has taught Introduction to Financial Accounting and Introduction to Managerial Accounting. In addition to teaching, he is a former director of the Rauch Center for Business Communications and also former acting Associate Dean and Director of Undergraduate Programs for the College of Business. Prior to Lehigh, Professor Manzo worked in apparel manufacturing, retail, and wealth management industries. His industry practice had a heavy emphasis on data analytics and corporate strategic planning. He has written several textbooks addressing practical applications for Microsoft Office that teach students how to use such applications for professional and personal needs.

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Dedication

For my children, Isaac and Stella

With hard work and passion, anything is possible.

Life cannot kill the dreams you dream.

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Preface

Data Analytics Using Microsoft Excel provides students with a strong foundation of skills that are needed to become proficient in data analytics. Microsoft Excel is the ideal platform for students who are in the early stages of learning the fundamentals of data analytics. The ability to visually observe the architecture of several datasets in Excel is a great advantage when learning how to use data analytics techniques to produce solutions for both professional and personal projects. Having an understanding and the ability to visualize a variety of data architectures is vital for students who intend to go on to study other data analytics platforms beyond Excel. Extensive datasets included in the book are drawn from accounting and finance scenarios and provide students with a basis for conceptualizing and designing data analytics projects with the highest level of integrity. As a result, this textbook is suitable as either a core text for using Excel in an introductory data analytics course or as a supplement to many basic through intermediate accounting or finance courses. This textbook may also be assigned to students who need exposure or a refresher on how to use the Excel application in general. This clear, easy-to-follow text prepares students to master advanced Excel skills and places a heavy emphasis on how to efficiently navigate big datasets by using the keyboard to access commands during the design process. In addition, data visualization is presented throughout the textbook as a powerful data analytics technique as well as a method for communicating data using a variety of charts. Author-narrated videos embedded throughout the digital reader explain concepts and operations, adding an engaging audio and visual richness to the written explanations and exercises.

Key features include:

- Early chapters explain how to conceptualize, design, and maintain the integrity of data analytics projects in any context, not just finance or accounting.
- Compatible with general technology courses that are not content specific.
- Can be used stand-alone or as a supplemental resource, depending on the context.
- Datasets and projects are compatible with many accounting and finance courses, but can also support an interdisciplinary focus.
- Clearly and simply walks students through core concepts. No prior accounting or finance coursework is required.
- Provides students with a framework and model for conducting data analytics projects in any platform, not just Excel.

What's New in Version 3.0

- This version is updated to align with Excel Microsoft 365.
- New Chapter 10 on predictive analytics features nine new Excel skills and a new applied stock-market analysis case.
- New appendixes identifying the differences between Excel run on a PC and a Mac includes the following:
  - Keyboard only command translation from PC to Mac.
  - Visual differences between a PC and Mac.
  - Instructions for Mac users where commands significantly differ between a PC and Mac.

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- New skills and features include:
  - Correlation Analysis
  - Regression
  - Combo Chart
  - Descriptive Statistics
  - Adding the Data Analysis Tools
  - Formatting Negative Values on a Chart
  - Comments Tool
- Author-generated instructional videos have all been re-recorded from scratch with new screenshots and voice overs to reflect Excel Microsoft 365.
- Framework and model for conducting data analytics projects using any platform is presented and applied throughout the textbook.
- The concept of data visualization as a data analytics technique and way of presenting data is reinforced throughout the textbook.
- Capstone chapter where students investigate a fraud case by analyzing over 30,000 rows of data.

Supplements

- **Test Item Files**: Each comprehensive Test Item File includes several multiple-choice and short-answer questions. The items have been written specifically to reinforce the major chapter topics.
- **FlatWorld Homework**: Provided in an easy-to-use interface, homework for this title includes multiple choice and fill-in-the-blank question types which are all auto-gradable. Students who complete these questions with success should see their performance transfer to examinations that are given using the Test Item File questions provided to adopters of this textbook.
- **Online Quizzes**: Carefully written quiz questions are available by section and by chapter in the online eBook. Students can test themselves on their comprehension as they move through the textbook or once they have completed a chapter.
- **Instructor's Manual**: This component includes an outline that reviews the major points of the textbook.
- **PowerPoint Slides**: These slides provide a concise outline for the chapter and include key terms. Instructors can use the slides as composed to support lectures or augment and customize them to suit their particular needs and interests.
- **Other Supplements**: All of the Text Files that students will need to use as Follow Along Files and the End of Chapter solutions are also included as supplemental material.
  - **Follow Along Files**: Each project that is covered in the textbook has a follow along file. Follow along files that end with a zero after the decimal point are intended to be posted for students. Students can also access these files at point of use directly from this textbook. However, follow along files that end with a number greater than zero after the decimal point should **not** be posted for students. For example, Data Analytics Project 4.5 should not be made available to students unless you are skipping the first four topics for this project. This follow along file will have all of the work completed for the first four topics of this project. This allows you to skip certain topics within each project if desired. Instructors can access all of the follow along files by downloading the "Manzo_Excel_v3_0_Text_Files.zip" file from the Other Supplements category of the catalog page.

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CHAPTER 1

Introduction to Data Analytics and Microsoft Excel 365

Data analytics skills are highly valued in many professional environments. Put simply, **data analytics** is the ability to analyze data to produce information that can be used to make decisions. While there are many tools that can be used to analyze data, Microsoft Excel is perhaps the most common. Having the ability to use Excel is a tremendous asset for anyone seeking employment or looking to advance to higher positions in a variety of careers. In addition to its value in professional environments, Excel also provides significant personal value. From managing simple household budgets to complex investment portfolios, Excel can provide the same analytical powers used by professionals for personal needs. The purpose of this chapter is to develop a working model for data analytics and to provide an overview of Microsoft Excel 365.

data analytics

A comprehensive process to analyze data and produce outputs that can inform decision making.

1.1 A Working Model for Data Analytics

Learning Objectives

1. Establish the relationship between data design and data analytics.
2. Define the DATA Analytics Framework.
3. Identify the role of data audits when using an existing dataset or spreadsheet.
4. Define the concept of data internal controls for shared spreadsheets.
5. Review the complete Data Analytics Model.
6. Highlight the limitations of data analytics.

Excel is perhaps the most widely used analytics and decision making tool for both professional and personal activities. A critical success factor for getting the best results from Excel is to establish a working model for data analytics that can be used for any project. Data analytics is not just about crunching numbers. It is a comprehensive process that can change the way you think about decisions in both professional and personal situations. The Data Analytics Model shown in this chapter will establish a process that will be used throughout the textbook.

What Is Data Design?

Follow Along File: None

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There is no follow along file needed for this chapter. Your first follow along file will be downloaded in Chapter 2 Section 1.

data design

The data that exists in a spreadsheet and the way in which the data is arranged.

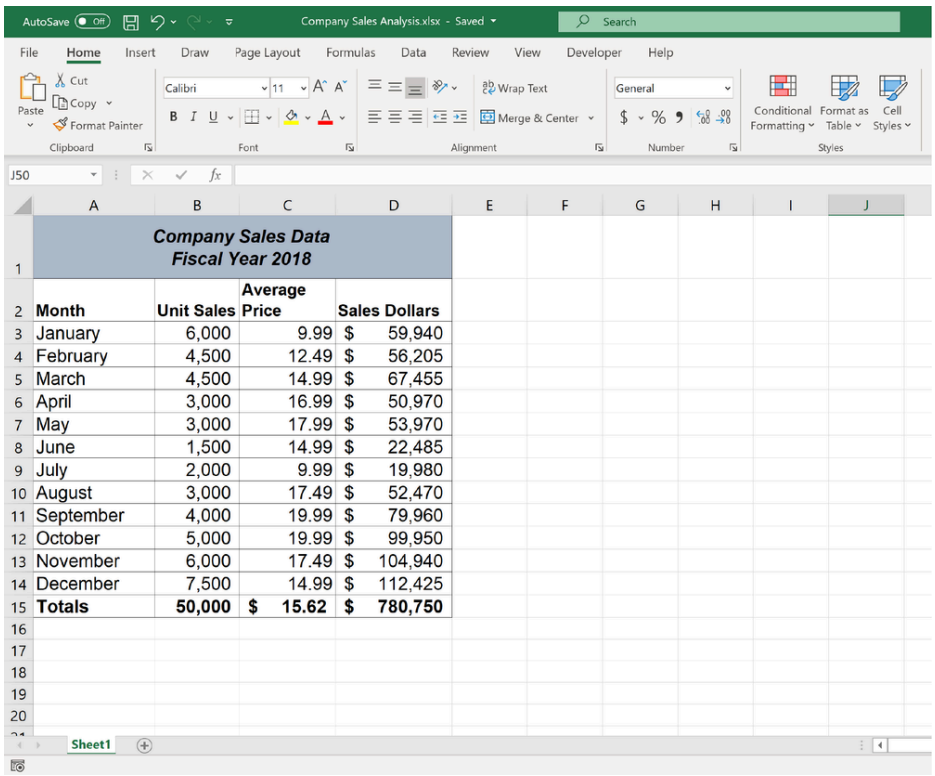
data presentation

The way in which data is presented or visualized to an audience to explain circumstances and decisions in professional settings.

For the purposes of this textbook, **data design** will address the data you have and how it is arranged in a spreadsheet. The design of a spreadsheet will have significant ramifications for completing any analytics project using Microsoft Excel. There are many benefits for storing data in an electronic format, many of which will be explored in this textbook. However, it is important to understand that the way in which this data is entered into a spreadsheet will dictate what analytical tasks you can perform. This is not to be confused with data presentation. **Data presentation** is the way in which data is presented or visualized to an audience to explain circumstances and decisions in professional settings. Data presentation and visualization will be explored later in the textbook. To illustrate the importance of data design, Figure 1.1 shows a simple spreadsheet that could be used to analyze sales data for a small company. Suppose an analyst using this data has the following goals:

1. Evaluate at least two or more years of sales data to decide when the company might need to borrow money from a bank.
2. Decide if the company has sufficient inventory depending on sales trends.

FIGURE 1.1 Data Design Example



Month	Unit Sales	Average Price	Sales Dollars
January	6,000	9.99	$ 59,940
February	4,500	12.49	$ 56,205
March	4,500	14.99	$ 67,455
April	3,000	16.99	$ 50,970
May	3,000	17.99	$ 53,970
June	1,500	14.99	$ 22,485
July	2,000	9.99	$ 19,980
August	3,000	17.49	$ 52,470
September	4,000	19.99	$ 79,960
October	5,000	19.99	$ 99,950
November	6,000	17.49	$ 104,940
December	7,500	14.99	$ 112,425
Totals	**50,000**	**$ 15.62**	**$ 780,750**

The Data Design Example shows that data and how the data is arranged can hinder the ability to accomplish the goals identified for this project. For example, the first goal states that the analyst would like to analyze at least two or more years of data. For this project, the analyst will likely accumulate data in a spreadsheet for a few years. Placing the Totals row (row 15) at the bottom of the dataset is an inconvenient choice because blank rows will have to be added above this row when new data is added to the spreadsheet. In addition, as more data is added, you will have to scroll down to the bottom of the spreadsheet to see the totals, which is also inconvenient. Placing a Totals row above the dataset would be a better choice. Also, notice that there is no column to designate the

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year for each month. This column would have to be added to the spreadsheet if more than one year of data is going to be analyzed. Finally, the second goal states that the analyst will need to evaluate the inventory needs of the company. However, there is no inventory data in the spreadsheet. This data will need to be added in order to complete the project.

The DATA Analytics Framework

Follow Along File: None

When using Excel to work on a data analytics project, there are many data design choices that have to be made. Establishing an analytics framework for a project will help you make these design choices and ultimately help produce the best possible outputs in Excel. While there are many views as to what steps should be taken to conduct an effective data analytics project, this textbook will simplify the process into four steps which spell the acronym DATA. Each step of the DATA Analytics Framework is explained below.

1. ***Decisions*:** What decisions do you intend to make as a result of the analytical outputs? Depending on the project, whether personal or professional, certain decisions need to be made. For example, in a professional situation you may have to decide how much inventory to purchase, how many people to hire, or how much money needs to be raised to start a new company. In personal situations you might want to know how to improve your personal spending habits, or how much money is needed to buy a house. However, not every project will result in a concrete decision. For some projects, the decision may be to conduct more research or analysis based on a discovery that was revealed by the analysis.
2. ***Acquisition*:** What data must be acquired to inform the decisions you plan to make? Once you know what decisions you are trying to make, you will have a better idea of the data that is required to inform these decisions. For example, if you are trying to decide how to decrease personal spending, you might need to record and track all personal expenses such as rent, utility bills, food bills, etc. In the Data Design Example (Figure 1.1), the analyst needed to decide if the company was maintaining the proper amount of inventory. Therefore, inventory data for the company must be acquired.
3. ***Time*:** Over what period of time do you intend to collect and analyze data to support your decision? The purpose of this step is to determine the amount of data that will be required for a project over a certain period of time. As in the Data Design Example, if the analyst is intending to study a few years of sales and inventory data, the spreadsheet should be designed so that it is convenient to add new rows of data. Totals and summaries of the data could be placed above the dataset or in an entirely new spreadsheet.
4. ***Analysis*:** How will you analyze the data? This is perhaps the most complex component of the framework. This will require additional project-specific questions to be asked. For example, in the case of a personal budget you might ask, "Am I spending too much money on restaurants?" or "How much money do I spend a month?" These questions can lead to a few analytical possibilities. Each month we could analyze how much money is spent on restaurants as a percent to total spending for the month. We might also look at how much money is spent on restaurants for the year and see what months make up the highest percentage of the annual spend for this category. This step of the framework helps to identify calculations and analytical processes that need to be conducted to produce the most relevant outputs that can inform the decisions being made.

The DATA Analytics Framework will serve as the central component of the overall Data Analytics Model and should be used at the very beginning of a project. A summary of the framework is shown in Table 1.1.

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TABLE 1.1 DATA Analytics Framework Summary

DATA Analytics Framework
1. *Decisions*: What decisions need to be made?
2. *Acquisition*: What data must be acquired?
3. *Time*: Over what time period, or how long will data be collected?
4. *Analysis*: How should the data be analyzed?

Conducting a Data Audit

Follow Along File: None

data audit
The process of evaluating the design, scope, and integrity of a dataset to ensure reliable outputs can be produced to inform decisions.

The use of the DATA Analytics Framework is relevant for projects that are started from a blank spreadsheet and when working with spreadsheets that are already created. Professionals often begin a data analytics project with a dataset that has been given to them on a spreadsheet. The DATA Analytics Framework is especially valuable when working with existing spreadsheets, as it provides the necessary guidelines to conduct a data audit. A **data audit** uses the DATA Analytics Framework to evaluate the data and the data design of an existing spreadsheet to determine if the goals of a project can be accomplished. Data audits also verify the scope of the data in a spreadsheet and its integrity to produce reliable outputs. Data audits are especially critical when working with big datasets, as it is not possible to visually inspect the data for errors.

Integrity Check

Data Audit

It is critical to conduct a data audit on any existing spreadsheet you did not create or on any dataset that is provided to you. The DATA Analytics Framework should be used to guide the data audit to verify the scope and validity of the dataset before conducting any analytics project. Failure to conduct a data audit may result in erroneous outputs and poor decisions.

Establishing Data Internal Controls

Follow Along File: None

data internal controls
Instructions and features added to a spreadsheet that decrease or eliminate the risk of an analysis becoming corrupt or distorted by errors incurred by other users of a shared spreadsheet.

It is common for professionals to create Excel spreadsheets that will be used by coworkers. In fact, several professionals may contribute to and use the same Excel workbook using the OneDrive cloud network featured on Microsoft Excel 365. While this creates a very efficient way to build comprehensive datasets that can provide significant decision making benefits, it can also lead to errors and possible data corruption. When you create a spreadsheet for an analytics project, you will know what can and cannot be done with the data. If you do not have a way of communicating these potential pitfalls to your coworkers, you increase the risk of your analysis producing erroneous outputs. Placing **data internal controls** into a spreadsheet decreases or eliminates the risk of your analysis becoming corrupt or distorted when other people use your spreadsheet.

There are many tools that Excel provides that can serve as effective internal controls. For example, if a project contains many complex calculations that should not be tampered with, those cells can be password protected. If necessary, entire Excel worksheets or workbooks can be password protected. Some data internal controls can be as simple as typing instructions or warnings

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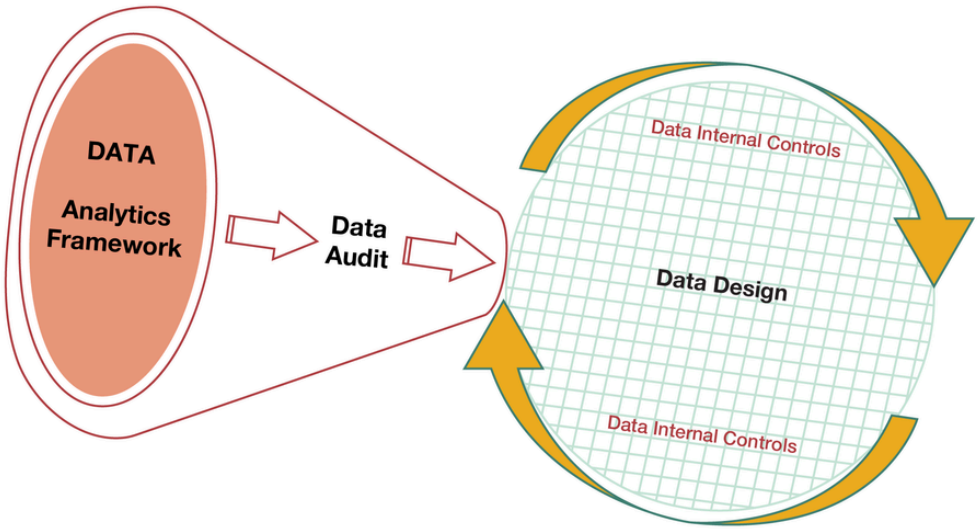
at the top of a spreadsheet. These data internal controls, as well as several others, will be explored throughout this textbook.

The Data Analytics Model

Follow Along File: None

The four components of the Data Analytics Model are the DATA Analytics Framework, data audit, data design, and data internal controls. The DATA Analytics Framework can be viewed as the engine that provides guidance as to how a data audit should be conducted, how a spreadsheet should be designed, and what data internal controls should be established. The diagram below provides a visual depiction as to how the DATA Analytics Framework informs these three components of the Data Analytics Model.

FIGURE 1.2 Data Analytics Model Diagram



Limitations of Data Analytics

Follow Along File: None

predictive analytics
Using data analytics to predict what might happen in the future.

While data analytics can be a powerful tool when making professional or personal decisions, it is not a perfect system. The analysis and corresponding decisions you make are only as good as the data you have. If there are problems with the validity or accuracy of the data used in a project, the outputs will not be effective in making good decisions. Another limitation is that data is always changing and therefore difficult to predict. For example, we don't know what the price of a certain stock will be tomorrow, next week, next month, etc. The same goes for sales in any given company. Data analytics can help us make educated guesses as to what we think the data might be in the future, but we will not know for sure until the data becomes a historical record. Most data analytics projects begin with data that occurred in the past. It is this past data that can help us predict the future. This is often referred to as **predictive analytics**. If the data used for a certain project is mostly consistent over a long period of time, the results of predictive analytics can be very reliable. However, data that drastically changes over time can completely change the results of a

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project that are used to make decisions. It is these extreme changes that are very difficult to predict. However, we can still evaluate these potential changes by conducting "what-if" analyses. For example, someone analyzing a stock portfolio might conduct a scenario analysis to see how much money would be lost if a stock were to fall 20%, or 50%. The results of this analysis may not help the person to understand if a particular stock is, in fact, going to drop a significant amount, but could establish a risk profile that could lead to other decisions being made to minimize losses in case that scenario were to occur. Even though there are limitations as to the predictive powers of data analytics, it can still produce valuable information that can help you make good decisions.

Key Takeaways

- The data you have and the way it is arranged are critical to successfully completing an analytics project.
- There are four steps to the DATA Analytics Framework that should be used prior to each project: what decisions will be made, what data should be acquired, define the time frame for the project, and establish how the data will be analyzed.
- The DATA Analytics Framework is the central component of the data analytics working model and informs data design, data audits, and data internal controls.
- You should always conduct a data audit on a spreadsheet that you are using but did not create or on a dataset that has been provided to you.
- To prevent a data analytics project from becoming corrupted, data internal controls should be added to your spreadsheet if it is going to be shared with other people.
- Predictive analytics are limited in determining future outcomes when the dataset that is analyzed contains drastic changes.
- Exercises such as "what-if" scenarios can be used to understand risks that might occur if drastic changes occur to the data you are analyzing.

1.2 A Review of Excel 365

Learning Objectives

1. Learn how to launch Microsoft Excel 365 and open a new workbook.
2. Become familiar with the Excel workbook and worksheets.
3. Learn how to navigate worksheets.
4. Understand the use of keyboard shortcuts and Key Tips.
5. Define cell addresses and cell ranges.
6. Review the Excel Ribbon.
7. Become familiar with the Quick Access Toolbar and Right-Click Menu.
8. Examine the Backstage View and software default settings.
9. Learn how to save workbooks on your computer.
10. Learn how to save and share workbooks on the OneDrive cloud.
11. Learn how to add headers and footers to a printed worksheet.
12. Review Page Layout commands to prepare a worksheet for printing.
13. Become familiar with Excel help features.

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This section will introduce and review the features of Microsoft Excel 365. These skills are necessary to begin working in Excel whether you are starting a project from scratch or working with an existing Excel workbook. This section will also cover features for storing and sharing Excel workbooks on the cloud.

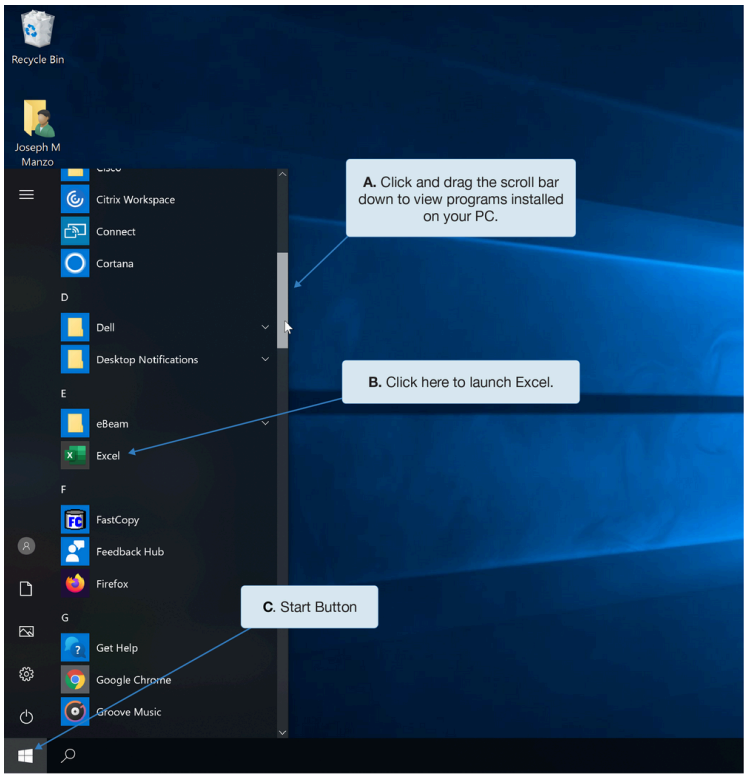
Launching Microsoft Excel 365

Follow Along File: None

There are a few different ways in which you can launch Microsoft Office Excel 365 on your PC. The following demonstrates three ways in which Excel can be launched. Any program that is currently open on your PC should be closed or minimized. You should be able to see your desktop in its entirety before starting.

1. Click the Start button on the lower left corner of your computer screen.
2. Click and drag the scroll bar down until the Excel icon is visible, as shown in Figure 1.3. The programs are listed in alphabetical order, so you will have to scroll down to the letter E.

FIGURE 1.3 Start Menu in Microsoft Windows 10



3. Click the Excel icon from the list of programs on the Start Menu. This will launch Excel.
4. Excel can also be launched by clicking the Excel icon pinned to the Start Menu. To pin Excel to the Start Menu, right click the Excel icon on the programs list as shown in Figure 1.4. Select the Pin to Start option from the Right-Click Menu.

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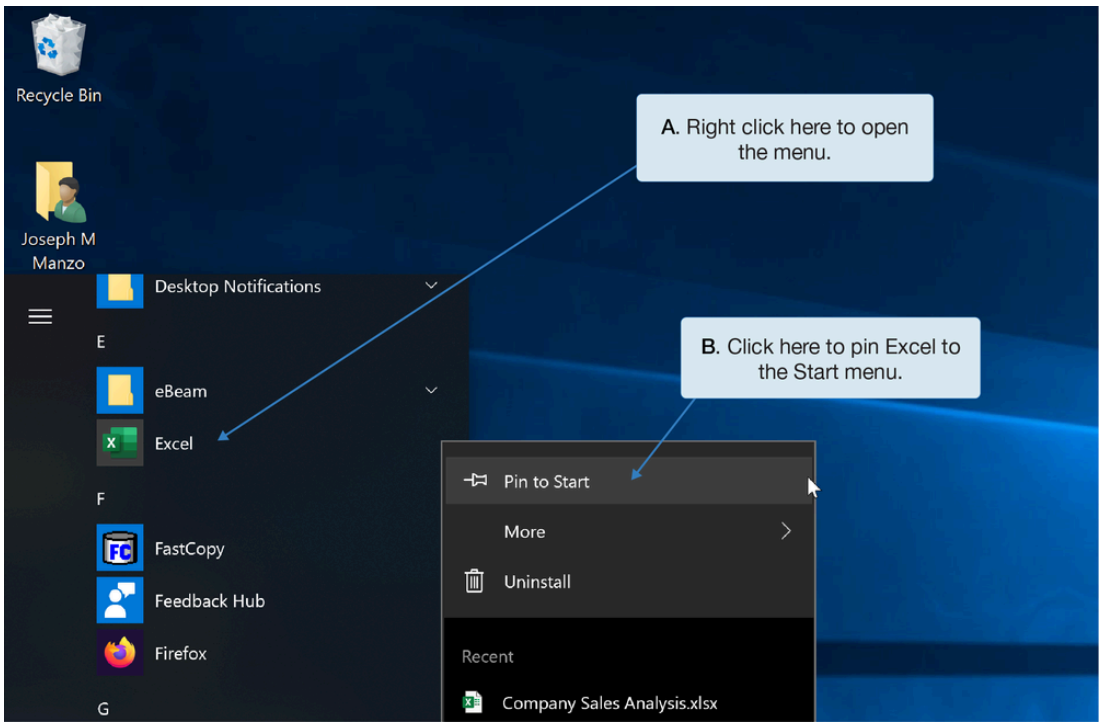
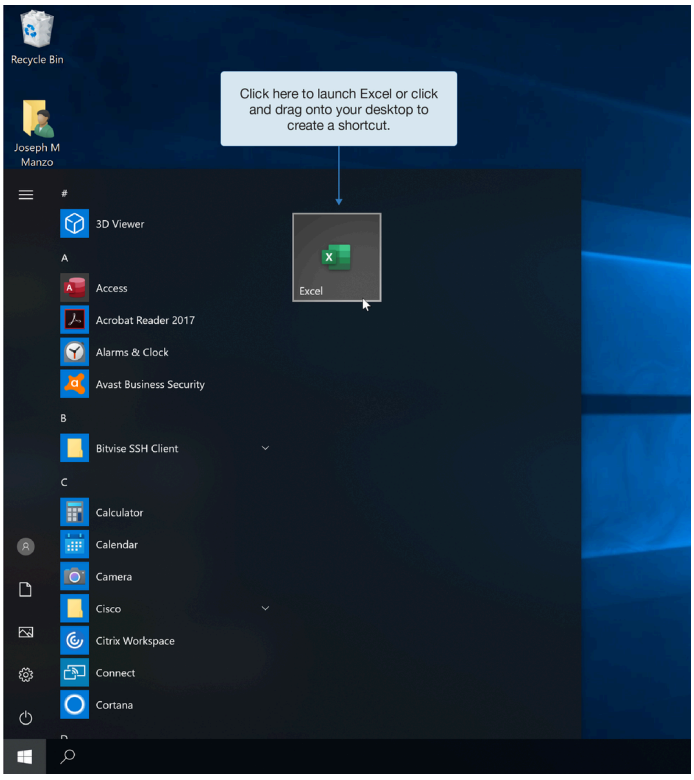
FIGURE 1.4 Pinning Excel to the Start Menu



Once Excel is pinned to the Start Menu, you can launch it by clicking the icon as shown in Figure 1.5.

FIGURE 1.5 Launching Excel from Pinned Icon on Start Menu



5. You can also launch Excel by double clicking the shortcut icon on your desktop as shown in Figure 1.6. To add an Excel shortcut to your desktop, click and drag the Excel icon shown in Figure 1.5 or Figure 1.4 onto your desktop.

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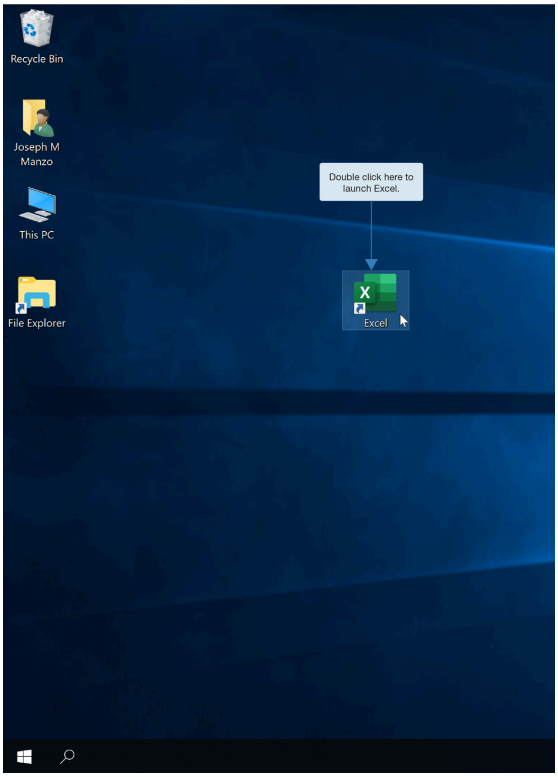
FIGURE 1.6 Launching Excel from the Desktop Shortcut

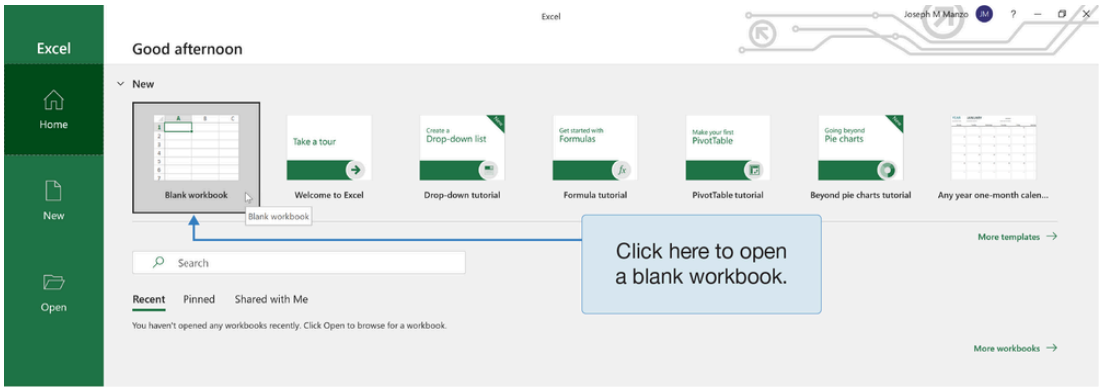


The Excel Workbook

Follow Along File: None

Once Excel is launched, you will see the Excel Start screen as shown in Figure 1.7. Click the blank workbook option, and a blank workbook will be opened on your screen.

FIGURE 1.7 The Excel Start Screen



A **workbook** is an Excel file that contains one or more worksheets (also referred to as spreadsheets). Excel will assign a file name to the workbook, such as Book1, Book2, Book3, and so on, depending on how many new workbooks are opened. Figure 1.8 shows the appearance of a blank workbook.

workbook
An Excel file that contains one or more worksheets.

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