Unit 2 Tutorials: Application Software

INSIDE UNIT 2

Operating Systems

by Sophia

 WHAT'S COVERED

Recall that the technological core of an information system is the computer. All computers consist of hardware and software working together to provide users with the ability to manipulate data. As computer hardware is categorized based on function, computer software can also be divided into categories based on function: operating systems and application software. In this section we will take a closer look at computer operating systems.

Our discussion will break down as follows:

1. What Is An Operating System

An **operating system (OS)** is software that performs the task required to keep the system running, and provides the main interface for the user. In essence, the operating system enables the computer's hardware to communicate with and control the computer's software, while providing the user with a way to interact with both. All computing devices (desktop PCs, notebook PCs, tablet PCs, smartphones, etc.) run an operating system. Without the operating system, a computer would not be operational. The operating system orchestrates several essential functions, including managing the hardware resources of the computer, providing the **user-interface** components, and providing a platform for software developers to write applications. The user-interface is what allows a user to interact with the files and software on a computer. Typically, when a computer is in operation, multiple programs are running concurrently. All software running must have access to the computer's resources, such as CPU, memory, and storage, in order to function properly. The operating system is what coordinates access to the hardware (CPU, memory, and storage) to ensure that each software application gets the resources it needs.

Operating systems facilitate communication between the user and the computer's resources. When a user interacts with applications, the operating system manages access to the computer's resources, such as CPU, memory and storage, and peripheral devices.

> ⑦ **DID YOU KNOW**
>
> Non-computer devices, such as a car or an ATM machine, have operating systems installed on them. For instance, if your car can display your average miles per gallon or tire pressure, that display has an OS running behind it.

> 📄 **TERMS TO KNOW**
>
> **Operating System**
> Software that manages the hardware and creates the interface between the hardware and the user.
>
> **User-Interface**
> Operating interface that allows a user to interact with the files and software on a computer.

2. Types of Operating Systems

In most cases, when you purchase a computer, it will come loaded with an operating system on it. Most people use the operating system that comes with the computer. For personal computers, the most popular operating systems are Microsoft's Windows, Apple's OS X, and different versions of Linux. These standard operating systems are typically only found on desktop or laptop computers. Mobile operating systems such as Apple's iOS, Google's Android, Microsoft's Windows Mobile, and Blackberry are run on smartphones and

tablets.

Operating systems can be differentiated from one another by characteristics such as: if it offers a graphical user interface (GUI), if it can multitask, if it is multi-user, and if it is commercial or open-source. We will examine these characteristics in more detail below.

3. User Interface, Multitask, and Multi-user

Early personal-computer operating systems were simple by today's standards. For example, they did not provide multitasking and required the user to type commands to initiate an action. However, as computers have evolved, so have the characteristics of their operating systems.

- **User-Interface**: The way an operating system allows a user to communicate with the computer, enter commands, access software, input data, and receive output or feedback, is defined by its user-interface. A user-interface can be either graphical or command line. A **command line interface** provides users with a prompt to type text commands. Examples of operating systems that fall into this category are Linux and UNIX.

   Most operating systems today, however, provide a **graphical user interface (GUI)**. A GUI provides a graphical interface that allows the user to issue commands, run programs, and manage files by using a mouse and/or keyboard input. Linux and UNIX also offer GUI capability. MS Windows and Mac OS are the most common GUI-based operating systems.

- **Multitask**: Early operating systems could only run one program at a time. Today, all operating systems can multitask. Multitasking refers to whether an operating system is capable of allowing multiple software processes to run at the same time. Examples of operating systems that would fall into this category are: Linux, Windows, UNIX, and Mac OS.

- **Multi-user**: Operating systems tend to be designed for single users. Since there is only one keyboard, one mouse, and one monitor, there is no need to allow multiple people to control the computer at once. Multi-user refers to the operating system's ability to allow more than one user to use the same computer at the same time and at different times. Examples of operating systems that fall into this category are Linux and UNIX.

  📄 **TERMS TO KNOW**

  Command Line Interface
    A user-interface that provides users with a prompt to type text commands.

  Graphical User Interface (GUI)
    Contains graphics and icons and is navigated with a mouse.

4. Open-Source vs. Commercial Operating Systems

Early computers were difficult to program and required great attention to detail. However, many personal-computer enthusiasts immediately banded together to build applications and solve problems. These computer

enthusiasts were happy to share any programs they built, as well as any solutions to problems they found. This collaboration enabled them to more quickly innovate and fix problems. **Open-source** software is free software that makes the source code available for anyone to copy and use. This encourages others to contribute to the future development and improvement of the software. The open-source movement has led to the development of some of the most-used software in the world, including the Firefox browser, the Linux operating system, the Apache web server, FreeBSD, and GNU.

However, as software began to become a business, this idea of sharing everything fell out of favor, at least with some. This led to a new business model of restrictive software licensing, which required payment for software, a model that is still dominant today. This model is sometimes referred to as **commercial (closed-source)**, as the source code is not made available to others. Examples of commercial operating systems are Microsoft Windows and Apple OSX.

There are many arguments on both sides of the aisle for the commercial or open-source software. The table below explains some benefits for open-source and closed-source operating systems.

Operating System	Benefits
Open-Source	The software is available for free. The software source-code is available; it can be examined and reviewed before it is installed. The large community of programmers who work on open-source projects leads to quick bug-fixing and feature additions.
Commercial (Closed-Source)	By providing financial incentive for software development, some of the brightest minds have chosen software development as a career. Technical support from the company that developed the software.

📄 TERMS TO KNOW

Open-Source
   Used to describe software that is free to users, and for which the source code is made available; users are encouraged to modify.

Commercial (Closed-Source)
   Used to describe software that is not free to users nor is the source code made available for users to modify.

5. Summary of Characteristics

The table below lists today's common operating systems, and summarizes their user interface, multitasking, and multi-user characteristics.

Operating System	User Interface	Multitasking	Multi-user	Open-Source Or Commercial

MS Windows	GUI/Command Line	Yes	No	Commercial
Linux	GUI/Command Line	Yes	Yes	Open-Source
UNIX	GUI/Command Line	Yes	Yes	Commercial
Mac OS	GUI	Yes	No	Commercial
MS DOS	Command Line	No	No	Commercial
Windows Mobile	GUI	No	No	Commercial
Apple iOS	GUI	No	No	Commercial
Android	GUI	Yes (up to two applications at once)	No	Commercial

☑ SUMMARY

The two major categories of computer software are application software and **operating system** software. **Operating system** software is required of all computers, as it manages the hardware and provides the main **interface** for the user to interact with the computer. In this tutorial, we discussed **operating system** types and the main **characteristics of operating systems**.

Source: Derived from Chapter 3 of "Information Systems for Business and Beyond" by David T. Bourgeois. Some sections removed for brevity.
https://www.saylor.org/site/textbooks/Information%20Systems%20for%20Business%20and%20Beyond/Textbook.html

📄 TERMS TO KNOW

Graphical User Interface (GUI)
Contains graphics and icons and is navigated with a mouse.

Multitask
Ability to allow multiple software processes to run at the same time.

Multiuser
Operating system's ability to allow more than one user to use the same computer at the same time and at different times.

Operating System
Software that performs the task required to keep the system running and provides the main interface for the user.

User Interface
Operating interface that allows a user to interact with the files and software on a computer.

The Microsoft Windows Operating System

by Sophia

Without a doubt, Microsoft's Windows operating system is the most common of all the available GUI-based operating systems. Every software application on a Windows-based computer has a similar user interface. Users with experience using any software application on Windows should have no problem using other applications. The GUI, as implemented by MS Windows, has become the standard for applications and operating systems. The graphical user interface (GUI) incorporates icons and a mouse to make using a computer easy for experienced and inexperienced computer users. Users can simply point to and click on a file, folder, or software application that they want to use. In fact, the presence of a GUI is one of the most important requirements in properly characterizing an operating system. In this tutorial we will cover the Microsoft Windows operating system.

Our discussion will break down as follows:

1. Microsoft Windows

In 1985, Microsoft released the first version of Windows. This version of Windows was not an operating system, but instead was an application that ran on top of the DOS operating system, providing a graphical environment. It was quite limited and had little commercial success. It was not until the 1990 release of Windows 3.0 that Microsoft found success with a graphical user interface. Since then, there have been a multitude of Windows versions, but it was the release of Windows 3.0 that enabled business users to begin using a graphical user interface, ushering us into the graphical-computing era. Each release adds the ability to process more data at once and access more memory. Features such as multitasking, virtual memory, and voice input have become standard features.

2. Elements of the Microsoft Windows OS

The Windows OS is one of the most commonly used operating systems available. Due to its relative uniformity across releases, users who learn and understand how to use one version of MS Windows can typically make the transition to another (newer) version. Every version of Windows OS contains the same basic elements.

These elements can be grouped in two categories: system configuration and user interface elements.

2a. System Configuration Elements

- **Control Panel**: Gives the user the ability to change basic system settings. Users may also add hardware components, as well as add or remove software. The control panel also provides users with control over user accounts.
- **Device Manager**: Gives the user the ability to display and control computer hardware.

- **Windows Mobility**: Provides the user with information related to mobile computing.
- **Security and Maintenance**: Provides the user with information related to the security components within the operating system.

2b. User Interface Elements

- **Windows Shell**: Provides the main mechanism through which the Windows GUI is presented. All dialog boxes, menus, taskbar, start button menu options, and Windows Explorer are contained within the Windows Shell.
- **Windows Explorer**: Gives the user access to files and software applications, while allowing the user to launch applications and perform tasks.
- **File Folders**: Provides users with a visual way in which to view files that are contained or stored in a particular location.
- **Windows Search**: Provides users with a way to explore all files on a hard disk.
- **Start Menu**: The launch point for all software applications loaded into the Windows OS. All software appears in this menu as a nested list.
- **Taskbar**: Application bar used to launch and monitor software applications.
- **Icons**: Small graphical representation of a program or file that, when clicked on, will be run or opened.
- **Desktop** — A system of organization for icons and file folders on the computer screen.

3. Key Windows Applications

Microsoft Windows today is the most widely used OS on personal home computers and laptop computers, as well as on business machines. Microsoft popularized the idea of the office-software productivity bundle with its release of Microsoft Office. This package continues to dominate the market, and most businesses expect employees to know how to use this software. These applications, called **productivity software**, allow office employees to complete their daily work. Many times, these applications come packaged together, such as in Microsoft's Office Suite.

Below is a list of some common productivity software applications.

- **Word Processing**: This class of software provides for the creation of written documents. Functions include the ability to type and edit text, format fonts and paragraphs, and add, move, and delete text throughout the document. Microsoft's word processing application is Microsoft Word.
- **Spreadsheet**: This class of software provides a way to do numeric calculations and analysis. The working area is divided into rows and columns, where users can enter numbers, text, or formulas. Microsoft's spreadsheet application is Microsoft Excel.
- **Presentation**: This class of software provides for the creation of slideshow presentations, which can include tables, charts, images, and text. Typically, presentation software allows the user to include notes on the slides that are not visible to viewers when projected onto a larger screen. Microsoft's presentation software is Microsoft PowerPoint.
- **Electronic Mail**: This class of software provides for the sending and receiving of email messages.
- **Graphics**: This class of software enables users to create pictures, diagrams, charts, and graphs.

Some office suites include other types of software. The professional version of Office also includes Microsoft

Access, a database package. Users can also purchase Visio, a program that is used to create models, diagrams, and charts. The graphics that are used in Visio are standard images used in flowcharts, decision diagrams, playbooks, and even network diagramming.

WATCH

Check out the video below to learn more about key Windows applications.

TERM TO KNOW

Productivity Software
Software that allows people to complete daily work; typically utilized in business or organizational settings.

SUMMARY

Microsoft Windows has become one of the most popular and widely used operating systems for personal computing and business, primarily due to the fact that users who can use one version of Windows OS can easily transition to other versions without the need for added learning or training. In this tutorial, we defined the core **elements of Windows OS**, as well as the **productivity software** that comes prepackaged with MS Windows.

Source: DERIVED FROM CHAPTER 3 OF "INFORMATION SYSTEMS FOR BUSINESS AND BEYOND" BY DAVID T. BOURGEOIS. SOME SECTIONS REMOVED FOR BREVITY.
HTTPS://WWW.SAYLOR.ORG/SITE/TEXTBOOKS/INFORMATION%20SYSTEMS%20FOR%20BUSINESS%20AND%20BEYOND/TEXTBOOK.HTML

TERMS TO KNOW

Productivity Software
Software that allows people to complete daily work; typically utilized in business or organizational settings.

Using the Microsoft Windows Operating System

by Sophia

:≡	WHAT'S COVERED

Microsoft Windows provides users with a Graphic User Interface (GUI) to simplify the process of working with files and software applications. This organizes how users interact with the computer, and how data is processed and transferred between application software. Windows also makes the process of accessing information on the Internet easy for its users. In this tutorial, we will present an introductory tour of the Windows interface by performing several general tasks.

Our discussion will break down as follows:

1. Starting MS Windows

Starting Windows begins with pressing the power button on your computer's system unit to initialize the computer's **boot process**. The boot process describes the process for powering on a computer and loading the operating system. During the boot process, the computer will run a self diagnostic, and load the necessary information and software to help the computer and hardware devices to communicate from the computer's read-only memory (ROM). As your computer is booting up, a black screen with the MS Windows logo, progress bar, copyright information, and the word Microsoft will appear on the monitor. Users will then be presented with the Microsoft Windows **welcome screen**. The welcome screen will invite the user to authenticate a user account on the computer. At this point, the MS Windows OS is loaded and ready to be used. Using the mouse to click on a user name starts the process of logging onto the computer. **Logging on** to the computer opens the user account, and makes the computer ready to be used.

📄	TERMS TO KNOW

Boot Process

Process for powering on a computer and loading the operating system.

Welcome Screen

Presents a list of the names of all user accounts on the computer.

Logging On

Opens the user account and makes the computer ready to be used.

2. Running Applications

One of the most basic tasks that you will complete on a computer is starting an application program. There are several ways in which to start an application using the Windows OS; however, the most common way to start an application is by using the Start Menu. For example, the following steps start Microsoft Word using the Start Menu.
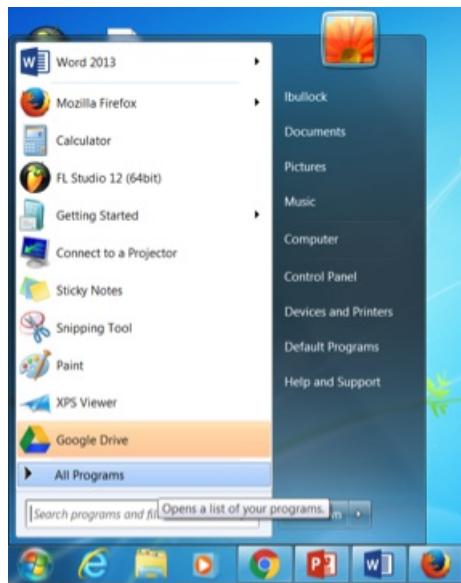
Step One: Display the Start Menu by clicking on the Windows icon in the lower left corner of the taskbar.
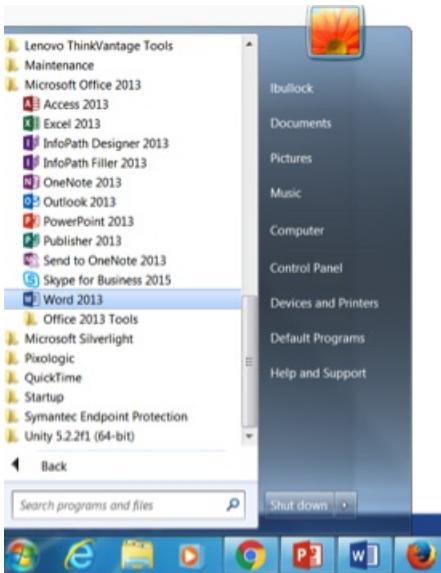

Step Two: Select All Programs from the menu list.

Step Three: Click on the MS Office Folder to view all MS Office applications.

Step Four: Click on MS Word to open the program.

3. Shutting Down MS Windows

Another one of the most basic tasks you will complete on a computer is shutting down the operating system. Many new computer users often fail to follow the proper process for shutting down their computer. Failing to properly shut down Windows can cause data to be lost and could create operating system issues. These issues could ultimately require complete system recovery. The most common way to shut down the computer's operating system is by using the Start Menu. The following steps shut down MS Windows using the Start Menu.
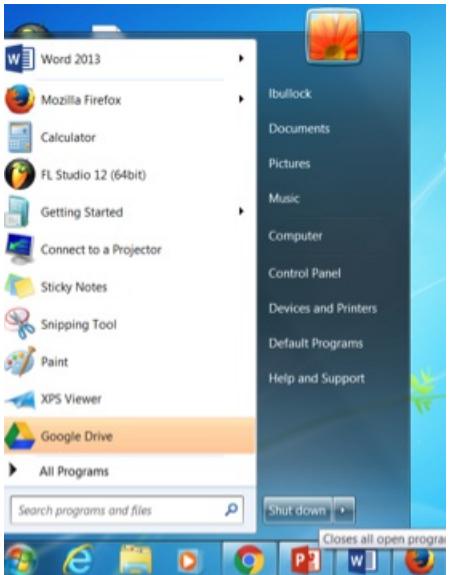
🔳 **STEP BY STEP**

Step One: Display the Start Menu by clicking on the Windows icon in the lower left corner of the taskbar.

Step Two: Click on the Shut down button.

4. Windows Explorer

Microsoft's Windows Explorer is a program that comes prepackaged with the Windows OS. It gives users the opportunity to view all of the files on a computer. When open, the program shows the hard disk as a hierarchy of drives, folders, and the files in each folder. Users can edit the hierarchy to organize files and folders.

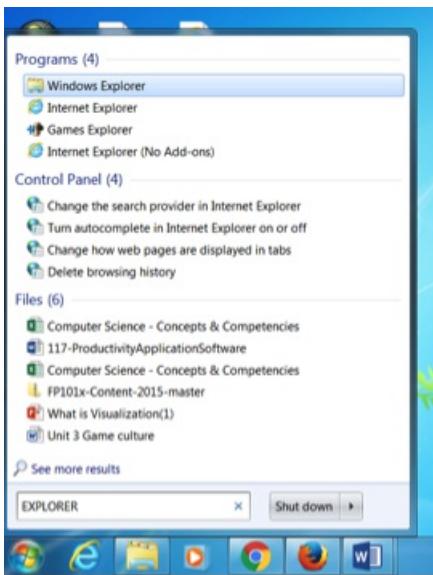The following steps start the Windows Explorer program.

⬢ STEP BY STEP

Step One: Display the Start Menu by clicking on the Windows icon in the lower left corner of the taskbar.

Step Two: In the Windows Search box, type "Explorer."

Step Three: Select Windows Explorer from the list of programs. The Explorer window will open and you should be able to manage all files on the computer.

Use the following steps to create a keyboard shortcut.

 STEP BY STEP

Step One: Press the windows key + E simultaneously. The Windows Explorer screen will open and you will be able to manage all files on the computer.

OR

Display the Start Menu by clicking on the Windows icon in the lower left corner of the taskbar.

Step Two: Click on the Computer button to display the Windows Explorer program. The Windows Explorer screen will open and you will be able to manage all files on the computer.

SUMMARY

In this tutorial, we covered some of the basic tasks that users of the **MS Windows OS** are required to perform to secure basic **operation of a Windows-based computer**. Some of these required tasks include starting up and **shutting down MS Windows** by using the start menu, as well as running software applications. We also covered how to view the computer's hard disk as a hierarchy of drives and folders using the **Windows Explorer** program.

Source: All images provided by Sophia

TERMS TO KNOW

Boot Process
Process for powering on a computer and loading the operating system.

Logging On
Opens the user account and makes the computer ready to be used.

Welcome Screen
Presents a list of the names of all user accounts on the computer.

Troubleshooting with Microsoft Windows

by Sophia

:≡	WHAT'S COVERED

Users who have a general understanding of the Windows operating system are able to find solutions to many common problems, without needing to seek any professional assistance. In this tutorial, we will review some of the problems that can occur, as well as methods for troubleshooting the operating system in these instances.

Our discussion will break down as follows:

1. Common Windows Problems

As you use Windows, you may occasionally encounter problems that will need to be resolved in order to ensure that the computer is working optimally. The problems that users typically have to deal with while using Windows can be categorized as being system performance problems, application/hardware crashes, or file management issues. Listed below are examples of some of the most common problems and their solutions.

- **System Performance Problems**: System performance problems are problems with the overall speed that it takes for a computer's hardware to execute instructions sent to it by software. Typically these types of problems manifest as a slow or system "lag."

  Sometimes a computer will not recognize peripheral devices. For example, you might plug in the USB cable to your digital camera to upload photos, but your computer will not recognize the device, and you won't have access to the files. A similar performance problem may be that you cannot access a shared drive or resource on a network. For example, your computer might regularly connect to your employer's shared network, but your computer might not recognize the network connection.

  Finally, another common system performance problem is the inability of the computer to identify an application software. For example, you may have deleted Microsoft's PowerPoint application from your computer. Without this application, if someone sends you a .ppt file, which is the file extension for PowerPoint, your computer will not open the file.

- **Application/Hardware Crashes**: An application or hardware crash occurs when a system component stops working suddenly with no warning. With software, crashes usually occur due to programming errors. Hardware tends to crash due to malfunctioning equipment.

- **File Management Issues**: File management issues tend to describe incompatibilities with system files and hardware or software. These types of issues can also occur between user generated files and software. Common file management issues include the portability of files, corrupted files, or extremely large file sizes. Portability of files refers to the ability to use files across different operating systems (such as being able to open a word document on a Windows and Mac computer). Sometimes, files are corrupted, and

may be viewable on one computer's operating system, but not another. Having enough memory and storage can also be an issue with file management. Your computer may not have the capacity to open or download files that require too much memory or storage.

2. Addressing System Performance and Crashes

What should you do if you experience issues with system performance, or if your applications or hardware crash? The examples below describe common problems, and tools you can use to solve the issue.

↗ EXAMPLE

Problem: System performance suddenly feels slow

Solution: Typically, sudden slow downs in your computer's performance tend to be caused by changes made to the system settings. Unintended changes can sometimes occur if a new software application has been installed. One solution could be to uninstall the new software and run **System Restore** to go back to the system settings prior to installing the new software. System restore requires you to activate this option which is, by default, not activated. If you did not recently install new software, run the system restore back to a time when you weren't having problems. Windows creates daily System Restore points automatically.
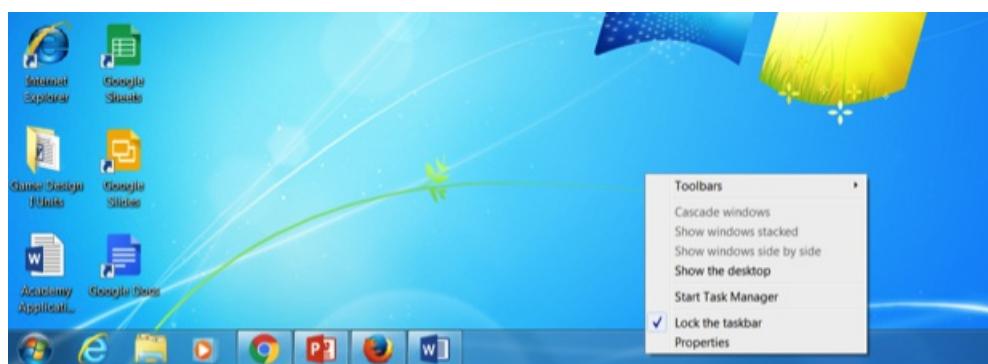
↗ EXAMPLE

Problem: The application does not respond

Solution: If an application does not respond (freezes), first use the Task Manager. The**Task Manager** is an operating system component that enables the user to view running tasks and process and shut down any that malfunction. The task manager also provides a way for users to view the overall system performance and restart the computer if needed.
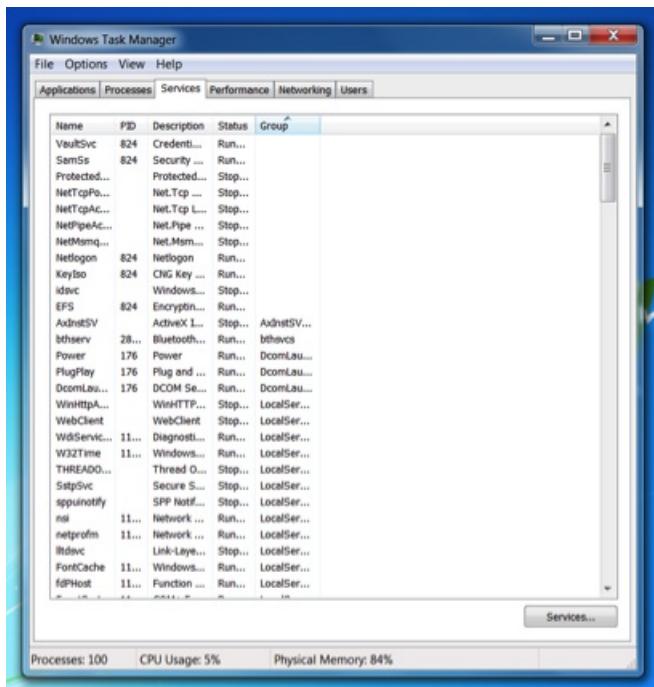
Use the following steps to display the Task Manager.

⚃ STEP BY STEP

Step One: Right click an empty area on the taskbar.

Step Two: Click on Start Task Manager.

🚩 HINT

You can also display the Task Manager by pressing Ctrl + Alt + Delete

↗ **EXAMPLE**

Problem: Windows crashes when booting up

Solution: This problem tends to be caused when users have unwanted or corrupt background applications automatically loading at startup. To solve this problem run Windows in **safe mode**. Safe mode is a special mode in which only the necessary software loads.

Use the following steps to run Windows in safe mode.

⧉ STEP BY STEP

1. Restart the computer. At the sound of the beep press F8.
2. At the advanced boot options menu, use the arrow keys to select safe mode.
3. Press Enter.

📄 TERMS TO KNOW

System Restore

Provides users with a way to go back to previous system settings.

Task Manager

Operating system component that enables the user to view running task and processes.

Safe Mode

Special mode in which only the necessary drivers and software load.

3. Troubleshooting Using the Help System

Included with Windows is an onscreen Help System. The Help System can be accessed through the Start Menu. The **Help System** is a collection of stored files on your hard disk, as well as information retrieved from the Internet. Because the Help System is a combination of files on the hard disk and Internet, you can always access the most recent information, as well as receive help even when you are offline.

Review the following steps to use the Help System.

> 🔲 **STEP BY STEP**

1. Click on the Start Menu.
2. Click on Help and Support.
3. Click on the Browse Help button.
4. Click the Email and other communications option; a list of articles shows related to email.
5. Read the article explaining how to send pictures in an email message.
6. Close the Windows Help and Support window.

> 📄 **TERM TO KNOW**

Help System

Collection of stored files on your hard disk as well as information retrieved from the Internet.

> 📋 **SUMMARY**

In this tutorial we discussed how to resolve some of the most **common problems Windows** users encounter while using Windows. The **Windows Help System** is a searchable collection of files on your computer's hard disk and on the Internet that can provide you with detailed information on how to **resolve a problem** or **complete a task**.

Source: All images provided by Sophia

> 📄 **TERMS TO KNOW**

Help System

Collection of stored files on your hard disk as well as information retrieved from the Internet.

Safe Mode

Special mode in which only the necessary drivers and software load.

System Restore

Provides users with a way to go back to previous system settings.

Task Manager

Operating system component that enables the user to view running task and processes.

Productivity Application Software

by Sophia

	WHAT'S COVERED

A computer can be a valuable tool. However, the value of a computer is not fully realized until it is loaded with software. With the correct software applications, a computer can perform useful tasks for its user, such as performing calculations, maintaining a schedule, typing a paper, or creating graphics. Recall that software can be categorized into two types: system software and application software. In this tutorial we will take a closer look at application software.

Our discussion will break down as follows:

1. Overview of Application Software

Essentially, **application software** is a computer program that provides the user with the ability to accomplish a goal or purpose. For example, if you have to write a paper, you might use the application software of Microsoft Word. If you want to listen to music, you might use iTunes. To surf the web, you might use Internet Explorer or Firefox. Even a computer game could be considered application software. There are a myriad of application software packages, and each one is designed to perform a specified task or set of tasks. A major subcategory of application software is productivity software. Examples of productivity application software include data management, text editing, and web page development. In most instances, application software can be purchased either from a store that sells computer products, or directly from a website.

Two other subcategories of application software worth mentioning are **utility software** and **programming software**. Utility software includes software that allows you to fix or modify your computer in some way. Examples include antivirus software and disk defragmentation software. These types of software packages were invented to fill shortcomings in operating systems. Many times, a subsequent release of an operating system will include these utility functions as part of the operating system itself. Programming software is software whose purpose is to make more software. Most of these programs provide programmers with an environment in which they can write the code, test it, and convert it into the format that can then be run on a computer.

	TERMS TO KNOW

Application Software
Software that provides user with the ability to accomplish a goal or purpose.

Utility Software
Software that allows you to fix or modify your computer in some way.

Programming Software
Software whose purpose is to make more software.

2. Productivity Software

While personal computer users make use of all types of application software on a regular basis, some of the most commonly-used types of application software are word processing, spreadsheet, database, and presentation software. These software packages are typically referred to as **productivity software** because they increase productivity of users, especially of individual office workers. Generally, productivity applications are applications used to create and edit documents associated with word processing, spreadsheet, presentation, and data management. Microsoft popularized the idea of the office-software productivity bundle with its release of Microsoft Office. This package continues to dominate the market, and most businesses expect employees to know how to use this software.

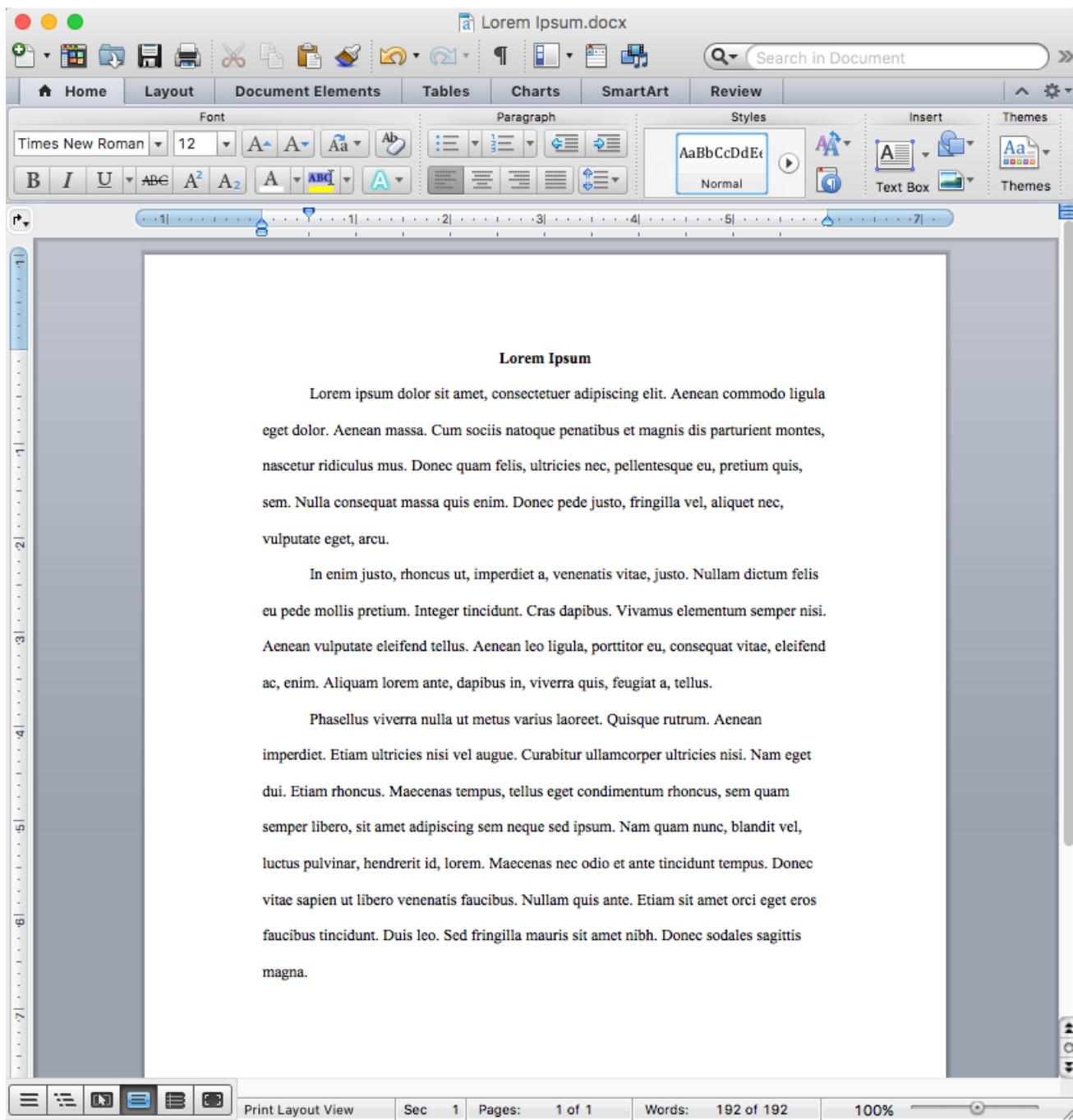The following sections list productivity applications and their basic functions.

> 🗎 TERM TO KNOW
>
> **Productivity Software**
>> Software that allows people to complete daily work; typically utilized in business or organizational settings.
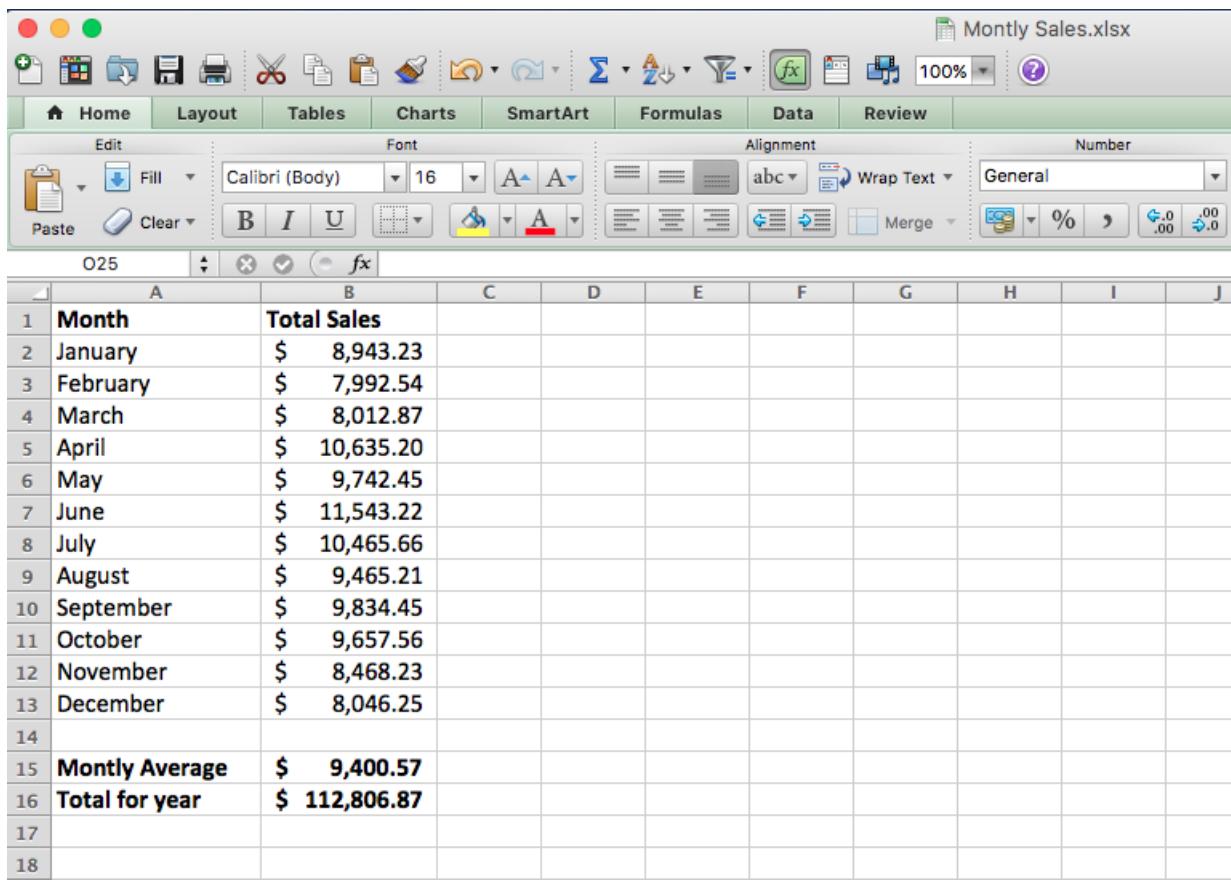
2a. Word Processing

This class of software provides for the creation of written documents. Functions include the ability to type and edit text, format fonts and paragraphs, and add, move, and delete text throughout the document. Most modern word processing programs also have the ability to add tables, images, and various layout and formatting features to the document. Word processors save their documents as electronic files in a variety of formats. By far, the most popular word processing package is Microsoft Word, which saves its files in the DOCX format. This format can be read and written by many other word processor packages.

2b. Spreadsheet

This class of software provides a way to do numeric calculations and analyses. The working area is divided into rows and columns, where users can enter numbers, text, or formulas. The formulas are what make a spreadsheet powerful, allowing the user to develop complex calculations that can change based on the numbers entered. Most spreadsheets also include the ability to create charts based on the data entered. The most popular spreadsheet package is Microsoft Excel. Just as with word processors, many other spreadsheet packages can read and write to this file format.
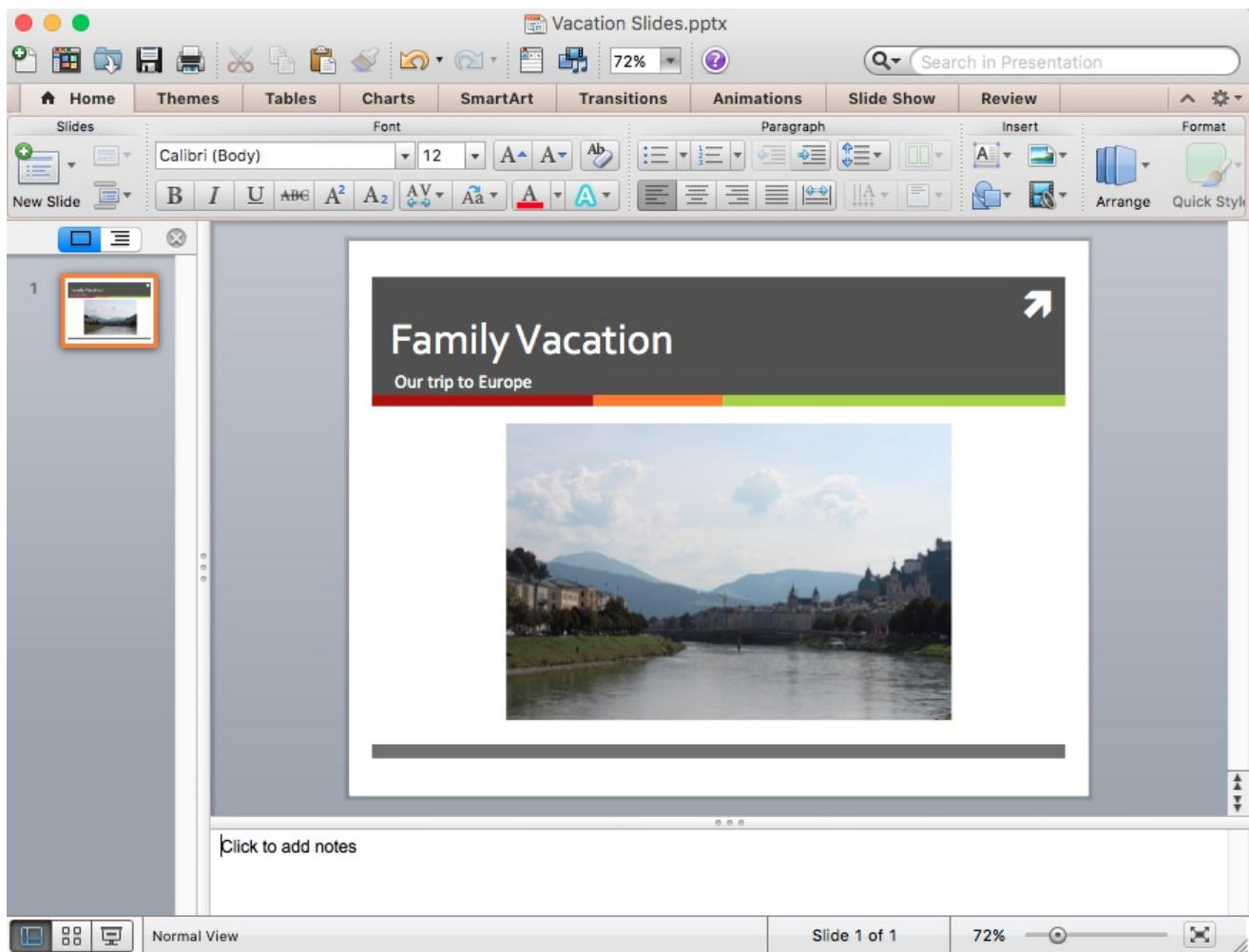
	A	B	C	D	E	F	G	H	I	J
1	**Month**	**Total Sales**								
2	January	$ 8,943.23								
3	February	$ 7,992.54								
4	March	$ 8,012.87								
5	April	$ 10,635.20								
6	May	$ 9,742.45								
7	June	$ 11,543.22								
8	July	$ 10,465.66								
9	August	$ 9,465.21								
10	September	$ 9,834.45								
11	October	$ 9,657.56								
12	November	$ 8,468.23								
13	December	$ 8,046.25								
14										
15	**Montly Average**	$ 9,400.57								
16	**Total for year**	$ 112,806.87								
17										
18										

2c. Presentation

This class of software provides for the creation of slideshow presentations. Harkening back to the days of overhead projectors and transparencies, presentation software allows its users to create a set of slides that can be printed or projected on a screen. Users can add text, images, and other media elements to the slides. Microsoft's PowerPoint is the most popular presentation software right now.

2d. Database Software

This class of software allows the user to enter, retrieve, and update data in an organized and efficient way. Database software has inquiry and reporting abilities that allow users to access the data in different ways and to create custom reports that include some or all of the information in the database. Microsoft Access is popular in academia and small business applications and systems. Microsoft SQL Server, Oracle, and IBM DB2 are the industry standard software applications for professionals working with database systems.

3. Using Productivity Application Software

Productivity application software works to increase the overall productivity of its users. You are probably used to using productivity application software in your personal or professional lives. If you have ever written documents, created presentations or spreadsheets, made graphics, or edited photos or electronic music, you have used productivity application software. The key to successfully using productivity application software is understanding when to use a particular application. For example, if your company needs to regularly communicate information to shareholders, you may wish to use a word processor such as Microsoft Word. Microsoft Word is best suited for working with and producing text-based documents. If you frequently work with numbers, using a spreadsheet such as Microsoft Excel would be your best option. Listed below are productivity software examples and how they are used.

Type of Software	Common Example	Typical Use
Word Processing	Microsoft Word Google Doc Open Office Writer	Create letters, memos, newsletters, posters, reports
Spreadsheet	Microsoft Excel Open Office Calc Google Sheets	Charts, graphs, data visualizations, simple databases, grade book, invoices
Presentation	Microsoft Powerpoint Open Office	Linear presentations, hyper presentations, simple animation

	Impress Google Slides	
Database	Microsoft Access Microsoft SQL Server MySQL	Data driven reports, electronic filing system, simple database management system

WATCH

This video follows Naomi Bishop and how she uses Word in her career as a travel writer.

SUMMARY

In this tutorial we took a look at application software and the various types of application software. **Productivity application software** packages are some of the most commonly used software in business and personal situations because they increase efficiency.

Source: Derived from Chapter 3 of "Information Systems for Business and Beyond" by David T. Bourgeois. Some sections removed for brevity. https://www.saylor.org/site/textbooks/Information%20Systems%20for%20Business%20and%20Beyond/Textbook.html, Screenshots of Microsoft software created by Sophia.

TERMS TO KNOW

Application Software
Provides user with the ability to accomplish a goal or purpose.

Productivity Software
Software that allows people to complete daily work; typically utilized in business or organizational settings.

Programming Software
Software whose purpose is to make more software.

Utility Software
Software that allows you to fix or modify your computer in some way.

Selecting Software

by Sophia

Software can perform many different tasks, and there are many different software packages that exist for computer users today. Although only two major categories of software exist — application software and system software — people further categorize application software based on commonalities such as function and field in which they are used. In this tutorial we will examine the categories in which application software falls.

Our discussion will break down as follows:

1. Software Categories
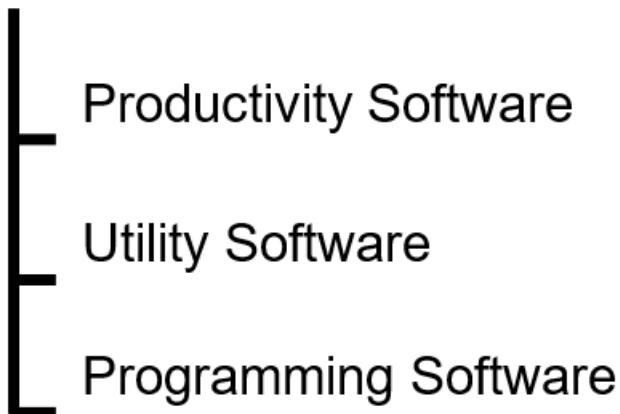
Software can be categorized at different levels. At the broadest level, there are two groups of **software categories**: application software and system software. Application software provides the user with the ability to accomplish a goal or purpose. System software (the operating system) performs the task required to keep the system running, and provides the main interface for the user.

Application software can be further categorized into three groups: productivity software, utility software, and programming software. Productivity software allows people to complete daily work, and is typically utilized in business or organizational settings. Utility software allows you to fix or modify your computer in some way. Programming software allows us to make more software.

Software Categories

Classifications of software based on function, such as word processing, spreadsheet, and presentation.

2. Productivity Software

Perhaps the most familiar type of software familiar to the everyday computer user is productivity software. Productivity software includes applications such as Microsoft Word, Microsoft Excel, and other applications that are typically offered as a package or suite. We can indeed further categorize productivity software based on its function or intended purpose. Major categories of productivity software, based on function, are word processing, spreadsheet, and presentation software. Listed below are common productivity software categorized by their function.

Category: Suite:	Word Processing	Spreadsheet	Presentation	Other
Microsoft Office	Word	Excel	PowerPoint	Outlook (email), Access (database), OneNote (information gathering)
Apple iWork	Pages	Numbers	Keynote	Integrates with iTunes, iCloud, and other Apple software
OpenOffice	Writer	Calc	Impress	Base (database), Draw (drawing), Math (equations)
Google Drive	Document	Spreadsheet	Presentation	Gmail (email), Forms (online form data collection), Draw (drawing)

3. Software Domains

Software applications make computers useful by completing tasks and ultimately making users productive. The key to understanding how to evaluate whether a software package can complete a specified task is to understand the domains in which the software is best suited. A **software domain** refers to the environment or situation in which a particular piece of software is designed to be operational. Education, entertainment, and business are a few examples of the domains in which software is used. Listed below are the domains in which various categories of software are best.

Software Category	Domain
Word Processing	Business: grant proposals, professional resumes, press releases Education: academic papers, speech outlines, lab reports Entertainment: film manuscripts, theater bills, jacket inserts for CDs/DVDs
Spreadsheet	Business: financial reports, tracking inventory, employee scheduling Education: data for creating charts and graphs, perform calculations Entertainment: ticket sales, resource planning, event schedules
Presentation	Business: quarterly reviews, sales and advertising, training new employees Education: enhancing lectures, student assessment, all-school assemblies Entertainment: promotions and trailers, audio/visual effects
Database	Business: customer interactions, merchandise inventory, payroll Education: course enrollments, research statistics Entertainment: digital marketing, trends and predictions, ratings forecasting

✎ TRY IT

Consider the case of an academic professor in the following scenario(s) and see if you can make a determination as to which type of software would be best used based on the situation.

A professor has collected data for five years and now needs to organize it to look for patterns. What type of software application should he/she choose? +

The professor would be best served by database software, as this type of application would give the researcher one place in which to enter and manage the data. Additionally, a database package would provide the professor with the tools to make a request for specific pieces of information contained within the database, or to perform operations on the information so that patterns apparent within the data can be observed.

A professor has concluded with research and must now write a report that summarizes the findings and that can be shared with colleagues in the scientific community. What type of software application should he/she choose? +

In this scenario the professor would be best served by using a word processing application, such as Microsoft Word, to format and type a report. Tables with data points can be included in the report.

A professor has collected data for five years and now needs to share his findings at a conference. What type of software application should he/she choose? +

The professor in this situation would be best served by presentation software, as it will provide large customizable slides to which information can be added and viewed by a large audience.

📄 **TERM TO KNOW**

Software Domain
Refers to the environment or situation in which a particular piece of software is designed to be operational.

📋 **SUMMARY**

In this tutorial we covered the various categories of software and the domains in which these software categories tend to be utilized. On a broad level, software is categorized as either application software or system software. However, application software can be categorized into productivity, utility, and programming software. Software domains describe the typical situations in which the software package is best suited, such as academic, business, or entertainment domains.

Source: Derived from Chapter 3 of "Information Systems for Business and Beyond" by David T. Bourgeois. Some sections removed for brevity.
https://www.saylor.org/site/textbooks/Information%20Systems%20for%20Business%20and%20Beyond/Textbook.html

📄 **TERMS TO KNOW**

Software Category
Refers to classification of software based on function such as word processing, spreadsheet, and presentation.

Software Domain
Refers to the environment or situation in which a particular piece of software is designed to be operational.

Application Software File Types and Formats

by Sophia

Microsoft popularized the idea of the office-software productivity bundle with its release of Microsoft Office. While Microsoft Office is no longer the only office software bundle, this package continues to dominate the market, and most businesses expect employees to know how to use this software. One of the major characteristics of all productivity software is that these applications produce information such as charts, graphs, slideshows, worksheets, video, music, drawings, pictures, etc. In this tutorial, we will examine the file types generated by productivity application software.

Our discussion will break down as follows:

1. What is a File Type?

A **file type**, commonly referred to as a file format, is the ending of a file that gives the operating system the ability to identify it. The file type specifies the relationship between the file and specific programs or applications, and tells a software application how to display it. In Microsoft Windows, the file type is a three-character suffix preceded by a period and the file's name. For example, a file named "windows" with a ".ppt" file type is displayed as "windows.ppt." The file type of "ppt" indicates to the computer's operating system that it is a presentation file and can be opened and edited in presentation software such as Microsoft PowerPoint. In most cases, the file type will be one to three characters at the end of the file name. However, there are some software applications that allow for more than the traditional three-character file type, such as the "html" file type associated with web pages.

> 🗎 TERM TO KNOW
>
> **File Type**
> The ending of a file that gives the operating system the ability to identify it; provides the structure of a document and tells a software application how to display it.

2. Common File Types

The file type of a document tells a program how to structure and display the contents of the file. As productivity application software has evolved, some file types have become associated with particular applications. Furthermore, manufacturers of software have also developed native file types. A **native file type** describes the file type that an application directly uses during the creation and editing of a document. For example, a file with the .doc or .docx file extension specifies to the computer's operating system that the file will be best viewed with Microsoft Word. This is because the .doc file type is native to Microsoft Word.

Listed below is a table with common productivity software applications and their native file formats:

Productivity Software Application	Common Native File Types
Microsoft Word	.doc, .docx, .rtf
Microsoft PowerPoint	.ppt, .pptx
Microsoft Excel	.xls, .xlsx
Microsoft Access	.accdb, .mdb

In some cases, a file with a specific extension may be viewed with a piece of software not native — or *foreign* — to that extension. A **foreign file type** is a file type that is not directly used by an application during the creation or editing of a document. When opening documents with file formats foreign to a software application, the contents may not be displayed accurately or completely. Programs that are not compatible with a file format may be able to give an overview of a file, but they may not be able to display all of the file's features.

📄 TERMS TO KNOW

Native File Type
File type that an application directly uses during the creating and editing of a document.

Foreign File Type
File type that is not directly used by an application during the creating or editing of a document.

3. Data and File Types

Remember that file formats define for software applications how the contents of a particular file are to be displayed. As you work with a computer, there may come a time in which you need to make a determination as to what file format will be best suited to display the type of data you will be working with, or the type of file you wish to create. There may even come an instance in which you need to make an association between a file type and the correct type of application to use to display the contents of the file. Listed below is a table with common data (file) types and the associated file:

Data Type	File Extension
Text	.asc, .doc, .docx, .msg, .txt, .wpd, .wps
Sound	.aac, .au, .mid, .mp3, .ra, .snd, .wma, .wav
Image	.bmp, .eps, .gif, .jpg, .pict, .png, .tif
Database	.xml, .tar, .sql, .db, .dbf, .dat, .csv
Video	.avi, mpg, .mov, .wmv
Computer Program	.bat, .com, .exe
Presentation	.ppt, .pptx, .pps, .key, .odp
Spreadsheet	.xls, .xlsx, .xlr, .ods

📋 SUMMARY

A file format defines a software application how to display the contents of a file created within the

application. In this tutorial, we covered common **file types** and the software applications and **types of data (files)** that tend to be associated with **specified file types**.

Source: Derived from Chapter 3 of "Information Systems for Business and Beyond" by David T. Bourgeois. Some sections removed for brevity.
https://www.saylor.org/site/textbooks/Information%20Systems%20for%20Business%20and%20Beyond/Textbook.html

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📄 TERMS TO KNOW

File Type
The ending of a file that gives the operating system the ability to identify it; provides the structure of a document and tells a software application how to display it; commonly referred to as file format.

Foreign File Type
File type that is not directly used by an application during the creation or editing of a document.

Native File Type
File type that an application directly uses during the creation and editing of a document.

Introduction to Databases

by Sophia

You have already been introduced to the first two components of information systems: hardware and software. However, those two components by themselves do not make a computer useful. Imagine if you turned on a computer and started the word processor, but could not save a document. Imagine if you opened a music player, but there was no music to play. Imagine opening a web browser, but there are no web pages. Without data, hardware and software are not very useful! Data is the third component of an information system. In this tutorial, we will take a look at the primary way in which data is collected, stored, and retrieved.

Our discussion will break down as follows:

1. Data and Information

Data are the raw bits and pieces of information with no context. Data can be **quantitative** or **qualitative**. Quantitative data is numeric — the result of a measurement, count, or some other mathematical calculation. Qualitative data is descriptive. "Ruby Red," the color of a 2013 Ford Focus, is an example of qualitative data. By itself, data is not that useful. To be useful, data needs to be given context. For example, if I told you, "15, 23, 14, 85," you would not have learned anything, but I would have given you data. Conversely, if I told you that 15, 23, 14, and 85 are the numbers of students that had registered for upcoming classes, that would be *information*. By adding the context — that the numbers represent the count of students registering for specific classes — I have converted data into information.

> ### 🗎 TERMS TO KNOW
>
> **Quantitative Data**
> Numeric data that is the result of a measurement, count, or some other mathematical calculation.
>
> **Qualitative Data**
> Data that is descriptive.

2. What is a Database?

The goal of many information systems is to transform data into information in order to generate knowledge that can be used for decision-making. In order to do this, the system must be able to take data, put the data into context, and provide tools for search, data manipulation, modification, and deletion. A *database* is designed for just such a purpose. A **database** is an organized collection of related information. It is considered an *organized* collection, because in a database, all data is described and associated with other data. All information in a database should be *related* as well; separate databases should be created to manage

unrelated information. For example, a database that contains information about students should not also hold information about company stock prices. Everyday examples of databases include phone books, a list of songs on a hard disk with the song length, or a list of student names with their birthdates. Additionally, databases are also working behind websites and data-driven web applications, such as the number of student absences.

3. Elements of a Database

A database can be composed of many different elements and features. In essence, a database is one or more tables composed of records and fields that hold data.

- **Tables**: A **table** is a way to organize data using rows and columns. Ideally, a separate table will be used to hold data about each aspect of a particular subject. As an example, if you were going to design a database that holds information about a high school, you may want to have a table that holds information about course offerings, and in a separate table, provide information about who teaches a particular course offering and the time it is taught.
- **Records**: A **record** is a row in a database table, and it contains all of the data associated with that particular item. For example, a record in a table about student enrollments might be John Doe, plus all of the information collected about him, such as his phone number, email address, and student ID number. A row is also sometimes called a tuple.
- **Fields**: A **field** is a column in a database table, and it contains one unique piece of information related to the record. For example, if a record included information about John Doe's phone number, email address, and student ID number, then the labels of phone number, email address, and student ID number are all fields in the database, that collect those pieces of information for other students in the database. All fields hold the specified data type required by the information contained within the field; in a field entitled "salary" the data type is set to number. That way, salary will always be formatted as a number.

▶ **WATCH**

Check out the video below that describes elements of a database.
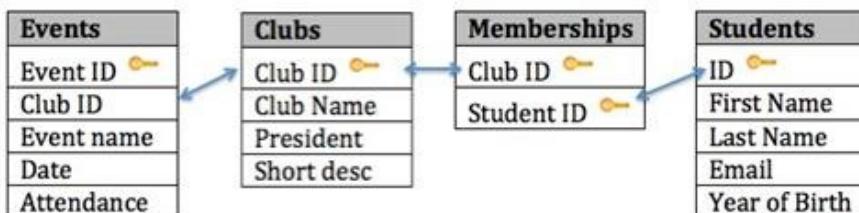
4. Database Types

Databases can be organized in many different ways, and can take many forms. A **flat file database** is a simple type of database that, at its core, contains a single table of information. A table is a set of data organized into rows and columns with the intersection of a row and column forming a cell. The flat file design places all information into one single table with no information sharing between multiple tables. Therefore, a flat file database does not give a user the ability to view, edit, or manipulate data in two separate tables simultaneously. Additionally, making edits in one table will not change the contents of another. This type of database is best used in situations in which users only need to store, edit, print, or display data. A flat file database can be created using a spreadsheet application. In fact, you can create this type of database using a simple text editor such as Notepad, using commas to separate the columns and paragraph breaks to separate the rows.

ID	First Name	Last Name	Email	Year of Birth
1	Peter	Lee	plee@university.edu	1992
2	Jonathan	Edwards	jedwards@university.edu	1994
3	Marilyn	Johnson	mjohnson@university.edu	1993
6	Joe	Kim	jkim@university.edu	1992
12	Haley	Martinez	hmartinez@university.edu	1993
14	John	Mfume	jmfume@university.edu	1991
15	David	Letty	dletty@university.edu	1995

Table: Students

Flat file database

The most popular form of database today is the relational database. In a **relational database**, all the tables are related by one or more fields, so that it is possible to connect all the tables in the database through the field(s) they have in common. Connected tables are advantageous, because the tables and the information contained within them can be searched, edited, manipulated, and stored while working from one file. Relational databases are also able to share information between devices and over networks such as the Internet. In fact, relational databases have come to play a major role on the Internet as they are utilized frequently by web developers to design data-driven websites. Popular examples of relational databases are Microsoft Access, MySQL, and Oracle.

Relational database

📄 TERMS TO KNOW

Flat File Database

Simple type of database that, at its core, contains a single table of information.

Relational Database

A database in which all the tables are related by one or more fields.

SUMMARY

A **database** provides a way to maintain and store data in a structured format, such as an address book or a list of hotels. Each person or item is a record; each type of information stored is a field. In this tutorial we explored what a **database** is, the **elements of a database**, and the **different types of databases**.

TERMS TO KNOW

Database

An organized collection of related information.

Field

A fundamental element of a record; contains one unique piece of information about the record.

Flat File Database

Simple type of database that, at its core, contains a single table of information.

Qualitative Data

Data that is descriptive.

Quantitative Data

Numeric data that is the result of a measurement, count, or some other mathematical calculation.

Record

An entry in a database that contains all the data about one instance of a particular person, company, or item.

Relational Database

A database in which all the tables are related by one or more fields.

Table

A collection of related data.

Designing a Database

by Sophia

Recall that a database is an organized collection of related information of which there are two types: flat file and relational. In a relational database, tables are connected, thereby simplifying the process of searching for and retrieving data. Because a relational database maintains a separate table for certain pieces of data, the possibility of errors or redundant information in the database is eliminated. In this tutorial, we will explore the mechanisms employed by relational databases in order to connect its tables, as well as the ways in which data is represented.

Our discussion will break down as follows:

1. Primary Key/Foreign Key

In a relational database, all the tables are related by one or more fields, so that it is possible to connect all the tables in the database through the field(s) they have in common. To connect tables in a relational database, one of the fields is identified as a primary key. A **primary key** is the unique identifier for each record in the table. A primary key must contain a unique value for each row of data. Additionally, a **foreign key** is a field in one table that links to the primary key in another table. To help you understand these terms further, let's walk through the process of designing a database.

> ↗ EXAMPLE Suppose a university wants to create an information system to track participation in student clubs. After interviewing several people, the design team learns that the goal of implementing the system is to give better insight into how the university funds clubs. This will be accomplished by tracking how many members each club has and how active the clubs are. From this, the team decides that the system must keep track of the clubs, their members, and their events. Using this information, the design team determines that the following tables need to be created:
> - **Clubs**: this will track the club name, club president, and a description of the club.
> - **Students**: student name, e-mail, and year of birth.
> - **Memberships**: this table will correlate students with clubs, allowing us to have any given student join multiple clubs.
> - **Events**: this table will track when the clubs meet and how many students showed up.
>
> Now that the design team has determined which tables to create, they need to define the specific information that each table will hold. This requires identifying the fields that will be in each table. For example, Club Name would be one of the fields in the Clubs table. First Name and Last Name would be fields in the Students table. Finally, since this will be a relational database, every table should have a field in common with at least one other table (in other words, they should have a relationship with each other). In order to properly create this relationship, a primary key must be selected for each table. This key is a unique identifier for each record in the table. For example, in the Students table, it might

be possible to use a student's last name as a way to uniquely identify him or her. However, it is more than likely that some students will share a last name (like Rodriguez, Smith, or Lee), so a different field should be selected. A student's e-mail address might be a good choice for a primary key, since e-mail addresses are unique. However, a primary key cannot change, so this would mean that if students changed their e-mail address we would have to remove them from the database and then re-insert them — not an attractive proposition. Our solution is to create a value for each student — a user ID — that will act as a primary key. We will also do this for each of the student clubs. This solution is quite common and is the reason you have so many user IDs!

⭐ **BIG IDEA**

A relational database's primary key can never be changed. It should, therefore, be a unique identifier for each record. A common primary key is a user ID, student ID number, or customer ID number, as these types of identifiers are unique and rarely change.

📄 **TERMS TO KNOW**

Primary Key

Unique identifier for each record in the table.

Foreign Key

A field in one table that links to the primary key in another table.

2. Data Types

When defining the fields in a database table, we must give each field a data type. A **data type** is a classification of the type of data that a field will hold. For example, the field Birth Year is a year, so it will be a number, while First Name will be text. Most modern databases allow for several different data types to be stored. There are two important reasons why we must properly define the data type of a field. First, a data type tells the database what functions can be performed with the data. For example, if we wish to perform mathematical functions with one of the fields, we must be sure to tell the database that the field is a number data type. So, if we have, say, a field storing birth year, we can subtract the number stored in that field from the current year to get age. The second important reason to define data type is so that the proper amount of storage space is allocated for our data. For example, if the First Name field is defined as a text (50) data type, this means 50 characters are allocated for each first name we want to store. However, even if the first name is only five characters long, 50 characters (bytes) will be allocated. While this may not seem like a big deal, if our table ends up holding 50,000 names, we are allocating 50 * 50,000 = 2,500,000 bytes for storage of these values. It may be prudent to reduce the size of the field so we do not waste storage space.

Some common data types and examples are listed here:

Data Type	Description	Example
Text	Used to store non-numeric data that is brief, generally under 256 characters. The database designer can identify the maximum length	"Hello world"

	of the text.	
Number	Used to store numbers. There are usually a few different number types that can be selected, depending on how large the largest number will be.	1 -4 7.3
Yes/No	A special form of the number data type that is (usually) one byte long, with a 0 for "No" or "False" and a 1 for "Yes" or "True."	0 for "No" or "False" 1 for "Yes" or "True"
Date/Time	A special form of the number data type that can be interpreted as a number or a time.	9-6-17 10:04 AM
Currency	A special form of the number data type that formats all values with a currency indicator and two decimal places.	$45.00 £38.82
Paragraph Text	Used to store text longer than 256 characters.	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur.
Object	Used to store data that cannot be entered via keyboard, such as an image or a music file.	Music file Image file

⊟ **TERM TO KNOW**

Data Type

A classification of the type of data that a field will hold.

📋 **SUMMARY**

In this tutorial we took a closer look at the **relational database**, and how utilizing a primary key can connect **information** held in one table to the information held in another table. We also explored **data types**, and the importance of specifying the type of data a field will hold, as this will communicate to the **database** what **type** of operations can be performed on the data.

Source: Derived from Chapter 4 of "Information Systems for Business and Beyond" by David T. Bourgeois. Some sections removed for brevity.

🗎 TERMS TO KNOW

Data Type
A classification of the type of data that a field will hold.

Foreign Key
Field or group of fields in one table that uniquely identifies a row of another table or the same table.

Primary Key
Unique identifier for each record in the table.

Managing Data in a Database

by Sophia

☰	WHAT'S COVERED

In business, an information system's ability to effectively manage data plays a significant role in that organization's ability to manage operations, generate revenue, contain costs, and control risks. Businesses that seek to gain a competitive advantage must be able to effectively and efficiently store and retrieve the data they collect. In this tutorial, we will discuss data management and how to retrieve stored data.

Our discussion will break down as follows:

1. Data Management

As businesses and organizations have sought to grow and improve products and services, the realization that company data should factor into decision-making has encouraged business leaders to look for data internally and externally. As more data is amassed, the need for systems to effectively manage data is integral. The most important aspect of data management is having access to the data, or being able to retrieve it. Leaders of businesses understand the importance of having access to reliable information at all times, for the purpose of maintaining a competitive advantage. Businesses and organizations must be able to systematically maintain and manage company-related data that can be accessed, retrieved, referenced, and analyzed at any time, so they can make decisions that will ultimately push the business or organization forward.

To the computer, a database looks like one or more files. In order for the data in the database to be read, changed, added, or removed, a software program must access it. Many software applications have this ability: iTunes can read its database to give you a listing of its songs (and play the songs), and your mobile-phone software can interact with your list of contacts. But what about applications to create or manage a database? What software can you use to create a database, change a database's structure, or simply do analysis? That is the purpose of a category of software applications called database management systems (DBMS).

DBMS packages generally provide an interface to view and change the design of the database, create queries, and develop reports. Most of these packages are designed to work with a specific type of database, but generally they are compatible with a wide range of databases. For example, Apache OpenOffice.org Base can be used to create, modify, and analyze databases in open-database (ODB) format. Microsoft's Access is used to work with databases in its own Microsoft Access Database format. Both Access and Base have the ability to read and write to other database formats as well.

Microsoft Access and Open Office Base are examples of personal database-management systems. These systems are primarily used to develop and analyze single-user databases. These databases are not meant to be shared across a network or the Internet, but are instead installed on a particular device. They work with a single user at a time.

A database that can only be used by a single user at a time is not going to meet the needs of most

organizations. As computers have become networked and are now joined worldwide via the Internet, a class of database has emerged that can be accessed by two, 10, or even a million people. These databases are sometimes installed on a single computer, to be accessed by a group of people at a single location. Other times, they are installed over several servers worldwide, meant to be accessed by millions. These relational enterprise database packages are built and supported by companies such as Oracle, Microsoft, and IBM. The open-source MySQL is also an enterprise database.

As stated earlier, the relational database model does not scale well. The term scale here refers to a database getting larger and larger, being distributed on a larger number of computers connected via a network. Some companies are looking to provide large-scale database solutions by moving away from the relational model to other, more flexible models. For example, Google now offers the App Engine Datastore, which is based on NoSQL. Developers can use the App Engine Datastore to develop applications that access data from anywhere in the world. Amazon.com offers several database services for enterprise use, including Amazon RDS, which is a relational database service, and Amazon DynamoDB, a NoSQL enterprise solution.

2. Making Queries

In general terms, a query is a question, or an inquiry. In a database, a query is a subset of the data that answers a particular question. To show how a query works, and what data is retrieved in response to a query, let's use information from the following database that shows student club membership information.

The following tables in a database are used by the student association of a university which tracks information about club memberships. Queries are made to create a subset of the data if the student association wants to send targeted emails to certain students regarding club events.

Table: Students

Student_ID	Student_Name	Email	On Campus	Major
001	Lee, Peter	p.lee@uni.edu	No	Biology
004	Edwards, Jonathan	j.edwards@uni.edu	Yes	English Literature
007	Johnson, Marilyn	m.johnson@uni.edu	Yes	IT
011	Kim, Joe	j.kim@uni.edu	No	Biology
015	Martinez, Haley	h.martinez@uni.edu	Yes	IT
022	Mfume, John	j.mfume@uni.edu	No	Biology
028	Letty, David	d.letty@uni.edu	Yes	IT
031	Valeriev, Roger	r.valeriev@uni.edu	Yes	Biology
034	Sayer, Harish	h.sayer@uni.edu	Yes	English Literature

Table: Student Clubs

Club_ID	Club_Name	Location	Faculty Lead
01	Pre-Med Society	McCormick Hall	Dr. Arntzen
02	Speech & Debate	Norup Hall	Dr. Hendrix

03	Engineering Club	Rice Hall	Dr. Moray
04	Residential Life	Thorton Hall	Dr. Yamasaki
05	Student Health Association	De With Hall	Dr. Dahlmans
06	Math Club	Smith Hall	Dr. Donne

Table: Memberships

Club_ID	Student_ID
01	001
01	022
01	031
02	034
03	007
04	028

The Pre-Med Society is hosting a meeting about special summer internship opportunities for pre-med students. They placed posters around on-campus housing units, but they want to make sure those who live off campus know about this meeting, too.

To make a query, you must first define your criteria. Here, we are interested in all students who: (a) live off campus, and (b) are in the Pre-Med Society. The query applies this criteria to the tables within the database, and displays the subset of all data that meets this criteria:

Student_ID	Student_Name	Email	On Campus	Major
001	Lee, Peter	p.lee@uni.edu	No	Biology
022	Mfume, John	j.mfume@uni.edu	No	Biology

There are two records that meet all of the criteria of the query. Peter Lee and John Mfume are members of the Pre-Med Society and live off campus. The student association can use this list of students who match their criteria to know who to contact about the student club meeting.

> **SUMMARY**
>
> The ability to effectively **manage data** has a huge impact on the overall effectiveness of a business or organization, as decisions are made based on the data available to business leaders. The most important aspect of data management is having access to or being able to retrieve data. **Queries** allow organizations to retrieve specific subsets of data by applying criteria to all of the records in the database tables. Applying effective queries helps organizations to answer specific questions about the information in their database, and to analyze specific records.

Source: Derived from Chapter 4 of "Information Systems for Business and Beyond" by David T. Bourgeois. Some sections removed for brevity.

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Data Warehousing

by Sophia

As organizations have begun to utilize databases as the centerpiece of their operations, the need to fully understand and leverage the data they are collecting has become more and more apparent. However, directly analyzing the data that is needed for day-to-day operations is not a good idea. We do not want to tax the operations of the company more than we need to. Further, organizations also want to analyze data in a historical sense: how does the data we have today compare with the same set of data this time last month, or last year? From these needs arose the concept of the data warehouse. In this tutorial, we will take a closer look at the concept of a data warehouse, and how it informs the decisions made in business environments.

Our discussion will break down as follows:

1. Business Intelligence

A new buzzword that has been capturing the attention of businesses lately is**big data**. Big data refers to such massively large data sets that conventional database tools do not have the processing power to analyze them, as big data sets tend to take up large amounts of storage within the petabyte and exabyte realm. When data reaches these sizes, it becomes much more difficult to analyze and find patterns, as the data continues to evolve. For example, Walmart must process over one million customer transactions every hour.

	DID YOU KNOW

One petabyte (abbreviated PB) is equivalent to 1,000,000,000,000,000 (10^15) bytes, or one million gigabytes. One exabyte (abbreviated EB) is equivalent to 1,000,000,000,000,000,000 (10^18) bytes, or one billion gigabytes.

Storing and analyzing that much data is beyond the power of traditional database-management tools. Understanding the best tools and techniques to manage and analyze these large data sets is a problem that governments and businesses alike are trying to solve. **Business intelligence** is used to describe the process that organizations use to take data they are collecting and analyze it. The primary motivation behind businesses seeking to acquire this information lay in the hopes of obtaining a competitive advantage. Besides using data from their internal databases, firms often purchase information from data brokers to get a big-picture understanding of their industries. **Business analytics** is the term used to describe the use of internal company data to improve business processes and practices. **Data mining** is the process of analyzing data to find previously unknown trends, patterns, and associations in order to make decisions. Generally, data mining is accomplished through automated means against extremely large data sets, such as a data warehouse, discussed below.

	TERMS TO KNOW

Big Data

Process of handling and analyzing evolving data.

Business Intelligence

Used to describe the process that organizations use to take data they are collecting and analyze it.

business analytics

Used to describe the use of internal company data to improve business processes and practices.

Data Mining

Process of analyzing data to find trends, patterns, and associations in order to make decisions.
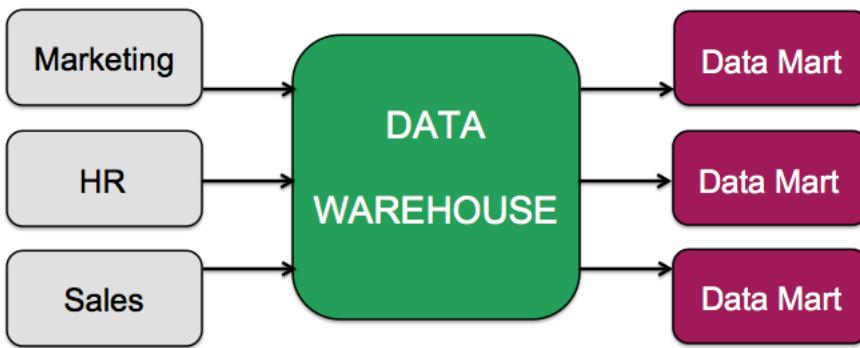
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2. The Data Warehouse

A **data warehouse** is a database used by large businesses and organizations for the purposes of collecting and analyzing data related to the business to improve the quality of the business. The concept of the data warehouse is simple: extract data from one or more of the organization's databases, and load it into the data warehouse for storage and analysis. The goal is to enhance the understanding of the organization's performance in hopes of obtaining a competitive advantage.
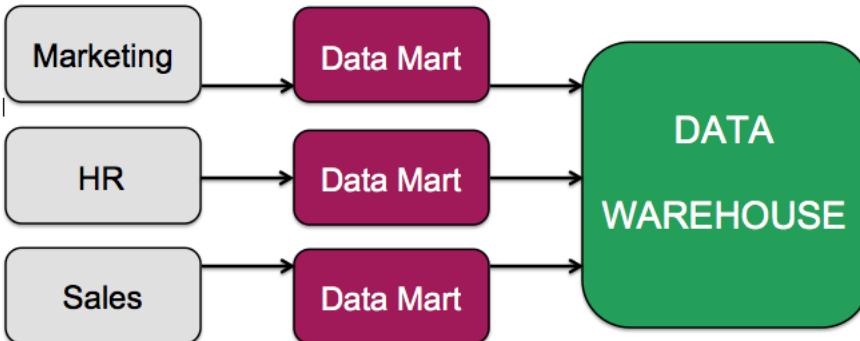
While the concept of the data warehouse is simple, implementation of this concept is not that simple. A data warehouse should be designed so that it meets the following criteria:

- **It uses non-operational data.** This means that the data warehouse is using a copy of data from the active databases that the company uses in its day-to-day operations, so the data warehouse must pull data from the existing databases on a regular, scheduled basis.
- **The data is time-variant.** This means that whenever data is loaded into the data warehouse, it receives a timestamp, which allows for comparisons between different time periods.
- **The data is standardized.** Because the data in a data warehouse usually comes from several different sources, it is possible that the data does not use the same definitions or units. For example, one database might list dates using the mm/dd/yyyy format (e.g., 01/10/2013), while a table in another database might format dates using yy/mm/dd (e.g., 13/01/10). In order for the data warehouse to match up dates, a standard date format would have to be agreed upon and all data loaded into the data warehouse would have to be converted to use this standard format. This process is called extraction-transformation-load (ETL).

There are two primary schools of thought when designing a data warehouse: the top-down approach, and the bottom-up approach. The top-down approach starts by creating enterprise-wide data (data from all departments of an organization, such as marketing, HR, and sales) to form the centralized data warehouse. Then, as specific business needs are identified, this approach creates smaller data warehouses, called **data marts**. The bottom-up approach starts by creating these smaller data marts to solve specific business problems. As these data marts are created, they can be combined into a larger data warehouse.

Top-Down Design

Bottom-Up Design

Each approach has its pros and cons. The top-down approach can be more time-consuming to initially develop, whereas the bottom-down approach takes less time to build and has a shorter initial set-up time. Consequently, the top-down approach has a higher cost at the beginning, but has a lower ongoing development cost, whereas the bottom-up approach has a low initial cost, but doesn't have the benefit of an even lower cost for ongoing development. Aside from time and cost, the benefit from the top-down approach is enterprise-wide data, and the benefit from the bottom-up approach is that the organization starts with specific individual business areas.

📄 **TERM TO KNOW**

Data Warehouse

A database used by large businesses and organizations for the purposes of collecting and analyzing data related to the business.

Data Mart

A small data warehouse used to solve specific business problems.

3. Benefits of Data Warehousing

To achieve the goal of enhanced business intelligence, and to obtain a competitive advantage, businesses employ the data warehouse. However, businesses and organizations find data warehousing quite beneficial for a number of other reasons. Below is a list of benefits that data warehousing brings to business:

- The process of developing a data warehouse forces an organization to better understand the data that it is currently collecting and, equally important, what data is not being collected.
- A data warehouse provides a centralized view of all data being collected across the enterprise, and provides a means for determining data that is inconsistent.
- Once all data is identified as consistent, an organization can generate one version of truth. This is important when the company wants to report consistent statistics about itself, such as revenue or number of employees.
- By having a data warehouse, snapshots of data can be taken over time. This creates a historical record of data, which allows for an analysis of trends.
- A data warehouse provides tools to combine data, which can provide new information and analysis.

☑ SUMMARY

In this tutorial, you got a chance to see how data plays a major role in the information systems that businesses use to make decisions about the business. A data warehouse is a special form of database that takes data from other databases in an enterprise, and organizes it for analysis. Data mining is the process of looking for patterns and relationships in large data sets. Many businesses use databases, **data warehouses**, and **data-mining** techniques in order to produce **business intelligence** and gain a competitive advantage.

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📄 TERMS TO KNOW

Big Data
Process of handling and analyzing evolving data.

Business Analytics
Used to describe the use of internal company data to improve business processes and practices.

Business Intelligence
Used to describe the process that organizations use to take data they are collecting and analyze it.

Data Mart
A small data warehouse used to solve specific business problems.

Data Mining
Process of analyzing data to find trends, patterns, and associations in order to make decisions.

Data Warehouse
A database used by large businesses and organizations for the purposes of collecting and analyzing data related to the business.

Trends and Challenges with Data Warehousing

by Sophia

Although businesses understand the role that data driven decision-making plays in their overall effectiveness, many fail to either fully utilize the data they collect, or they make the wrong inferences from the data collected. Business intelligence and analytics can provide businesses and organizations with the information that managers can use to improve the business and increase revenue, thus making the data warehouse an essential piece of any business intelligence strategy. However, while the concept of a data warehouse is simple, it can be very challenging to implement. In this tutorial, we will discuss the challenges and trends associated with data warehousing.

Our discussion will break down as follows:

1. Data Warehouse Challenges

A data warehouse is an extremely large database. For this reason, designing and implementing one is an immense undertaking. The process of design and implementation involves a great deal of planning, collaboration, and coordination of people, resources, and time. As with any large-scale project, there are challenges associated with building a data warehouse. However, if each challenge is addressed properly, the benefits of data warehousing are immediate and lasting for businesses and organizations. The challenges associated with data warehousing are as follows:

- **Data Quality**: In a data warehouse, data is coming from multiple sources within an organization. Data warehouses that include inconsistent data will encounters errors. Inconsistent data, duplicates, and missing data all result in data quality challenges. These quality challenges can result in faulty reporting and analytics necessary for optimal decision-making.

- **Understanding Data**: When building a data warehouse, analytics and reporting will have to be taken into design considerations. In order to do this, the business user will need to know exactly what analysis will be performed. Envisioning these reports will be difficult for someone who has no experience in business-intelligence data analysis, and who is unaware of its capabilities.

- **Testing**: Data must be 100 percent accurate or a business leader could make improper decisions that are detrimental to the future success of their business. This high reliance on data quality makes testing the data warehouse a high priority issue that will require a lot of resources to ensure the information provided is accurate.

- **Performance**: A data warehouse must be carefully designed to meet overall performance requirements. While the final product can be customized to fit the performance needs of the organization, the initial overall design must be carefully thought out to provide a stable foundation from which to start.

- **Design of the Data Warehouse**: Usually, business leaders understand what they need and want out of a data warehouse. However, if they don't fully understand all the implications of these needs and wants,

they will have a difficult time adequately defining them. Often this results in miscommunication between the business users and the technicians building the data warehouse. The typical end result is a data warehouse which does not deliver the results expected by the user. Since the data warehouse is inadequate for the end user, there is a need for fixes and improvements immediately after initial delivery. The unfortunate outcome is greatly-increased development costs.

- **Cost**: There are a multitude of hidden problems in building data warehouses. A frequent misconception among business leaders is that they can build a data warehouse internally to save money. Even if a business or organization adds a data warehouse "expert" to their staff, the depth and breadth of skills needed to deliver an effective result is simply not feasible with one or a few experienced professionals leading a team of non-business intelligence trained technicians.

- **Privacy Concerns**: The increasing power of data mining has caused concerns for many, especially in the area of privacy. In today's digital world, it is becoming easier than ever to take data from disparate sources and combine them to do new forms of analysis. In fact, a whole industry has sprung up around this technology: data brokers. These firms combine publicly-accessible data with information obtained from the government and other sources to create vast warehouses of data about people and companies that they can then sell.

2. Data Warehousing Trends

Data warehousing is no longer an abstract idea; it is a reality. A significant number of businesses and organizations across the globe have made the commitment to building and maintaining data warehouses. Data warehousing has made an enormous impact on the way people perform business analysis and make strategic decisions. Companies that incorporate data warehouses realize benefits that positively affect their bottom line. As data warehousing will only increase due to more and more companies realizing its effectiveness, the major trend seems to be pointing toward the web-enabled data warehouse. A web-enabled data warehouse will involve the real time of capturing the screenshots and clickstream (mouse clicks) of visitors to a business or organization's website, in addition to performing all of the traditional data warehousing tasks. Adding this layer of functionality to the traditional data warehouse will enable businesses and organizations to analyze: web traffic, effectiveness of marketing campaigns, customer satisfaction, demographic data collection, user preferences, affiliate product relationships, customer buying patterns, and website feedback.

☑	SUMMARY

Seeking to gain a competitive advantage, businesses and organizations have embraced the idea of data warehousing as a central part of their **business intelligence** strategy. In this tutorial, we took a deeper look into the **data warehouse** to assess the challenges associated with **building a data warehouse**, as well as the trends that are informing the future of data collection amongst businesses and organizations.

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Terms to Know

Application Software

Provides user with the ability to accomplish a goal or purpose.

Big Data

Process of handling and analyzing evolving data.

Boot Process

Process for powering on a computer and loading the operating system.

Business Analytics

Used to describe the use of internal company data to improve business processes and practices.

Business Intelligence

Used to describe the process that organizations use to take data they are collecting and analyze it.

Data Mart

A small data warehouse used to solve specific business problems.

Data Mining

Process of analyzing data to find trends, patterns, and associations in order to make decisions.

Data Type

A classification of the type of data that a field will hold.

Data Warehouse

A database used by large businesses and organizations for the purposes of collecting and analyzing data related to the business.

Database

An organized collection of related information.

Field

A fundamental element of a record; contains one unique piece of information about the record.

File Type

The ending of a file that gives the operating system the ability to identify it; provides the structure of a document and tells a software application how to display it; commonly referred to as file format.

Flat File Database

Simple type of database that, at its core, contains a single table of information.

Foreign File Type

File type that is not directly used by an application during the creation or editing of a document.

Foreign Key

Field or group of fields in one table that uniquely identifies a row of another table or the same table.

Graphical User Interface (GUI)

Contains graphics and icons and is navigated with a mouse.

Help System

Collection of stored files on your hard disk as well as information retrieved from the Internet.

Logging On

Opens the user account and makes the computer ready to be used.

Multitask

Ability to allow multiple software processes to run at the same time.

Multiuser

Operating system's ability to allow more than one user to use the same computer at the same time and at different times.

Native File Type

File type that an application directly uses during the creation and editing of a document.

Operating System

Software that performs the task required to keep the system running and provides the main interface for the user.

Primary Key

Unique identifier for each record in the table.

Productivity Software

Software that allows people to complete daily work; typically utilized in business or organizational settings.

Programming Software

Software whose purpose is to make more software.

Qualitative Data

Data that is descriptive.

Quantitative Data

Numeric data that is the result of a measurement, count, or some other mathematical calculation.

Record

An entry in a database that contains all the data about one instance of a particular person, company, or item.

Relational Database

A database in which all the tables are related by one or more fields.

Safe Mode

Special mode in which only the necessary drivers and software load.

Software Category

Refers to classification of software based on function such as word processing, spreadsheet, and presentation.

Software Domain

Refers to the environment or situation in which a particular piece of software is designed to be operational.

System Restore

Provides users with a way to go back to previous system settings.

Table

A collection of related data.

Task Manager

Operating system component that enables the user to view running task and processes.

User Interface

Operating interface that allows a user to interact with the files and software on a computer.

Utility Software

Software that allows you to fix or modify your computer in some way.

Welcome Screen

Presents a list of the names of all user accounts on the computer.