Information Literacy

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INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

- Define Information Literacy.
- Define the four domains that fall under Metaliterate Learners.
- Identify a lack of knowledge in a subject area.
- Identify a search topic/question and define it using simple terminology.
- Articulate current knowledge on a topic.
- Recognize a need for information and data to achieve a specific end and define limits to the information need.
- Manage time effectively to complete a search.

Definition

To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information.

IDENTIFY: UNDERSTANDING YOUR INFORMATION NEED

In this chapter, you will learn about the first pillar of information literacy. While the pillars are normally presented in a certain order, it is important to remember that they are not intended to be a step-by-step guide to be followed in a strict order. In most research projects, you will find that you move back and forth between the different pillars as you discover more information and come up with more questions about your topic. In this chapter you will learn how to identify your information need so that you can begin your research, but it is likely that you will also revisit some of the ideas in this chapter to make sure you are actually meeting that need with your research findings.

A person proficient in the Identify pillar is expected to be able to identify a personal need for information. They understand

- That new information and data is constantly being produced and that there is always more to learn.
• That being information literate involves developing a learning habit so new information is being actively sought all the time
• That ideas and opportunities are created by investigating/seeking information
• The scale of the world of published and unpublished information and data

They are able to

• Identify a lack of knowledge in a subject area
• Identify a search topic/question and define it using simple terminology
• Articulate current knowledge on a topic
• Recognize a need for information and data to achieve a specific end and define limits to the information need
• Use background information to underpin the search
• Take personal responsibility for an information search
• Manage time effectively to complete a search

Proficiencies in the Identify pillar
Scenario

Norm Allknow was having trouble. He had been using computers since he was five years old and thought he knew all there was to know about them. So, when he was given an assignment to write about the impact of the Internet on society, he thought it would be a breeze. He would just write what he knew, and in no time the paper would be finished. In fact, Norm thought the paper would probably be much longer than the required ten pages. He spent a few minutes imagining how impressed his teacher was going to be, and then sat down to start writing.

He wrote about how the Internet had helped him to play online games with his friends, and to keep in touch with distant relatives, and even to do some homework once in a while. Soon he leaned back in his chair and looked over what he had written. It was just half a page long and he was out of ideas.

Identifying a Personal Need for Information

One of the first things you need to do when beginning any information-based project is to identify your personal need for information. This may seem obvious, but it is something many of us take for granted. We may mistakenly assume, as Norm did in the above example, that we already know enough to proceed. Such an assumption can lead us to waste valuable time working with incomplete or outdated information. Information literacy addresses a number of abilities and concepts that can help us to determine exactly what our information needs are in various circumstances. These are discussed below, and are followed by exercises to help develop your fluency in this area.

Understanding the Context of an Information Need

When you realize that you have an information need it may be because you thought you knew more than you actually do, or it may be that there is simply new information you were not aware of. One of the most important things you can do when starting to research a topic is to scan the existing information landscape to find out what is already out there. We’ll get into more specific strategies for accessing different types of information later in the book, particularly in the Gather chapter, but for now it pays to think more broadly about the information environment in which you are operating.

For instance, any topic you need information about is constantly evolving as new information is added to what is known about the topic. Trained experts, informed amateurs, and opinionated laypeople are publishing in traditional and emerging formats; there is always something new to find out. The scale of information available varies according to topic, but in general it’s safe to say that there is more information accessible now than ever before.

Due to the extensive amount of information available, part of becoming more information literate is developing habits of mind and of practice that enable you to continually seek new information and to adapt your understanding of topics according to what you find. Because of the widely varying quality of new information, evaluation is also a key element of information literacy, and will be addressed in the Evaluate chapter of this book.

Finally, while you are busy searching for information on your current topic, be sure to keep your mind open for new avenues or angles of research that you haven’t yet considered. Often the information you found for your initial need will turn out to be the pathway to a rich vein of information that can serve as raw material for many subsequent projects.

When you understand the information environment where your information need is situated, you can begin to define the topic more clearly and you can begin to understand where your research fits in with related work that precedes it. Your information literacy skills will develop against this changing background as you use the same underlying principles to do research on a variety of topics.

From Information Need to Research Question

Norm was abruptly confronted by his lack of knowledge when he realized that he had nothing left to say on his topic after writing half a page. Now that he is aware of that shortcoming, he can take steps to rectify it.
Your own lack of knowledge may become apparent in other ways. When reading an article or textbook, you may notice that something the author refers to is completely new to you. You might realize while out walking that you can’t identify any of the trees around your house. You may be assigned a topic you have never heard of.

Exercise: Identifying What You Don’t Know

Wherever you are, look around you. Find one thing in your immediate field of view that you can’t explain.
What is it that you don’t understand about that thing?
What is it that you need to find out so that you can understand it?
How can you express what you need to find out?
For example: You can’t explain why your coat repels water. You know that it’s plastic, and that it’s designed to repel water, but can’t explain why this happens. You need to find out what kind of plastic the coat is made of and the chemistry or physics of that plastic and of water that makes the water run off instead of soaking through. (The terminology in your first explanation would get more specific once you did some research.)

All of us lack knowledge in countless areas, but this isn’t a bad thing. Once we step back and acknowledge that we don’t know something, it opens up the possibility that we can find out all sorts of interesting things, and that’s when the searching begins.

Taking your lack of knowledge and turning it into a search topic or research question starts with being able to state what your lack of knowledge is. Part of this is to state what you already know. It’s rare that you’ll start a search from absolute zero. Most of the time you’ve at least heard something about the topic, even if it is just a brief reference in a lecture or reading. Taking stock of what you already know can help you to identify any erroneous assumptions you might be making based on incomplete or biased information. If you think you know something, make sure you find at least a couple of reliable sources to confirm that knowledge before taking it for granted. Use the following exercise to see if there is anything that needs to be supported with background research before proceeding.

Exercise: Taking Stock of What you Already Know

As discussed above, part of identifying your own information need is giving yourself credit for what you already know about your topic. Construct a chart using the following format to list whatever you already know about the topic.
Name your topic at the top.
In the first column, list what you know about your topic.
In the second column, briefly explain how you know this (heard it from the professor, read it in the textbook, saw it on a blog, etc.).
In the last column, rate your confidence in that knowledge. Are you 100% sure of this bit of knowledge, or did you just hear it somewhere and assume it was right?
When you’ve looked at everything you think you know about the topic and why, step back and look at the chart as a whole. How much do you know about the topic, and how confident are you about it? You may be surprised at how little or how much you already know, but either way you will be aware of your own background on the topic. This self-awareness is key to becoming more information literate.
This exercise gives you a simple way to gauge your starting point, and may help you identify specific gaps in your knowledge of your topic that you will need to fill as you proceed with your research. It can also be useful to revisit the chart as you work on your project to see how far you’ve progressed, as well as to double check that you haven’t forgotten an area of weakness.
Once you’ve clearly stated what you do know, it should be easier to state what you don’t know. Keep in mind that you are not attempting to state *everything* you don’t know. You are only stating what you don’t know in terms of your current information need. This is where you define the limits of what you are searching for. These limits enable you to meet both size requirements and time deadlines for a project. If you state them clearly, they can help to keep you on track as you proceed with your research. You can learn more about this in the Scope chapter of this book.

One useful way to keep your research on track is with a “KWHL” chart. This type of chart enables you to state both what you know and what you want to know, as well as providing space where you can track your planning, searching and evaluation progress. For now, just fill out the first column, but start thinking about the gaps in your knowledge and how they might inform your research questions. You will learn more about developing these questions and the research activities that follow from them as you work through this book.

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<th>What do you know?</th>
<th>How do you know it?</th>
<th>How confident are you in this knowledge?</th>
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Defining a research question can be more difficult than it seems. Your initial questions may be too broad or too narrow. You may not be familiar with specialized terminology used in the field you are researching. You may not know if your question is worth investigating at all.
These problems can often be solved by a preliminary investigation of existing published information on the topic. As previously discussed, gaining a general understanding of the information environment helps you to situate your information need in the relevant context and can also make you aware of possible alternative directions for your research. On a more practical note, however, reading through some of the existing information can also provide you with commonly used terminology, which you can then use to state your own research question, as well as in searches for additional information. Don’t try to reinvent the wheel, but rely on the experts who have laid the groundwork for you to build upon.

Once you have identified your own lack of knowledge, investigated the existing information on the topic, and set some limits on your research based on your current information need, write out your research question or state your thesis. The next exercise will help you transform the question you have into an actual thesis statement. You’ll find that it’s not uncommon to revise your question or thesis statement several times in the course of a research project. As you become more and more knowledgeable about the topic, you will be able to state your ideas more clearly and precisely, until they almost perfectly reflect the information you have found.

### Exercise: Research Question/Thesis Statement/Search Terms

Since this chapter is all about determining and expressing your information need, let’s follow up on thinking about that with a practical exercise. Follow these steps to get a better grasp of exactly what you are trying to find out, and to identify some initial search terms to get you started.

1. Whatever project you are currently working on, there should be some question you are trying to answer. Write your current version of that question here.
2. Now write your proposed answer to your question. This may be the first draft of your thesis statement which you will attempt to support with your research, or in some cases, the first draft of a hypothesis that you will go on to test experimentally. It doesn’t have to be perfect at this point, but based on your current understanding of your topic and what you expect or hope to find is the answer to the question you asked.
3. Look at your question and your thesis/hypothesis, and make a list of the terms common to both lists (excluding “the,” “and,” “a,” etc.). These common terms are likely the important concepts that you will need to research to support your thesis/hypothesis. They may be the most useful search terms overall or they may only be a starting point.

If none of the terms from your question and thesis/hypothesis lists overlap at all, you might want to take a closer look and see if your thesis/hypothesis really answers your research question. If not, you may have arrived at your first opportunity for revision. Does your question really ask what you’re trying to find out? Does your proposed answer really answer that question? You may find that you need to change one or both, or to add something to one or both to really get at what you’re interested in. This is part of the process, and you will likely discover that as you gather more information about your topic, you will find other ways that you want to change your question or thesis to align with the facts, even if they are different from what you hoped.

### A Wider View

While the identification of an information need is presented in this chapter as the first step in the research process, many times the information need you initially identified will change as you discover new information and connections. Other chapters in this book deal with finding, evaluating, and managing information in a variety of ways and formats. As you become more skilled in using different information resources, you will likely find that the line between the various information literacy skills becomes increasingly blurred, and that you will revisit your initial ideas about your topic in response to both the information you’re finding and what you’re doing with what that information.

Continually think about your relationship to the information you find. Why are you doing things the way you are? Is it really the best way for your current situation? What other options are there? Keeping an open mind about your use of information will help you to ensure that you take responsibility for the results of that use, and will help you to be more successful in any information-intensive endeavor.
INTRO TO THE INFORMATION LITERACY USER’S GUIDE

You may be using this book for any one of a variety of reasons. It may have been assigned by a professor, in whole or in part. You may be using it to enhance your research techniques for your classes. Or you may see the importance of being savvy about information use and production, and have decided to learn more on your own. After all, our world is defined by our easy access to information. In fact, as is often said, we are drowning in information. Some is valuable. Some is worthless. And some is just fun, in its proper context. As you know, information comes in many different formats and sometimes, depending on the content, information in one format can be in any of these categories. For example, a tweet could be valuable (maybe an expert on a topic has just announced something groundbreaking), worthless (“Going shopping. Looking for socks that don’t fall down.”), or fun (I’ll let you decide what that message might be). So it seems that information content, context, and quality matter more than what kind of package or format the information takes. You will have a chance to read more about this later in the book. And accessing information is just one component; there is also your role as an information producer. We’ll get to that, too. You will learn a number of ways to enhance your abilities to work with the information that surrounds you.

So let’s start at the beginning. This book is entitled The Information Literacy User’s Guide. If you are information literate, you are adept at working with information. But a user’s guide can still be of assistance, since there are so many components to information. You, the authors, and just about everyone is better versed in working with some aspects of information than with others. While you will find elements in this book that you are totally up to speed on, there will be others that you have less familiarity with. Hence, the value of a user’s guide.

While this textbook refers to information literacy throughout, there are a variety of different models and subsets of information literacy: visual literacy, science literacy, digital literacy, information fluency, media literacy, and many more. Let’s highlight just one: metaliteracy. The originators of this model think of it as information literacy for today’s open, networked, collaborative information environment. It also places an emphasis on metacognition, or thinking about your own thinking. Being able to find and use information well means realizing what you know, what you don’t, and what you need to learn, and thinking about these categories throughout the process. It means being aware of how one is interacting with information, and not just reverting to long-standing habits only because they are familiar. There is a list of learning objectives for metaliterate learners at the end of this chapter, but we continue to identify occasional small changes to the objectives. The most current version can be found at http://metaliteracy.org.

You might think of the learning objectives as one of those headlines you see on magazine covers while waiting in a grocery store checkout lane:

- 6 Symptoms You Shouldn’t Ignore (from AARP, January/February 2013)
- 50 People Who Make Your Life Better (from AARP, January/February 2013)
- Get 30% Richer This Year: Very Smart Money Tips (from Marie Claire, February 2013)
- 4 Panza-Blasting Moves for a Tighter Bod (from Cosmopolitan, Spring 2013)

Maybe there should be some catchy, motivational title for these learning objectives. (If you have a good idea, send it to one of the authors.) But, in seriousness, being aware of your own thought processes and working towards becoming more proficient in the areas included in the metaliteracy learning objectives will help you in your academic endeavors and in your everyday life. When you finish reading this introduction, take a look at the list. Are there items that you do well? Are there others that you just need to remember to follow through on? Possibly some will be less familiar to you. Recognize that they are empowering behaviors and attributes that will advance your abilities in school, the workplace, and in daily life. Knowing this may well provide the motivation to follow through with the readings and exercises in the upcoming chapters.
This book is arranged using a model called the SCONUL Seven Pillars of Information Literacy. The model was developed in the United Kingdom, and revised in 2011, to reflect today's information world. As you would expect, its visual representation shows pillars, each one labeled with a one-word access point to a larger concept. The pillars, with short explanatory descriptions, are

- **Identify** (understanding your information need)
- **Scope** (knowing what is available)
- **Plan** (developing research strategies)
- **Gather** (finding what you need)
- **Evaluate** (assessing your research process and findings)
- **Manage** (organizing information effectively and ethically)
- **Present** (sharing what you've learned)

The authors of this book have added two additional chapters to engage you in important areas not specifically represented by the pillars:

- **Visual Literacy** (applying information literacy to visual materials)
- **Science Literacy** (information literacy in the sciences)

The developers of the Seven Pillars model explain that an individual can be more expert in some areas than others, and has the ability to increase their expertise. But interestingly, they also mention that people can become less expert in the areas designated by the pillars. How might that be? If you learned something, and then learned more, you become more adept, right? They make the point, however, that because the information environment shifts all the time, it is possible people won't keep up, and thus become less proficient. So just as someone can climb one of the pillars, so too can he or she slip down.

Each of the seven areas incorporates both abilities and understandings. The abilities include what an individual can do. The understandings cover both attitude and behaviors. For example, someone might be aware that they should carefully evaluate the information they find and know how to go about it, yet not care enough to actually do it. Abilities and understandings work together to enable information literacy. Near the beginning of each chapter, you will find pertinent abilities and understandings lists taken from the Seven Pillars model.

As mentioned earlier, you are likely skilled at some of the elements the book will be discussing, less so at others. In other words, you will have ascended some of the pillars more than others. This is true of the authors themselves. We teach information literacy and call ourselves experts. But we can still learn from our colleagues’ chapters on various facets of the nine areas covered in this book. We hope you will also find this to be the case.

This introductory chapter is intended to be short, and will end with an important recommendation: As you learn from this textbook, remember to reflect on your new knowledge, skills, and attitudes. What are you doing differently? Did you find particular new approaches to locating or sharing information that work better? Why? Are you evaluating information more consistently? Differently? Do you feel more comfortable as an information producer? If you continue to ask yourself questions like these, and follow through based on your responses, your proficiency with information will last far beyond your memory of reading this textbook.

**Note**

If you encounter terms in this book whose meanings are not clear to you, start your investigation by looking at these two sites. The first provides definitions, while the second is a multilingual glossary that provides corresponding terms in six languages:

**Definitions**

- “Information Literacy Defined,” from ALA
- Glossary of terms, with English, Chinese, Korean, Japanese, French, Spanish, and Arabic.
DEFINITIONS

Read the section called “Information Literacy Defined.”

5 Components of Information Literacy

Watch this video online: https://youtu.be/1ronp6lue9w

Information Literacy Introduction

During your college career, you will probably take a variety of classes in the humanities, social sciences, sciences, and other fields. Although the demands for these courses will vary widely, in each of the classes you will need to determine the information required, evaluate the credibility of primary and secondary resources, communicate complex ideas in simple and clear ways, research sources for your own writing, and use such sources to help you explain your ideas. These skills, which teachers and librarians often refer to as “information literacy skills,” will be necessary in every class you take—particularly writing courses.

Watch this video online: https://youtu.be/-4CV05HyAbM

Broadly defined, information literacy refers to the ability to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (American Library Association 1989). More specifically, information literacy refers to the ability to:

- Determine the extent of information needed
- Access the needed information effectively and efficiently
- Evaluate information and its sources critically
- Incorporate selected information into one’s knowledge base
- Use information effectively to accomplish a specific purpose
- Understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally (ACRL 2000).

Thanks to the Internet, locating information resources like library databases or Google Scholar has become relatively straightforward; however, evaluating the scope and quality of information has become much more problematic. After all, as resources such as Writing Commons demonstrate, it’s possible to publish major Internet sites without the support of traditional publishers or institutions. Thanks to our distinguished editorial board, review editors, and transparent peer review process, you can have some confidence that this site is reliable, but what about other websites that you stumble upon?

Information Literacy @ Writing Commons

Being a critical reader is essential to your success as a student and a citizen. To avoid being spammed and spoofed, you need to probe written and visual texts for their messages, tones, lenses, etc. Doing so will not only encourage you to become a better critical thinker, but it will also enable you to become a more engaged citizen.

Watch this video online: https://youtu.be/MrkFwhbXrBU

- One technique that will not only make you a better critical thinker but will also help you develop as a writer is to break down others’ arguments when reading. Critical Reading Practices will assist you in
analyzing argument-driven pieces, as will Distinguishing between Main Points and Sub-claims and The Guiding Idea and Argumentative Thesis Statement.

- Identifying a Conversation will instruct you about how to make connections between sources, preparing you to situate your own argument in an existing conversation about a particular topic.
- Engaging in rhetorical analysis requires you to develop an awareness and understanding of the rhetorical appeals (ethos, pathos, logos, and kairos) and the logical fallacies, which in this section are organized based on their associated rhetorical appeal: fallacious ethos, fallacious pathos, fallacious logos, and fallacious kairos.
- Writers use visual rhetoric to sway consumers’ buying decisions, voting preferences, and emotional responses to alphabetic texts. Consult Breaking Down an Image to discover how to dissect an image into its essential components, and check out Ad Analysis to learn how to analyze advertisements from a particular lens (i.e., race, gender, or socioeconomic status).

BEGIN RESEARCH

“Where Do I Start?”

Do you have an assignment to write a research paper but you’re not sure where to start? Take a deep breath and begin by carefully reading the assignment requirements. This will help you understand the work you need to do.

First, let’s think about what we mean when we say “research.”

How Much Do You Already Know?

1. What makes a good topic?
   1. It is broad enough that you can find enough information on the subject.
   2. It is focused enough that you are not overwhelmed with too much information.
   3. The topic is interesting to you.
   4. All of the above.

2. If you don’t know much about your topic, what resources would be most helpful when you being your research?
   1. Encyclopedias and websites
   2. Scholarly articles
   3. Newspapers and magazines
   4. Statistical information

3. It is always a good idea to brainstorm different words for similar ideas when you first begin to research your topic.
   1. True
   2. False

4. What statement below is generally true about beginning research?
   1. It is pretty easy to find information on any topic.
2. As long as you have a good topic, researching for it will not take a long time.
3. No matter the assignment, good research takes time and effort.
4. None of the above.

Answers

1. All of the above.
2. 2.1
3. True
4. 4.3

Read Your Assignment Carefully

Before you can even begin your research, though, you need to read the assignment instructions carefully—more than once! This will help you understand the work you need to do.

Highlight topic guidelines, required length, and the types of information sources allowed.

Let’s take a look at a sample assignment.

Understand Your Assignment

Lily is taking a University Studies class and must complete this assignment:

In this paper, you will analyze the scientific aspects of a known environmental problem and identify and discuss at least two proposed solutions.

Now, analyze this assignment step by step.

1. Find the words that tell you what to do (think verbs!): **analyze**, **identify**, and **discuss**.
2. Find the limits of the assignment: **scientific aspects** and **two proposed solutions**.
3. Find the key theme: **a known environmental problem**

By reading the assignment carefully, we know that Lily has to analyze an environmental problem and identify and discuss at least two proposed solutions.

Pick a Good Topic

Lily’s assignment is broad enough to give her some choices when picking a topic. So, what makes a good topic?

- It interests you! You’ll enjoy it and do a better job.
- It meets the requirements of your assignment.
- It’s broad enough to give you several search options.
- It’s focused enough that you’re not overwhelmed with information.
Hot Tip!

• Explore the library’s databases to get you started.
• Browse newspapers and news sources.
• Talk to your instructors and fellow students.
• Consult with a librarian.

Too Broad, Too Narrow, or Just Right?

1. Air pollution in urban areas
   1. Too broad
   2. Too narrow
   3. Just right
2. Respiratory diseases in children in high-density urban areas
   1. Too broad
   2. Too narrow
   3. Just right
3. Environmental consequences of California’s October 2007 forest fires
   1. Too broad
   2. Too narrow
   3. Just right
4. Polar bear adaptation to global warming in the Arctic
   1. Too broad
   2. Too narrow
   3. Just right
5. Renewable energy in the United States
   1. Too broad
   2. Too narrow
   3. Just right
6. The design and implementation of Cal-Cars—the California Cars Initiative
   1. Too broad
   2. Too narrow
   3. Just right

Answers

1. Too broad. You’d need to identify an aspect of air pollution to narrow down the scope
2. Just right! This is a good topic. You’ll continue to refine your ideas as you learn more about the topic.
3. A bit narrow. It will be hard to find information on just one event. Look more broadly for information on forest fires in California or the West.
4. Just right. There should be just enough information to get you started. You will continue to refine your ideas as you learn more about the topic.
5. Too broad. This is a good starting place, but you’d want to focus the topic by selecting a specific renewable energy like solar power or wind.
6. Too narrow. It’s going to be difficult to find information on such a narrow topic. Broaden the focus to look at initiatives like this one that are less regional.

Identify Potential Ideas

Now it’s time to really focus your topic. Browse a few resources for ideas and identify different aspects of the topic.

Remember, if you pick a subject that interests you, you’ll enjoy the research process much more!
Customize Your Topic

Let’s say your assignment is to research an environmental issue. This is a broad starting point, which is a normal first step.

One way to customize your topic is to consider how different disciplines approach the same topic in different ways. For example, here’s how your broad topic of “environmental issues” might be approached from different perspectives.

- **Social Sciences:** Economics of Using Wind to Produce Energy in the United States
- **Sciences:** Impact of Climate Change on the Habitat of Desert Animals in Arizona
- **Arts and Humanities:** Analysis of the Rhetoric of Environmental Protest Literature

Turn Your Topic into a Question

When you’ve chosen a topic, it’s time to ask some questions. Using “environmental issues” as our general research interest, let’s ask some questions about environmental issues and agriculture.

- **How:** How do government agricultural subsidies impact the price of food? How does the use of pesticides affect food safety?
- **Who:** Consumers, farmers, farm workers
- **What:** Food safety, pesticides, food prices, genetically modified food, organic farming
- **Where:** United States, developing nations, European Union
- **Why:** Why does the European Union ban the sale and distribution of genetically modified food?

What’s Your Angle?

Let’s say that the most interesting question that emerged from the last exercise was: “How does repeated pesticide use in agriculture impact soil and groundwater pollution?”

Find Your Keywords

Now that we have our sample research question, we need to identify the key concepts and their related keywords.

Using our research question, “How does repeated pesticide use in agriculture impact soil and groundwater pollution?” we might consider these keywords:
Let's examine our research question again:

How does repeated pesticide use in agriculture impact soil and groundwater pollution?

Now analyze this assignment step by step:

1. Find important words and phrases that describe this topic (you can ignore common words that don't have a lot of meaning, such as prepositions, articles, and adjectives): pesticide, agriculture, soil, and pollution.
2. Now, think of some synonyms for the keywords you found:

<table>
<thead>
<tr>
<th>pesticide</th>
<th>agrochemicals, pest management, weed management, diazinan, malathion</th>
</tr>
</thead>
<tbody>
<tr>
<td>agriculture</td>
<td>farming, food crops, specific types of crops</td>
</tr>
<tr>
<td>soil</td>
<td>clay, organic components</td>
</tr>
<tr>
<td>groundwater</td>
<td>watershed, water resources, water table, aquatics</td>
</tr>
<tr>
<td>pollution</td>
<td>environmental impact, degradation, exposure, acid rain</td>
</tr>
</tbody>
</table>

Why are synonyms necessary? You'll often need to search for different words relating to the same concept.

Dive Into a Sea of Resources!

Browse through general sources to get familiar with your topic. You will find many sources for locating background information. Remember our point from earlier in this tutorial: the source you select will determine what you find. Make sure you spend your time looking in the right places.
Hot Tip!

Is there enough info on your topic? If not, review the earlier steps for starting your research. It’s normal to refine and revise your topic multiple times.

What Do You Know?

Once you’ve established your focused topic, you need to get familiar with it by doing some reading. Start with more general sources and then work up to more specific and detailed sources. Where you go next depends on how much you know.

So, just how much do you know about your topic?

<table>
<thead>
<tr>
<th>Not All That Much</th>
<th>I’ve Got the Basics</th>
<th>I’m Ready for Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sounds like you need the type of information typically found in encyclopedias and websites.</td>
<td>Sounds like you’ve got a basic understanding of your topic and just need to learn more. Check out books, magazines, and newspapers.</td>
<td>Specific information is what you need. You’ll want to find relevant scholarly articles, statistical sources, and government publications.</td>
</tr>
</tbody>
</table>

Matching Resources to Your Information Need

- **Newspaper**: Current regional or local information
- **Scholarly journal article**: Detailed analysis of a complex problem.
- **Book or book chapter**: Summary of what is known about a topic.
- **Encyclopedia or website**: Factual information like names, dates, and definitions.
Test Yourself: What Have You Learned?

1. What are the characteristics of a good topic?
   *(Select all that apply)*
   1. It interests you.
   2. It meets the requirements of your assignment.
   3. It’s broad enough to give you several search options.
   4. It’s focused enough that you’re not overwhelmed with information.

2. Rank the following questions in order from most general to most specific (1 being the most general):
   1. Are pesticides bad?
   2. Do video games cause violent behavior in adolescent males?
   3. Are agricultural workers in Mexico at a higher risk of health problems due to pesticide exposure because of lax government safety standards?
   4. Is there a relationship between fast food consumption and obesity?

3. What is the best way to focus your topic?
   1. Think about the discipline that you are researching for.
   2. Tailor your topic to the requirements of your assignment.
   3. Talk to a librarian about the resources that are available for your topic.
   4. All of the above.

4. Pick the best set of keywords to begin searching for information on global warming.
   1. Rising ocean levels, air pollution, greenhouse gases
   2. Biodiversity, atmospheric temperature, ozone layer
   3. Global climate change, greenhouse effect, atmospheric carbon dioxide
   4. Environment sustainability, alternative energy, biofuels

5. Why is it a good idea to use different words to describe similar ideas when you are beginning research?
   *(Select all that apply)*
   1. Because there is only one right answer and you can find it by trial and error.
   2. Because using different words will help you cast a broader net than just using the same term over and over.
   3. Different researchers might use different terms to describe the same idea.
   4. You might spell some of the words wrong and not get any results.

6. What is the most difficult aspect of beginning to research a topic that you don’t know very much about?
   1. You don’t know enough about the topic to know what is important and what is not.
   2. You don’t understand the technical aspects of the topic.
   3. It takes a lot of time to do research.
   4. All of the above.

7. For you, what the most difficult part about beginning your research?
   Answers

   1. A good topic will incorporate all these characteristics.
   2. 1 = Are pesticides bad?
      2 = Is there a relationship between fast food consumption and obesity?
      3 = Do video games cause violent behavior in adolescent males?
      4 = Are agricultural workers in Mexico at a higher risk of health problems due to pesticide exposure because of lax government safety standards?
      The more a research question incorporates the concepts of Who, What, When, Where, Why, and How the more specific it will be.
   3. All of the above.
   4. 4.3; think carefully about which terms are closely related to global warming.
   5. 5.2 and 5.3; there may be many ways to describe a single topic. Using as many related words as possible will help you find the most information!
   6. All of the above; remember that research takes time and energy and isn’t an easy thing to do!
   7. No matter what, coming to the library and talking to a librarian will help you get started.
INVESTIGATING

Have you ever heard a song and really wanted to have it in your own collection? How did you go about satisfying that need? Chances are, you had to:

- **Investigate** to find out the song’s title: (“E.T.,” “The Lazy Song,” “Born This Way,” “Latinoamérica”)
- **Investigate** to find out who performed the song: (Lady Gaga, Bruno Mars, Katy Perry, Maroon 5, Kanye West, Calle 13)
- **Investigate** to find out what CD that song was on: (Teenage Dream, Doo-Wops & Hooligans, Born This Way, Entren Los Que Quieran)
- **Investigate** to find out where—or if—you could buy that CD or mp3s.

You can’t—and won’t—get what you want without *investigating*.

And it's really no different with researching. To find what you want and need, you will have to *investigate*.

Why Is Investigating So Important in Your Research?

**how you ask**
+ **where you look**
= **what you get**

Researching takes a lot of your time and your effort.

The wrong approach can waste your time and effort and result in a paper you know your professors won't want—and a grade you don't want.

So, Where Do You Start Investigating?

Researching is a process:

- Identifying a topic
- Analyzing the assignment so you know what you are expected to accomplish
- Writing a thesis statement
- Searching for important information to support your thesis statement
- Working the information you find into the paper you are writing

**Investigating Step 1: Analyzing the Assignment**

Resist the temptation to start researching immediately. Don't waste your time diving into research until you know what the assignment requires.
• Is it a report?
• Is it an analytical paper?
• Is it an argumentative essay?

You need to know before you begin! The type of assignment will determine what kind of research you need to do, and how you need to organize and present that research in your paper. Even an “A” quality report can earn an “F” if the assignment is to write an argumentative essay.

Consider the differences in these assignments:

• **Basic Report:** Pretty easy. You’ll simply have to find information on your topic and present it as it appears.
• **Analytical Paper:** A little harder. You’ll have to explore multiple aspects of your topic and present your research findings objectively without attempting to persuade the reader to take a stand.
• **Argumentative Paper:** You’ll have to take a “stand” on a particular issue in your topic and use your research to support your argument.

Most professors will tell you explicitly what they want for an assignment. *If they don’t, you can tell a lot by looking for certain terms in the assignment instructions.*

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Terms in instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report</td>
<td>Describe, summarize</td>
</tr>
<tr>
<td>Analytical paper</td>
<td>Explain, compare and contrast</td>
</tr>
<tr>
<td>Argumentative paper</td>
<td>Argue, persuade, evaluate</td>
</tr>
</tbody>
</table>

**Examples of Papers on Tattooing**

- **Report:** This paper will explore the history of tattooing in the United States.
- **Analytical paper:** This paper will explain differences in attitudes toward tattooing in the 1960s and 1990s.
- **Argumentative paper:** This paper will argue that tattoos present serious health risks to adolescents.

**Investigating Step 2: Identifying a topic**

Deciding on a topic to research can be frustrating.

What SHOULD you choose for a topic? Your answer may be “I have no idea what I want.” But don’t let this bog you down. Topics are all around you every day.

Choose your topic as carefully as you would choose someone you wanted to date. Would you enjoy dating someone who was dull, annoying, or had totally different interests from you? Then why spend a few days, weeks, or even months with a topic you don’t like only to be graded on it?

Topics don’t have feelings, but you do, so try to choose something that interests you. Even if your professor assigns you a topic, you can choose an aspect of that topic that interests you.
Investigating Step 3: Writing a working thesis statement

All the time and effort you put into researching is wasted unless you can focus on what you need. How do you do that? By establishing a working thesis statement. Plan to revise it several times as you learn more about your topic.

A working thesis statement helps you concentrate on what you want and ignore information that is irrelevant. Consider the following working thesis statement.

Profilers have played a necessary role in catching serial killers.

Using this statement for a paper allows you to skip over the sources:

- that do not deal with profiling.
- that do not deal with the apprehension of serial killers.
- that deal only with the injustices of “racial profiling.”

A good working thesis statement saves you time and keeps you focused.

Avoiding Poor Thesis Statements

It is important not only to have a thesis statement, but to have a good one. An inadequate thesis statement is almost as bad as not having one at all.

Here are examples of thesis statements you’ll want to avoid—because they’ll lead to weak papers with poor grades:

### Why Is This Unsuitable?

**Man has had major impact on the environment.**

- Way too vague and broad.
- What constitutes “major impact”?
- What aspects of the environment are we talking about?
- What century are we talking about?

### Why Is This Unsuitable?

**Marijuana use in Mishawaka, Indiana, has been a problem for law enforcement since the 1970s.**

- Even if it is true, it is too local and narrow to be supported with national or scholarly research.
- Sources would probably be limited to local newspaper articles and personal interviews.
- Can you make those sources “stretch” across a 10 page research paper? Not likely.

### Why Is This Unsuitable?

**Miley Cyrus is a horrible singer.**
Because the statement is largely an unfocused opinion.
What exactly is “horrible”?
How does Miley Cyrus fall into that category?
Do you think there are many books or research articles that could support this topic? Probably not.

Forming Your Research Question

A good working thesis statement can often be converted into a question, which is typically called your research question. Consider these examples:

- **Working thesis statement**: Younger basketball players “turning pro” continue to ruin the quality of the NBA.
- **Research question**: How have younger professional basketball players ruined the quality of the NBA?

- **Working thesis statement**: The rise in teenage obesity is directly related to the fast food industry.
- **Research question**: What has the fast food industry done to contribute to the rise in teenage obesity?

Notice that neither of these questions can be answered with a simple “Yes” or “No.” The quest of your research efforts is to find sources that answer your research question.

Turn Your Topic into a Question

When you’ve chosen a topic, it’s time to ask some questions. Using “environmental issues” as our general research interest, let’s ask some questions about environmental issues and agriculture.

- **How**: How do government agricultural subsidies impact the price of food? How does the use of pesticides affect food safety?
- **Who**: Consumers, farmers, farm workers
- **What**: Food safety, pesticides, food prices, genetically modified food, organic farming
- **Where**: United States, developing nations, European Union
- **Why**: Why does the European Union ban the sale and distribution of genetically modified food?

**Which is Better?**

For each pair, select the better research question:

1. Is global warming harmful? OR What are the adverse effects of global warming?
2. What factors influence the operating costs of physicians? OR Do doctors charge too much?

**Answers**

1. What are the adverse effects of global warming?
2. What factors influence the operating costs of physicians?

Not every thesis statement can be supported. You may search for sources to support your thesis statement and come up empty.
Investigating Step 4: Searching for Information

Some topics may be too current or too obscure for coverage in academic journals. Or you may find too many articles to wade through if your research question is broad. Be flexible with your topic, thesis statement, and research question. Revising them early in the process based on what you DO find will save you time in the long run.

Review of the Investigating Process

Let’s wrap up the process of investigating:

• **Plan! Plan! Plan!** You will save time and effort if you do.
• **Not all papers are created equal.** Examine each assignment carefully and pick research resources accordingly.
• **Be flexible.** If you feel as if you are spinning your wheels, re-evaluate your topic, thesis, or research question and revise if necessary.

<table>
<thead>
<tr>
<th>Test Yourself!</th>
</tr>
</thead>
</table>
| 1. Which of the following would make the best research question to guide an 8-page analytical research paper?  
  1. Is fast food bad for children?  
  2. Do fast food companies focus their advertisements on children?  
  3. How do fast food companies create effective advertisements aimed at children?  
  
  2. Which type of assignment requires you to explore multiple aspects of your topic and present your research findings without attempting to persuade the reader to take a position?  
  1. basic report  
  2. analytical paper  
  3. argumentative paper  
  
  3. Your professor has assigned a 6-page report about an environmental issue. Which of the following would make the best topic (not too narrow or too broad)?  
  1. Air pollution in urban areas  
  2. Respiratory diseases in children in high density areas  
  3. Environmental consequences of California’s October 2007 forest fire.  
  4. Renewable energy in the United States.  
  
  4. Which is the first step in investigating your research topic?  
  1. Citing your sources  
  2. Searching a database  
  3. Reading a scholarly article about the topic  
  4. Analyzing the assignment  

5. Which of the following statements about thesis statements is NOT correct?
   1. A good thesis statement saves you time and keeps you focused.
   2. Every thesis statement can be supported by research.
   3. A thesis statement helps you concentrate on what you want and ignore information that is irrelevant.
   4. A good thesis statement can often be converted into a question.

   **Answers**

1. 1.3; Questions that can be answered with a “yes” or “no” generally do not make the best research question. It is preferable to start your question with “How”, “What”, or “Why.”
2. 2.2
3. 3.2 is a good topic that you can continue to refine as you learn more about it.
4. 4.4; The type of assignment will determine what kind of research you need to do so you should begin by first analyzing the assignment.
5. 5.2; A good thesis statement will save you time and keep you focused and will help you concentrate on the information you need; A good thesis statement can often be converted into a question. However, not every thesis statement can be supported by research because the topic may be too current or too obscure.

ASSIGNMENT: RESEARCH QUESTION/THESIS STATEMENT/SEARCH TERMS

Complete the Exercise “Research Question/Thesis Statement/Search Terms” on the page “Identify: Understanding Your Information Need.” If you revise your original question after reading the paragraph below number 3, please post both your original and revised question, indicating which one is the revised question. Post your response to the exercise in the IL ch1 discussion forum. Please follow the instructions below:

- Type a term that is common to both the thesis/hypothesis in the subject line of the discussion thread.
- Respond to one other student. Your response should give recommendations of improving their thesis statement and/or hypothesis. Please respond to a student that does not already have two responses.
- View the grading rubric in the discussion board so you know how you will be graded.
INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

• “Know what you don’t know” to identify any information gaps
• Identify which types of information will best meet the need
• Identify the available search tools, such as general and subject specific resources at different levels
• Identify different formats in which information may be provided
• Demonstrate the ability to use new tools as they become available

SCOPE: KNOWING WHAT IS AVAILABLE

A person who is information literate in the Scope pillar is able to assess current knowledge and identify gaps.

The above statement is from the Seven Pillars of Information Literacy, the model of information literacy presented in the Introduction of this book. The following list, from the creators of the Seven Pillars model, provides more detail about the Scope pillar. Components include:

• “Know what you don’t know” to identify any information gaps
• Identify which types of information will best meet the need
• Identify the available search tools, such as general and subject specific resources at different levels
• Identify different formats in which information may be provided
• Demonstrate the ability to use new tools as they become available

Additionally the information literate person in the Scope pillar understands

• What types of information are available
• The characteristics of the different types of information source available to them and how they may be affected by the format (digital, print)
• The publication process in terms of why individuals publish and the currency of information
• Issues of accessibility
• What services are available to help and how to access them
**scope**

Knowing what is available means:

- Understand, know, recognize:
  - Different types of information and how the format affects their content
  - The publication process
  - Issues of accessibility
  - Services available to help and how to access them

- Able to:
  - Identify which types of information best meet the need
  - Identify available search tools
  - Identify different information formats
  - Use new tools as they become available
Proficiencies in the Scope pillar

Now let’s examine these concepts.

Scenario

Harry and Sally Dennis have lived in central New York State for 25 years. They work as teachers in the Cortland City School District. Lately, they have been closely following the debate about hydraulic fracturing or fracking in New York State and are concerned about their ability to influence the course of fracking in the future. Although they don’t own much land, they are worried about the possible adverse effect on drinking water, disruption to their environment, and the influx of people that fracking-related jobs will bring into their city. Sally Dennis is considering running for public office in her town to have a more powerful voice in the fracking debate. To receive the backing of her local political party, Sally needs to present some persuasive arguments against hydraulic fracking that are well thought out and scientifically sound. She needs to engage in substantial research on this issue so that she can present herself as an expert.

At this point, all that Sally really knows about fracking is what she has heard from neighbors and news shows. How will she proceed with her research? Sally’s intentions are laudable and she knows she will have to fill in the information gaps in her fracking issue knowledge before she can be taken seriously as a candidate for city office. Knowing that you don’t have sufficient information to solve an information need is one important aspect of information literacy. It enables you to obtain that missing information.

Different Information Formats and Their Characteristics

In addition to knowing that you are missing essential information, another component of information literacy is understanding that the information you seek may be available in different formats such as books, journal articles, government documents, blog postings, and news items. Each format has a unique value. The graphic below represents a common process of information dissemination. When an event happens, we usually hear about it from news sources—broadcast, web, and print. More in-depth exploration and analysis of the event often comes from government studies and scholarly journal articles. Deeper exploration, as well as an overview of much of the information available about the event, is often published in book format.
Sally realizes that she needs to obtain an overview of the whole fracking debate. She needs to determine how severe the consequences of fracking could be and what is actually involved in the fracking process. Where can she find such an overview and how can she trust that the overview is accurate and complete?

Sally believes that she can find this information online and uses Google to search the World Wide Web. She quickly finds that there is an overwhelming amount of online information about fracking. Her search has resulted in more than 11,000,000 sites. Sally knows that she doesn't have to peruse all of these resources, but those that she does examine do not provide a comprehensive overview of the issues. She also notices that many of the sites are obviously advocating their own point of view.

A better first step is to identify a library that contains academic resources so that Sally will have access to more scholarly treatments of the subject. Sally can use the SUNY union catalog or Worldcat.org (that will allow her to search numerous academic libraries at once).

Library Catalogs

A library catalog is a database that contains all of the items located in a library as well as all of the items to which the library has access. It allows you to search for items by title, author, subject, and keyword. A keyword is a word that is found anywhere within the record of an item in the catalog. A catalog record displays information that is pertinent to one item, which could be a book, a journal, a government document, or a video or audio recording.
If you search by subject in an academic library catalog you can take advantage of the controlled vocabulary created by the Library of Congress. Controlled vocabulary consists of terms or phrases that have been selected to describe a concept. For example, the Library of Congress has selected the phrase “Motion Picture” to represent films and movies. So, if you are looking for books about movies, you would enter the phrase “Motion Picture” into the search box. Controlled vocabulary is important because it helps pull together all of the items about one topic. In this example, you would not have to conduct individual searches for movies, then motion pictures, then film; you could just search once for motion pictures and retrieve all the items on movies and film. You can discover subject terms in item catalog records.

Many libraries provide catalog discovery interfaces that provide cues to help refine a search. This makes it easier to find items on specific topics. For example, if Sally enters the search terms “Hydraulic Fracturing” into a catalog with a discovery interface, the results page will include suggestions for refinements including several different aspects of the topic. Sally can click on any of these suggested refinements to focus her search.

Using this method, Sally finds several good resources on her topic, now she needs to locate them. The SUNY catalog will provide a list of the institutions that own the book she wants to read. She can then link to the institution’s own library catalog to find out more information on the location and status of the item.

Why should Sally choose books instead of another format? Books can provide an overview of a broad topic. Often, the author has gathered the information from multiple sources and created an easy to understand overview. Sally can later look for corroborating evidence in government documents and journal articles. Books are a good information resource for this stage of her research.

Once Sally starts to locate useful information resources, she realizes that there are further gaps in her knowledge. How does she decide which books to use? She needs the most current information, because she certainly doesn’t want to get caught spouting outdated information.

Looking at publication date will help her to choose the most recent items.

How can she get these books? She is not a SUNY student or faculty member.

Interlibrary loan services at her public library will allow her to access books from an academic library or the college in her area may allow community members to borrow materials. There is a wealth of knowledge contained in the resources of academic and public libraries throughout the United States. Single libraries can’t hope to collect all of the resources available on a topic. Fortunately, libraries are happy to share their resources and they do this through interlibrary loan. Interlibrary loan allows you to borrow books and other information resources regardless of where they are located. If you know that a book exists, ask your library to request it through their interlibrary loan program. This service is available at both academic and most public libraries.

Checking for Further Knowledge Gaps

Sally has had a chance to review the books that she chose and although her understanding of the issues associated with fracking has improved, she still needs more specific information from the point of view of the energy industry, the government, and the scientific community. Sally knows that if she doesn’t investigate all points of view, she will not be able to speak intelligently about the issues involved in the fracking debate. Where will she get this information? Because this information should be as current as possible, much of it will not be available in book format. Sally will need to look for scholarly journal articles and government documents. It is not likely that the public library will have the depth and scope of information that Sally now needs. Fortunately, Sally has just enrolled in a class at her local SUNY school and is able to use the resources at this academic library. However, when Sally visits the library, she finds that the amount of information available is overwhelming. There are many databases that will help Sally find journal articles on almost any topic. There are also many kinds of government information, some in article format, some as documents, and some as published rules and regulations. Sally suddenly feels out of her element and doesn’t have any idea of where to start her research.

Databases

Sally should start her search for journal articles with research databases. Research databases contain records of journal articles, documents, book chapters, and other resources. Online library catalogs differ from other research
databases in that they contain only the items available through a particular library or library system. Research databases are often either broad or comprehensive collections and are not tied to the physical items available at any one library. Many databases provide the full-text of articles and can be searched by subject, author, or title. Another type of database provides just the information about articles and may provide tools for you to find the full text in another database. The databases that contain resources for a vast array of subjects are referred to as general or multidisciplinary databases. Other databases are devoted to a single subject, and are known as subject-specific databases. Databases are made up of:

- Records: A record contains descriptive information that is pertinent to one item which may be a book, a chapter, an article, a document, or other information unit.
- Fields: These are part of the record and they contain information that pertains to one aspect of an item such as the title, author, publication date, and subject.
- The subject field can sometimes be labeled subject heading or descriptor. This is the field that contains controlled vocabulary. Controlled vocabulary in a database is similar to controlled vocabulary in a Library Catalog, but each database usually has a unique controlled vocabulary unrelated to Library of Congress classifications. Many databases will make their controlled vocabulary available in a thesaurus. If the database you are searching does not have a thesaurus, use the subject field in a record to find relevant subject terms.

Below is the first screen of a subject specific database called GEORef. This database covers technical literature on geology and geophysics. The thesaurus is circled. Clicking on the thesaurus allows you to find controlled vocabulary that will focus your search. In this search, Sally has typed the word “fracking” in the search box and only retrieved 23 records. When Sally uses the controlled vocabulary phrase “hydraulic fracturing,” she is able to increase her search results. In fact, she has retrieved too many records. Now she wants to limit her search, but she still wants to obtain the most relevant articles available.

**Boolean Operators**

One way to limit a database search is to use Boolean operators; words you can add to a search to narrow or broaden your search results. They are and, or, and not. You can usually find these words in the advanced search query area of a database. *And* will narrow your search. For example, if you are interested in fresh water fishing you would enter the terms “fish and freshwater.” Your results would then include records that only contained both of these words.
The green overlapping area in the diagram above represents the results from the “fish and freshwater” search.

Or will broaden your search and is usually used with synonyms. If you are interested in finding information on mammals found in the Atlantic Ocean, you could enter the terms “whales or dolphins.”

The circles above represent the or search. All of the records that contain one or another, or both of your search terms will be in your results list.
Not will eliminate a term from your results. If you were looking for information on all Atlantic Ocean fish except Bluefish, you would enter “fish not bluefish.”

The larger green circle represents the results that you would retrieve with this search.

Let’s go back to Sally’s search of the GEORef database. If you remember, she searched the controlled vocabulary term, “hydraulic fracturing.” She can use and with the phrase “Marcellus Shale” to focus and limit her results. Sally’s search query is now “hydraulic fracturing and Marcellus Shale.” You can see this represented below. The overlapping area represents the records this search will retrieve.
More information on Boolean Operators can be found in the Plan chapter.

Database searching can seem confusing at first, but the more you use databases, the easier it gets and most of the time, the results you are able to retrieve are superior to the results that you will get from a simple internet search.

Other Information Sources

After taking some time to think about her goal, which is to present a persuasive argument on why she would be a good candidate for public office, Sally decides to concentrate on obtaining relevant government information. After all, she hopes to become part of the government, so she should have some knowledge of the government’s role in the fracking issue.

Government information consists of any information produced by local, state, national, or international governments and is usually available at no cost. However, sometimes it is reproduced by a commercial entity with added value. Look for websites that are created by official government entities, such as the U.S. Department of the Interior and the congressional website. New York State’s website contains information from all New York State government branches. As Sally will discover, you can usually find a wealth of reliable information in government sources.

Even though she has narrowed the scope of her search for information resources, Sally is still confronted with a myriad of information formats. With help from a reference librarian, Sally discovers a research guide on government information available in the library. She notices that there is a section for New York State that she can explore.

She breathes a sigh of relief when she sees a whole section on the environment that includes a link to the New York State Department of Environmental Conservation’s website, which has many documents and regulations on the topic of Hydraulic Fracturing. The reference librarian continues to assist Sally to find the most useful information as she navigates through the site. Since this information is freely available to the public, Sally is able to access the site from home and spends many hours reading the documents.

Conclusion

Sally has demonstrated that she is competent in the Scope information literacy pillar. She was able to determine that there were gaps in her knowledge and she formulated a plan to locate information to close those gaps. Sally became aware that information was available in many different formats and she was able to choose the formats that were most relevant to her needs: books and government information. In addition, she was able to navigate a complex information environment—the New York State Department of Environmental Conservation—to identify the information that was most useful for her purpose. She did encounter some barriers:

- The information she found using Google was not useful because there was too much and it was biased.
- She had to determine which information formats would best serve her needs.
- Her public library didn’t have the required information.
- She was overwhelmed by the resources available at the academic library.

Sally was able to overcome all of these common research pitfalls. Consulting a reference librarian was a good way for her to obtain information that she might otherwise have not thought to use.

Exercise: Searching in Databases

1. Search both the SUNY connect catalog and Worldcat.org to identify possible books that will provide the information that Sally is seeking. Choose a few resources based on information provided in catalog record and explain why these resources will help Sally solve her knowledge gap.
2. Using an online catalog, identify both a print resource and an online resource on one specific topic. Compare these resources in terms of content and currency. Which resource would be most useful for obtaining an in-depth understanding of the topic? Which would be more useful for gaining a broad overview of the topic?

3. Use a newspaper database, such as Proquest Historical Newspapers to find a newspaper article written shortly after a well-known news event such as the immediate results of the election for the President of the United States in 2000. Compare that information with the information that we now have on that contested Presidential Election. What is missing from the newspaper account? What are some possible information sources that would provide the missing information from the early reports?

USE A BOOLEAN!

What’s that? The latest dance move from Brazil? No. It just means using AND, OR, or NOT in your searches. Your research will go much faster if you can use a Boolean operator.

So, let your fingers do the dancing by using AND, OR, or NOT to improve your search results.

Let’s see how.

Hot Tip!

Boolean operators are names after George Boole, an English mathematician and philosopher.

Boolean Logic
Combining Boolean Operators

You can use multiple operators within the same search to get even more effective and powerful results. Simply group your synonyms with OR, then combine them with another key concept using AND.

In the example below you can see how this works.

- wind power OR alternative energy OR solar power AND global warming

Quiz

1. Which search would return fewer results?
   1. recycle AND environment
   2. recycle OR environment

2. Which Boolean operator do you use to search for synonyms for a word (e.g., agriculture, farming, crops)?
   1. AND
   2. OR
   3. NOT

3. Which search will exclude any results with “recycle”?
   1. environment NOT recycle
   2. recycle NOT environment

4. The default and “hidden” Boolean operator in a standard Google search is:
   1. AND
   2. OR
   3. NOT

Answers

1. recycle AND environment
2. OR; by using OR grouping synonyms will broaden your search.
3. environment NOT recycle
4. AND; Google automatically uses AND to combine your terms.
Try Truncation

Another technique that can improve your search results is called truncation. Truncating a word means that you are able to search different forms of the same word at the same time.

Truncation requires the use of symbols, called wildcards, to replace word endings. The most common symbols are: * ? #

<table>
<thead>
<tr>
<th>Hot Tip!</th>
</tr>
</thead>
<tbody>
<tr>
<td>To see what character a particular database uses for truncation or a wildcard, always refer to the Help option in the database or ask a librarian!</td>
</tr>
</tbody>
</table>

Using Truncation

Shorten the word to its root and add the truncation symbol.

Vege*

- Vegetable(s)
- Vegetarian(s)
- Vegetation

This will retrieve all similar, singular, and plural forms of the root word “Vege.”

Truncation can save time and expand your search to include related words.

Using Internal Truncation

Replace one letter within a word using the wildcard symbol.

Wom?n

- Woman
- Women

Gr?y

- Gray
- Grey

Using internal truncation can increase your search results to include different forms and spellings of the same word.
Avoid Truncation Overload!

Trying to truncate a word too early can retrieve many unrelated and unwanted results.

For example, when trying to search for topics related to “politics” think carefully about where to truncate your search term.

Poli*

- Politics
- Political
- Politician
- Police
- Polling
- Polio

Truncation In Action!

Let’s see how using Truncation can help your research in the Academic Search Complete database available at UCI. To watch the demo in a new browser window, click here.

---

### Quiz

1. Every database uses the same wildcard for their truncation symbol.
   1. True
   2. False

2. If you search the truncated word educat*, what form(s) of the word would you retrieve in your search?
   1. Education
   2. Educator
   3. Educating
   4. All of the above

3. How would using internal truncation in a keyword increase your search results?
   1. It would retrieve results that may have alternate endings.
   2. It would retrieve related words.
   3. It would retrieve results that may have alternate spellings.
   4. None of the above.

4. Truncating a word in the wrong place can produce unwanted and irrelevant results.
   1. True
   2. False

### Answers

1. False
2. All of the above
3. It would retrieve results that may have alternate spellings.
4. True
Know Your Limits

Databases have many options that can help refine your search. Most database searches can be limited by these variables:

- Publication Year
- Language
- Document Type
- Publication Type
- Document Format

Hot Tip!

Most database searches can be limited to retrieving only peer-reviewed articles. This can save time when an assignment calls for only scholarly resources.

Limits In Action!

Let’s see how using Limits can help your research in the Academic Search Complete database available at UCI. To watch the demo in a new browser window, click here.

Quiz

1. Using limits can help refine and focus your search.
   1. True
   2. False
2. If you want to retrieve articles from January 2007 to March 2008, which limit would you use?
   1. Language
   2. Document type
   3. Date
   4. Document format
3. If you want results that include a full text copy of an article, which limit would you use?
   1. Language
   2. Document type
   3. Date
   4. Document format
4. If you want your results to bring up articles in scholarly journals, which limit would you use?
   1. Language
   2. Document type
   3. Date
   4. Document format

Answers

1. True
2. Date
3. Document format
4. Document type

Sort and Separate!

Databases allow you to sort your results. Common ways to sort results are by:
• Date
• Relevance
• Author
• Source

Hot Tip!

You SEARCH with limits and SORT your results. Use limits before the search and sort after you have your results.

Why Sort?

There are many reasons to sort the results of your search differently. Sorting can save time and energy when browsing through your results for the best materials. Drag and drop the sort options into the reasons that are listed.

• Date: I want to see the most current articles first.
• Relevance: I want to see the articles that best meet my keywords first.
• Author: I want to see the articles listed alphabetically by who wrote them.
• Source: I want to see the articles listed alphabetically by the journals that published them.

Sorting in Action!

Let’s see how sorting your results can help your research in the Academic Search Complete database available at UCI. To watch the demo in a new browser window, click here.

Test Yourself: What Have You Learned?

1. Sorting your results can take time and isn’t very helpful
   1. True
   2. False
2. If you sort your results by relevance, what will be at the top of the result list?
   1. The most current items
   2. Items that are published in journals that being with “A”
   3. The items that best matched your keywords
   4. None of the above
3. If you sort your results by date, what will be at the top of the result list?
   1. The most current items
   2. Items that are published in journals that being with “A”
   3. The items that best matched your keywords
   4. None of the above
4. Sorting your results is similar to using Limits in your search.
   1. True
   2. False

Answers

1. False; Sorting can SAVE valuable time when review your results and is only a click away.
2. 2.3
3. 3.1
4. True; Limits are applied before the search and sort is used after the search, but they both save time and energy!
VIDEO: BASIC BOOLEAN

This video shows how you can use Boolean Logic and the words AND, OR, and NOT to narrow your searches.

Watch this video online: https://youtu.be/dXdgsr2Lurc
INFORMATION LITERACY, CHAPTERS 3 AND 4

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

- Clearly phrase your search question.
- Use an appropriate search strategy, using key techniques.
- Selecting good search tools, including specialized ones.
- Use the terms and techniques that are best suited to your search.
- Use Library and electronic resources to find and access information.
- Use a range of retrieval tools and resources effectively
- Construct complex searches appropriate to different digital and print resources.
- Access full text information, both print and digital, read and download online material and data.
- Use appropriate techniques to collect new data.
- Keep up to date with new information.
- Engage with their community to share information.
- Identify when the information need has not been met.
- Use online and printed help and can find personal, expert help.

PLAN: DEVELOPING RESEARCH STRATEGIES

Scenario

Sarah’s art history professor just assigned the course project and Sarah is delighted that it isn’t the typical research paper. Rather, it involves putting together a website to help readers understand a topic. It will certainly help Sarah get a grasp on the topic herself! Learning by attempting to teach others, she agrees, might be a good idea. The professor wants the web site to be written for people who are interested in the topic and with backgrounds similar to the students in the course. Sarah likes that a target audience is defined, and since she has a good idea of what her friends might understand and what they would need more help with, she thinks it will be easier to know what to include in her site. Well, at least easier than writing a paper for an expert like her professor.
An interesting feature of this course is that the professor has formed the students into teams. Sarah wasn’t sure she liked this idea at the beginning, but it seems to be working out okay. Sarah’s team has decided that their topic for this website will be 19th century women painters. But her teammate Chris seems concerned, “Isn’t that an awfully big topic?” The team checks with the professor, who agrees they would be taking on far more than they could successfully explain on their website. He suggests they develop a draft thesis statement to help them focus, and after several false starts, they come up with:

The involvement of women painters in the Impressionist movement had an effect upon the subjects portrayed.

They decide this sounds more manageable. Because Sarah doesn’t feel comfortable with the technical aspects of setting up the website, she offers to start locating resources that will help them to develop the site’s content.

Before we learn more about what happens with Sarah and her team, let’s look at the components of the Plan pillar. The overall ability is: “Can construct strategies for locating information and data.” That is a fairly short sentence, but a great deal is packed into it. It includes

- Understanding a range of searching techniques
- Understanding the various tools and how they differ
- Knowing how to create effective search strategies
- Being open to searching out the most appropriate tools
- Understanding that revising your search as you proceed is important
- Recogning that subject terms are of value

And these are just the items to understand! There are also the things you need to be able to do:

- Clearly phrase your search question.
- Develop an appropriate search strategy, using key techniques.
- Selecting good search tools, including specialized ones.
- Use the terms and techniques that are best suited to your search.

Here is a visual representation of these components:
Now, take a look at the essence of these items condensed into another concept map:
The second concept map is simplified. The focus is on the key elements: the tools and strategies that you use and the mindset that will help you as you plan your research. This may seem a bit daunting, so let’s see how Sarah tackles the project. She sometimes falters, but that happens even to experienced researchers. As you read through Sarah’s quest for good information, think about the range and appropriateness of the strategies she uses. What would you do differently? What approaches seem to be good ones? (While there is some mention of particular research tools and resources in this chapter, they will be discussed in depth in the Gather chapter, and also in the Scope chapter.)

As you read about Sarah’s quest for information, and reflect on your own information searches in the past, remember particularly the bullet within the Plan pillar that emphasizes the need to revise your search as you work. It is very important to do this, and to build time into the process so you are able to revise. As you learn more about your topic, or the terms used in conjunction with its concepts, or key scholars in the field, it is only natural that you will need to shift focus, and, perhaps, change course. This is a natural part of the research process and indicates that your efforts are bearing fruit. Let’s return to Sarah...

The next time the class meets, Sarah tells her teammates what she has done so far:

“I thought I’d start with some scholarly sources, since they should be helpful, right? I put a search into the online catalog for the library, but nothing came up! The library should have books on this topic, shouldn’t it? I typed the
search in exactly as we have it in our thesis statement. That was so frustrating. Since that didn’t work, I tried Google, and put in the search. I got over 8 million results, but when I looked over the ones on the first page, they didn’t seem very useful. One was about the feminist art movement in the 1960s, not during the Impressionist period. The results all seemed to have the words I typed highlighted, but most really weren’t useful. I am sorry I don’t have much to show you. Do you think we should change our topic?”

Alisha suggests that Sarah talk with a reference librarian. She mentions that a librarian came to talk to another of her classes about doing research, and it was really helpful. Alisha thinks that maybe Sarah shouldn’t have entered the entire thesis statement as the search, and maybe she should have tried databases to find articles. The team decides to brainstorm all the search tools and resources they can think of.

Here’s what they came up with:

<table>
<thead>
<tr>
<th>Search Tools and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wikipedia</td>
</tr>
<tr>
<td>Professor</td>
</tr>
<tr>
<td>Google search</td>
</tr>
<tr>
<td>JSTOR database</td>
</tr>
</tbody>
</table>

Based on your experience, do you see anything you would add?

Sarah and her team think that their list is pretty good. They decide to take it further and list the advantages and limitations of each search tool, at least as far as they can determine.
Alisha suggests that Sarah should show the worksheet to a librarian and volunteers to go with her. The librarian, Mr. Harrison, says they have made a really good start, but he can fill them in on some other search strategies that will help them to focus on their topic. Would Sarah and Alisha like to learn more?

Let’s step back from this case study again, and think about the elements that someone doing research should plan before starting to enter search terms in Google, Wikipedia, or even a scholarly database. There is some preparation you can do to make things go much more smoothly than they have for Sarah.

**Self-Reflection**

As you work through your own research quests, it is very important to be self-reflective. The first couple of items in this list have been considered in the Identify chapter:

- What do you really need to find?
- Do you need to learn more about the general subject before you can identify the focus of your search?
- How thoroughly did you develop your search strategy?
- Did you spend enough time finding the best tools to search?
- What is going really well, so well that you’ll want to remember to do it in the future?
Another term for what you are doing is metacognition, or thinking about your thinking. Reflect on what Sarah is going through as you read this chapter. Does some of it sound familiar based on your own experiences? You may already know some of the strategies presented here. Do you do them the same way? How does it work? What pieces are new to you? When might you follow this advice? Don't just let the words flow over you, rather think carefully about the explanation of the process. You may disagree with some of what you read. If you do, follow though and test both methods to see which provides better results.

Selecting Search Tools

After you have thought the planning process through more thoroughly, start to think about where you can look for information. Part of planning to do research is determining which search tools will be the best ones to use. This applies whether you are doing scholarly research or trying to answer a question in your everyday life, such as what would be the best place to go on vacation. “Search tools” might be a bit misleading, since a person might be the source of the information you need. Or it might be a web search engine, a specialized database, an association—the possibilities are endless. Often people automatically search Google first, regardless of what they are looking for. Choosing the wrong search tool may just waste your time and provide only mediocre information, whereas other sources might provide really spot-on information and quickly, too. In some cases, a carefully constructed search on Google, particularly using the advanced search option, will provide the necessary information, but other times it won't. This is true of all sources: make an informed choice about which ones to use for a specific need.

So, how do you identify search tools? Let's begin with a first-rate method. For academic research, talking with a librarian or your professor is a great start. They will direct you to those specialized tools that will provide access to what you need. If you ask a librarian for help, she or he may also show you some tips about searching in the resources. This chapter will cover some of the generic strategies that will work in many search tools, but a librarian can show you very specific ways to focus your search and retrieve the most useful items.

If neither your professor nor a librarian is available when you need help, check your school's library website to see what guidance is provided. There will often be subject-related guides or lists of the best resources to assist researchers. There may be a directory of the databases the library subscribes to and the subjects they cover. Take advantage of the expertise of librarians by using such guides. Novice researchers usually don't think of looking for this type of help, and, as a consequence, often waste time.

When you are looking for non-academic material, consider who cares about this type of information. Who works with it? Who produces it or help guides for it? Some sources are really obvious, and you are already using them—for example, if you need information about the weather in London three days from now, you might check Weather.com for London's forecast. You don't go to a library (in person or online), and you don't do a research database search. For other information you need, think the same way. Are you looking for anecdotal information on old railroads? Find out if there is an organization of railroad buffs. You can search on the web for this kind of information, or, if you know about and have access to it, you could check the Encyclopedia of Associations. This source provides entries for all U.S. membership organizations, which can quickly lead you to a potentially wonderful source of information. Librarians can point you to tools like these.

As you consider the information presented in this chapter, keep the scope of the information you are looking for in mind. In the previous chapter we examined the topic of scope in detail. The breadth and depth of the information you require will have an impact as you plan.

Consider Asking an Expert

Have you thought about using people, not just inanimate sources, as a way to obtain information? This might be particularly appropriate if you are working on an emerging topic or a topic with local connections. There are a variety of reasons that talking with someone will add to your research.

For personal interactions, there are other specific things you can do to obtain better results. Do some background work on the topic before contacting the person you hope to interview. The more familiarity you have with your topic and its terminology, the easier it will be to ask focused questions. Focused questions are important if you want to get into the meat of what you need. Asking general questions because you think the specifics might be too detailed rarely leads to the best information. Acknowledge the time and effort someone is taking to answer
your questions, but also realize that people who are passionate about subjects enjoy sharing what they know. Take the opportunity to ask experts about sources they would recommend.

Determining Search Concepts and Keywords

Once you’ve selected some good resources for your topic, and possibly talked with an expert, it is time to move on to identify words you will use to search for information on your topic in various databases and search engines. This is sometimes referred to as building a search query. When deciding what terms to use in a search, break down your topic into its main concepts. Don’t enter an entire sentence, or a full question. Different databases and search engines process such queries in different ways, but many look for the entire phrase you enter as a complete unit, rather than the component words. While some will focus on just the important words, such as Sarah’s Google search that you read about earlier in this chapter, the results are often still unsatisfactory. The best thing to do is to use the key concepts involved with your topic. In addition, think of synonyms or related terms for each concept. If you do this, you will have more flexibility when searching in case your first search term doesn’t produce any or enough results. This may sound strange, since if you are looking for information using a Web search engine, you almost always get too many results. Databases, however, contain fewer items, and having alternative search terms may lead you to useful sources. Even in a search engine like Google, having terms you can combine thoughtfully will yield better results.

The following worksheet is an example of a process you can use to come up with search terms. It illustrates how you might think about the topic of violence in high schools. Notice that this exact phrase is not what will be used for the search. Rather, it is a starting point for identifying the terms that will eventually be used.

> TOPIC: Violence in high schools

> CONCEPTS:

<table>
<thead>
<tr>
<th>Violence</th>
<th>High School</th>
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<tbody>
<tr>
<td>violence</td>
<td>high school</td>
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<tr>
<td>bullying</td>
<td>secondary school</td>
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<tr>
<td>guns</td>
<td>12th grade</td>
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<tr>
<td>knives</td>
<td>or</td>
</tr>
<tr>
<td>gangs</td>
<td>or</td>
</tr>
</tbody>
</table>
Now, use a clean copy of the same worksheet to think about the topic Sarah’s team is working on. How might you divide their topic into concepts and then search terms? Keep in mind that the number of concepts will depend on what you are searching for. And that the search terms may be synonyms or narrower terms. Occasionally, you may be searching for something very specific, and in those cases, you may need to use broader terms as well. Jot down your ideas then compare what you have written to the information on the second, completed worksheet and identify 3 differences.

> **TOPIC:**
The involvement of women painters in the Impressionist movement had an effect upon the subjects portrayed.

> **CONCEPTS:**

<table>
<thead>
<tr>
<th></th>
<th>Painters</th>
<th>Impressionist Movement</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>Women</td>
<td>&amp;</td>
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<td>OR</td>
<td></td>
<td></td>
<td>OR</td>
</tr>
</tbody>
</table>
Boolean Operators

Once you have the concepts you want to search, you need to think about how you will enter them into the search box. Often, but not always, Boolean operators will help you. You may be familiar with Boolean operators. They provide a way to link terms. Boolean operators are also discussed in the Scope chapter. The information in the two chapters complements each other and reading about this important topic again provides a review for the topics that overlap.
We will start by capturing the ideas of the women creating the art. We will use *women painters and women artists* as the first step in our sample search. You could do two separate searches by typing one or the other of the terms into the search box of whatever tool you are using:

- women painters
- women artists

You would end up with two separate result lists and have the added headache of trying to identify unique items from the lists. You could also search on the phrase

- women painters and women artists

But once you understand Boolean operators, that last strategy won’t make as much sense as it seems to.

There are three Boolean operators: *and*, *or*, and *not*.

*And* is used to get the intersection of all the terms you wish to include in your search. With this example

- women painters and women artists

you are asking that the items you retrieve have both of those terms. If an item only has one term, it won’t show up in the results. This is not what the searcher had in mind—she is interested in both artists and painters, because she doesn’t know which term might be used. She doesn’t intend that both terms have to be used. Let’s go on to the next Boolean operator, which will help us out with this problem.

*Or* is used when you want at least one of the terms to show up in the search results. If both do, that’s fine, but it isn’t a condition of the search. So *or* makes a lot more sense for this search:

- women painters or women artists

Now, if you want to get fancy with this search, you could use both *and* as well as *or*:

- women and (painters or artists)

The parentheses mean that these two concepts, painters and artists, should be searched as a unit, and the search results should include all items that use one word or the other. The results will then be limited to those items that contain the word *women*. If you decide to use parentheses for appropriate searches, make sure that the items contained within them are related in some way. With *or*, as in our example, it means either of the terms will work. With *and*, it means that both terms will appear in the document.

Type both of these searches in Google Scholar and compare the results. Were they the same? If not, can you determine what happened? Which result list looked better?

Here is another example of a search string, using both parentheses and two Boolean operators:

- entrepreneurship and (adolescents or teens)

In this search, you are looking for entrepreneurial initiatives connected with people in their teens. Because there are so many ways to categorize this age group, it makes sense to indicate that either of these terms should appear in the results, along with entrepreneurship.

However, this search string isn’t perfect. Can you pick out two problems with the search terms?

The third Boolean operator, *not*, can be problematic. *Not* is used to exclude items from your search. If you have decided, based on the scope of the results you are getting, to focus only on a specific aspect of a topic, use *not*, but be aware that items are being lost in this search. For example, if you entered

- entrepreneurship and (adolescents or teens) not adults

you might lose some good results. Why? If you would like to see graphical representations of the effects of Boolean operators, take a look at the Scope chapter in this book.
Here is a good overview of Boolean operator use.

Other Helpful Search Techniques

Using Boolean operators isn’t the only way you can create more useful searches. In this section, we will review several others.

Truncation

In this search:

Entreprenuers and (adolescents or teens)

you might think that the items that are retrieved from the search can refer to entrepreneurs plural or entrepreneur singular. If you did, you spotted a problem. Because computers are very literal, they usually look for the exact terms you enter. While it is true that some search functions are moving beyond this model, you want to think about alternatives, just to be safe. In this case, using the singular as well as the plural form of the word might help you to find useful sources. Truncation, or searching on the root of a word and whatever follows, lets you do this.

So, if you search on

Entrepreneur* and (adolescents or teens)

You will get items that refer either to the singular or plural version of the word entrepreneur, but also entrepreneurship.

Look at these examples:

adolescen*
educat*

Think of two or three words you might retrieve when searching on these roots. It is important to consider the results you might get and alter the root if need be. An example of this is polic*. Would it be a good idea to use this root if you wanted to search on policy or policies? Why or why not?

In some cases, a symbol other than an asterisk is used. To determine what symbol to use, check the help section in whatever resource you are using. The topic should show up under the truncation or stemming headings.

Here is the same search terms worksheet you saw earlier, but with truncation acknowledged:
Phrase Searches

Phrase searches are particularly useful when searching the web. If you put the exact phrase you want to search in quotation marks, you will only get items with those words as a phrase and not items where the words appear separately in a document, website, or other resource. Your results will usually be fewer, although surprisingly, this is not always the case. Try these two searches in the search engine of your choice:

“essay exam”
Was there a difference in the quality and quantity of results? If you would like to find out if the database or search engine you are using allows phrase searching and the conventions for doing so, search the help section. These help tools can be very, well, helpful!

Advanced Searches

Advanced searching allows you to refine your search query and prompts you for ways to do this. Consider the basic Google.com search box. It is very minimalistic, but that minimalism is deceptive. It gives the impression that searching is easy and encourages you to just enter your topic, without much thought, to get results. You certainly do get many results. But are they really good results? Simple search boxes do many searchers a disfavor. There is a better way to enter searches.

Advanced search screens show you many of the options available to you to refine your search, and, therefore, get more manageable numbers of better items. Many web search engines include advanced search screens, as do databases for searching research materials. Advanced search screens will vary from resource to resource and from web search engine to research database, but they often let you search using

- Implied Boolean operators (for example, the “all the words” option is the same as using the Boolean and)
- Limiters for date, domain (.edu, for example), type of resource (articles, book reviews, patents)
- Field (a field is a standard element, such as title of publication or author’s name)
- Phrase (rather than entering quote marks)

Let’s see how this works in practice.

**Exercise: Google Searches**

Go to the [advanced search option in Google](https://www.google.com/search). Take a look at the options Google provides to refine your search. Compare this to the basic Google search box. One of the best ways you can become a better searcher for information is to use the power of advanced searches, either by using these more complex search screens or by remembering to use Boolean operators, phrase searches, truncation, and other options available to you in most search engines and databases.

While many of the text boxes at the top of the Google Advanced Search page mirror concepts already covered in this chapter (for example, “this exact word or phrase” allows you to omit the quotes in a phrase search), the options for narrowing your results can be powerful. You can limit your search to a particular domain (such as .edu for items from educational institutions) or you can search for items you can reuse legally (with attribution, of course!) by making use of the “usage rights” option. However, be careful with some of the options, as they may excessively limit your results. If you aren’t certain about a particular option, try your search with and without using it and compare the results. If you use a search engine other than Google, check to see if it offers an advanced search option: many do.

**Subject Headings**

In the section in this chapter on advanced searches, you read about field searching. To explain further, if you know that the last name of the author whose work you are seeking is Wood, and that he worked on forestry-related topics, you can do a far better search using the author field. Just think what you would get in the way of results if you entered a basic search such as *forestry and wood*. It is great to use the appropriate Boolean operator, but oh, the results you will get! But what if you specified that *wood* had to show up as part of the author’s name? This would limit your results quite a bit.

So what about *forestry*? Is there a way to handle that using a field search? The answer is yes (why else bring it up?). Subject headings are terms that are assigned to items to group them. An example is cars—you could also call them autos, automobiles, or even more specific labels like SUVs or vans. You might use the Boolean operator or and string these all together. But if you found out that the sources you are searching use *automobiles* as the
subject heading, you wouldn’t have to worry about all these related terms, and could confidently use their subject heading and get all the results, even if the author of the piece uses *cars* and not *automobiles*.

How does this work? In many databases, a person called an indexer or cataloger scrutinizes and enters each item. This person performs helpful, behind-the-scenes tasks such as assigning subject headings, age levels, or other indicators that make it easier to search very precisely. An analogy is tagging, although indexing is more structured than tagging. If you have tagged items online, you know that you can use any terms you like and that they may be very different from someone else’s tags. With indexing, the indexer chooses from a set group of terms. Obviously, this precise indexing isn’t available for web search engines—it would be impossible to index everything on the web. But if you are searching in a database, make sure you use these features to make your searches more precise and your result lists more relevant. You also will definitely save time.

You may be thinking that this sounds good. Saving time when doing research is a great idea. But how will you know what subject headings exist, so you can use them? Here is a trick that librarians use. Even librarians don’t know what terms are used in all the databases or online catalogs that they use. So a librarian’s starting point isn’t very far from yours. But they do know to use whatever features a database provides to do an effective search. They find out about them by acting like a detective.

You’ve already thought about the possible search terms for your information need. Enter the best search strategy you developed, which might use Boolean operators or truncation. Scan the results to see if they seem to be on topic. If they aren’t, figure out what results you are getting that just aren’t right, and revise your search. Terms you have searched on often show up in bold face type, so they are easy to pick out. Besides checking the titles of the results, read the abstracts (or summaries), if there are any. You may get some ideas for other terms to use. But if your results are fairly good, scan them with the intent to find one or two items that seem to be precisely what you need. Get to the full record (or entry), where you can see all the details entered by the indexers. Here is an example from the University at Albany’s Minerva catalog, but keep in mind that the catalog or database you are using may have entries that look very different.

<table>
<thead>
<tr>
<th>001567898</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
</tr>
<tr>
<td><strong>Added Author</strong></td>
</tr>
<tr>
<td><strong>Subject</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>ISBN</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Publisher/Date</strong></td>
</tr>
</tbody>
</table>

Once you have the “full” record (which does not refer to the full text of the item, but rather the full descriptive details about the book, including author, subjects, date, and place of publication, and so on), look at the subject headings (they may be called descriptors or some other term, but they should be recognizable as subjects) and see what words are used. They may be identical to the terms you entered, but if not, revise your search using the subject heading words. The results list should now contain items that are relevant for your need.

This chapter presents a strategy for developing a successful search. This figure reviews the key points:
It is tempting to think that once you have gone through all the processes around the circle, as seen in this diagram, your information search is done and you can start writing. However, research is a recursive process. You don’t start at the beginning and continue straight through until you end at the end. Once you have followed this planning model, you will often find that you need to alter or refine your topic and start the process again, as seen here:
This revision process may happen at any time, before or during the preparation of your paper or other final product. The researchers who are most successful do this, so don’t ignore opportunities to revise.

So let’s return to Sarah and her search for information to help her team’s project. Sarah realized she needed to make a number of changes in the search strategy she was using. She had several insights that definitely led her to some good sources of information for this particular research topic. Can you identify the good ideas she implemented?

Exercise: Reviewing Search Strategies

Take this quiz online!

1. Now that the team has a draft thesis statement, the next step would be to:
   1. Enter the thesis statement into a database, rather than the catalog
   2. Select keywords and enter them into Google
   3. Dissect the thesis statement to determine key terms, related terms, and Boolean operators or other searching techniques
2. If you are interested in the use of social media such as Twitter by college students for research purposes, which of the following is the best general search strategy:
   1. (social media and Twitter) and research and college students
   2. Social media and college students and research purposes
3. (social media or Twitter or Facebook) and research and college student
3. The best place to start the search online is:
   1. An online guide on the library’s website
   2. Google
   3. The library’s catalog
4. When searching a subject-specific database, it is especially important to…
   1. Use any search refinements they provide that make sense
   2. Check for the best subject headings to use
5. Sarah realized that the order for doing the best research most often includes these steps
   1. Select topic, select keywords, do search, read and understand results, create product
   2. Select topic, select keywords, do search, read and understand results, revise search and return to the process as needed, create product
   3. Check for online assistance on the library’s website, do the search, revise the search as needed, create product

GATHER: FINDING WHAT YOU NEED

Scenario

Harry Dosital is feeling overwhelmed by one of his class assignments. Harry would have been happy if the assignment was to write a traditional research paper but his professor has asked the class to solve a real life problem. The professor has asked the class to imagine a small city undergoing a natural disaster such as a flood or a tornado. Each group in the class is required to plan a hypothetical information command center for this city. The professor explains that the government needs to obtain accurate, up-to-date information on the scope of the damage and injuries sustained due to the disaster. This information is vital for the city to be able to provide adequate emergency and medical assistance to its citizens. Harry can see that this is an important function for any city in the midst of a crisis but he is not sure about where to get reliable information to help him construct a plan for the city.

Harry and his classmates do some brainstorming and decide to approach this assignment as if they were actually producing a research paper. Their first step will be to research recent disasters. They reason that this will provide some information about the way some cities have gathered information during disasters. If an information gathering strategy worked for other cities, it will work for their hypothetical city. There certainly have been a lot of natural disasters recently, so it shouldn’t be too hard to find some information. Super Storm Sandy and Hurricane Irene are two recent events that immediately come to mind. The group starts to research Super Storm Sandy with Google and Wikipedia.

Harry and his classmates are engaging in the Gather pillar of the Seven Pillars of Information Literacy model. Just as municipalities needed to gather reliable information in order to provide vital services to their citizens, Harry and his group members need to gather information that will help them complete this assignment.

These information needs are components of the Gather pillar, which states that the information literate individual understands

- How information and data are organized
- How libraries provide access to resources
- How digital technologies provide collaborative tools to create and share information
• The issues involved in collection of new data
• The different elements of a citation
• The use of abstracts
• The need to keep up to date
• The difference between free and paid resources
• The risks involved in operating in a virtual world
• The importance of appraising and evaluating search results

They are able to

• Use a range of retrieval tools and resources effectively
• Construct complex searches appropriate to different digital and print resources
• Access full text information, both print and digital, read and download online material and data
• Use appropriate techniques to collect new data
• Keep up to date with new information
• Engage with their community to share information
• Identify when the information need has not been met
• Use online and printed help and can find personal, expert help

The abilities connected with the Gather pillar overlap, in some aspects, with those in other chapters. Where this is the case, those abilities are not addressed in this chapter.
Information Formats and the Internet

Traditionally, information has been organized in different formats, usually as a result of the time it took to gather and publish the information. For example, the purpose of news reporting is to inform the public about the basic facts of an event. This information needs to be disseminated quickly, so it is published daily in print, online, on broadcast television, and radio media. More in-depth treatment of information takes longer to research, write, and publish and traditionally was published in scholarly journals and books.
Today, information is still published in traditional formats as well as in newly evolving formats on the Internet. These new information formats are loosely defined as Web 2.0 formats and can include electronic journals, books, news websites, blogs, Twitter, Facebook, and location postings. The coexistence of all of these information formats is messy and chaotic. The process for finding relevant information is not always clear.

One way to make some sense out of the current information universe is to thoroughly understand traditional information formats. We can then understand the concepts inherent in the information formats found online. There are some direct correlations such as books and journal articles, but there are also some newer formats like tweets that didn't exist until recently.

Let’s look at the news industry. Many traditional newspapers are shutting down and those that remain are retrenching. While there are many reasons for this, one of the major trends has been the rise of the Internet. In the United States, more than 50 per cent of the population reads the news online.

Indeed, online news sites provide a different and, some might argue, a more relevant experience for the reader. They offer video and sound, up-to-the-minute updates on breaking news, and the ability to interact with the content by posting comments. Another important feature of online news is that search engines can deliver content from the site in response to a query. In other words, readers don’t have to visit a site such as the New York Times in order to read its content.

This has both positive and negative consequences. The positive consequence is that readers can quickly and conveniently obtain information from a variety of sources on a topic or event. The negative consequence is that it is more difficult to evaluate the credibility of the sources. The Evaluate chapter in this book provides some good strategies for evaluating information sources.

For Harry and his group, all of this means they will have to research many different kinds of information resources in order to create an effective information command center.

Twitter and Blog Postings

Many of the group’s Google results are Twitter feeds and blog postings. These did not provide a lot of information. After all, a tweet consists of only 140 characters. However, these resources did help Harry’s group by suggesting key people, cities, technologies, and other resources associated with Super Storm Sandy to research. Often a blog posting will provide a link to a longer, more useful resource. The students’ review of blogs and tweets also provided an otherwise unthought-of insight. As Harry and his group were reviewing Twitter feeds posted during Super Storm Sandy, they noted that people were using Twitter to inform their friends and relatives about their whereabouts, their health, and the conditions of their surroundings. Since electricity was not available, most televisions and radios did not work, but mobile technologies like Twitter served as effective communication tools. Once Harry realized this, a Twitter feed was quickly incorporated into his command center’s communication plan.

Newspaper Articles

One of the members of Harry’s group suggested they should consult a newspaper to see what role the newspaper played to help the city understand the destruction caused by the storm. The group chose the New York Times. The New York Times can be accessed online and articles from the day of the storm can be viewed. However, the group found that more useful information was published in the New York Times in the days after the storm. Harry’s initial search of the New York Times for articles containing the phrase super storm Sandy published on October 29, 2012 resulted in some blog postings from reporters and many stories about damage from the storm. But when Harry reentered his search without a date limit, he retrieved articles that analyzed how the region’s municipalities performed during the storm. It takes time to conduct this type of analysis, so looking for information that was published days, weeks, or months after the storm took place was a good strategy.

Many other newspapers can be accessed online or at a local library in microfilm. Microfilm is a film image of the print version of a newspaper. Most libraries hold many years of newspaper issues on microfilm. A microfilm reader is required to view the microfilm version of a document. Libraries that own newspapers on microfilm also provide the microfilm readers.
Primary Sources

Another member of Harry’s group recalled that he had cousins in New York City who experienced Super Storm Sandy firsthand. He offered to interview his cousins about their experiences during the storm. This type of information is known as a primary information or source. Primary sources are accounts from a person or persons who have firsthand knowledge of an event. Speeches, photographs, diaries, autobiographies, and interviews are all primary sources.

In this case, the primary source is still alive and is accessible to Harry’s group. However, some researchers are not so fortunate. If this is the case, primary sources can still be found in a variety of locations and formats. There are many online sites that have created digitized collections of copies of diaries and letters from historical events. It is important to remember that primary sources are not limited to a single format. You may find them in books, journals, newspapers, email, websites, and artwork.

Scholarly Journal Articles

The results of the research that Harry and his group has done are useful, but Harry is concerned that there might be too much focus on Super Storm Sandy. He wants to find more information on crisis and disaster management in general. Harry thinks that there might be general standards or practices that should be incorporated into his group’s plan. Journal articles and books might provide this information.

Harry starts his search for journal articles by using a multidisciplinary database because he is not sure which specific disciplines will cover the information he seeks. He constructs and executes a search query and finds that the abstracts included in the results help him choose several peer-reviewed, or scholarly, articles to read.

Scholarly journal articles usually include an abstract at the beginning of the article. An abstract summarizes the contents of the article. In an abstract, key points as well as conclusions are briefly described. Abstracts are often included in the database record. Researchers find this information helpful when deciding whether or not to retrieve the whole article.

Most of the articles that Harry chooses are available in PDF format from the database, but there are a few articles that look very relevant that don’t have links to a PDF. Harry really wants to read these articles so he decides to try to find out if there is another way to obtain the full text. He consults a librarian who instructs him to look for the title of the journal (not the article) in the online catalog. The catalog record will provide information on whether the journal is available online from another database or if it is available in print.

Journals, and the articles they contain, are often quite expensive. Libraries spend a large part of their collection budget subscribing to journals in both print and online formats. You may have noticed that a Google Scholar search will provide the citation to a journal article but will not link to the full text. This happens because Google does not subscribe to journals. It only searches and retrieves freely available web content. However, libraries do subscribe to journals and have entered into agreements to share their journal and book collections with other libraries. If you are affiliated with a library as a student, staff, or faculty member, you have access to many other libraries’ resources, through a service called interlibrary loan. Do not pay the large sums required to purchase access to articles unless you do not have another way to obtain the material, and you are unable to find a substitute resource that provides the information you need.

There is one more feature Harry found while searching in databases: some offer the option of an alert service. This feature allows Harry to enter the most productive search strings, as well as his email address. When new items are added to the database that fit his search, he receives an alert. Harry found this to be a great way to keep up to date with new articles on his topic without having to initiate a new search.

Books

Next, Harry’s group looks for books on the topic. They search the library’s online catalog using search terms that were successful in their database searches. They find some great titles and head to the library stacks to retrieve them.
Most academic libraries use the Library of Congress classification system to organize their books and other resources. The Library of Congress classification systems divides a library’s collection into 21 classes or categories. A specific letter of the alphabet is assigned to each class. More detailed divisions are accomplished with two and three letter combinations. Book shelves in most academic libraries are marked with a Library of Congress letter-number combination to correspond to the Library of Congress letter-number combination on the spines of library materials. This is often referred to as a call number and it is noted in the catalog record of every physical item on the library shelves.

Harry uses the call numbers to locate some books that he found in the catalog. He is happily surprised to find that there are also some really useful books sitting on the shelf right next to the books he previously identified. This is a handy way to find additional information resources on a topic. It is more efficient to first search the online catalog to locate relevant resources and then search the shelves.

Library of Congress Classification

A General Works — includes encyclopedias, almanacs, indexes
B-BJ Philosophy, Psychology
BL-BX Religion
C History — includes archaeology, genealogy, biography
D History — general and eastern hemisphere
E-F History — America (western hemisphere)
G Geography, Maps, Anthropology, Recreation
H Social Science
J Political Science
K Law (general)
KD Law of the United Kingdom and Ireland
KE Law of Canada
KF Law of the United States
L Education
M Music
N Fine Arts — includes architecture, sculpture, painting, drawing
P-PA General Philosophy and Linguistics, Classical Languages, and Literature
PB-PH Modern European Languages
PG Russian Literature
PJ-PM Languages and Literature of Asia, Africa, Oceania, American Indian Languages, Artificial Languages
PN-PZ General Literature, English and American Literature, Fiction in English, Juvenile Literature
PQ French, Italian, Spanish, Portuguese Literature
PT German, Dutch, and Scandinavian Literature
Q Science — includes physical and biological sciences, math, computers
Citations

As Harry's group starts to read and digest all of the information they have gathered, they notice that many articles and books contain references to other articles and books. Even Wikipedia entries contain references. These consist of citations to resources that authors have quoted or paraphrased in their work or have used to research for their publications. Some of these citations look like they would provide great information. But the group is confused. They don’t know if the citation is to a book or an article or something else.

Citations can be confusing. There are many different citation styles and not many hard and fast rules about when to use a particular style. Your professor may indicate which citation style you should use. If not, the general rule of thumb is that the Social Sciences and Education disciplines use APA (American Psychological Association) citation style, while the Humanities and Arts disciplines use MLA (Modern Language Association) or the Chicago style. You can find detailed information about how to format a citation in these styles by consulting the latest Publication Manual of the American Psychological Association, for APA citations, the most recent copy of the MLA Handbook for Writers of Research Papers, or the current Chicago Manual of Style. You should be able to find copies of these publications in the reference section of your library. You can also obtain guidance on formatting citations in the APA and MLA style from the University at Albany’s Citation Fox.

However, just knowing what citation style is used doesn’t always clear up the confusion. Each different information format is cited differently. The most common formats that you will encounter are books, chapters in books, journal articles, and websites.

Take a look at the following citations. You can see that there are differences between citation styles. You can also see that each information format contains different elements. When you try to determine whether a citation is for a book, book chapter or journal, think about the elements inherent in each of these formats. For example, a journal article appears in a journal that is published in a volume and issue. If you see volume and issue numbers in the citation, you can assume that the citation is for a journal article. A book chapter is usually written by a different author from the editors of the whole book. A whole book is often the easiest citation to decipher. It contains the fewest elements.

This chapter has discussed citations in relation to finding resources. You will encounter citations again in the Manage chapter, which covers how to use citations to share information with others.

Sharing Information

Harry had a chance to talk with members of some of the other groups in his class about the hunt for information. This was initially done informally before class started, but he wished there was a more formal process, since it was so helpful to all the groups who participated. Harry’s group shared some of what they’d learned, and also found out about some strategies others had used. The students lamented that the professor hadn’t set up some sort of electronic forum where they could share tips and resources, but then decided to do it themselves! They set up a wiki on PBWorks. It felt a bit strange at first, being collaborative in this way, rather than competitive, but it really helped everyone. One group was struggling to find information that met their needs, but between working with a librarian and consulting the wiki, they succeeded with their project.
Conclusion

Harry and his classmates have spent time gathering information to help them create a realistic and accurate crisis command center. They accessed and used Web 2.0 information sources in the form of Twitter feeds and blogs. They used online newspapers and online journal articles. They even gathered some very useful hard copy books. During this process, the students learned about different ways that information is organized including the Library of Congress classification system. Harry was amazed at the wealth of quality information he was able to gather. It took him a while and the process was more complicated than just searching the web, but Harry now feels more confident about acing the assignment. He also feels that he learned more than how to set up a command center. He learned how to engage in academic research!

Exercise: Comparing Search Strategies

Find a newspaper article about a national event, such as the 2013 Boston Marathon bombing. Make note of your search strategy.

Next find a newspaper article about a local event, for example, a flood in your area or a local crime or election. Make a note of your search strategy for this search.

Compare the two strategies. How are they alike? How are they different? Which newspaper article was easier to find? Why?

Exercise: Primary Sources

Take this quiz online!

1. Where would you find a speech by Franklin Delano Roosevelt in which he said, “The only thing we have to fear is fear itself.”?
   1. Web site of Presidential Speeches
   2. Newspaper article dated Oct. 29, 1941
   3. A print publication titled “Vital Speeches of the Day,” which has been published since 1934
   4. All of the above

2. Which of the following sources is the most likely to contain an interview with Steven Spielberg about his film “Lincoln,” produced in 2012?
   1. Article from a news magazine dated November 23, 2012
   2. A blog written by a fan of Steven Spielberg
   3. IMDb – A large online database of movie and television information
   4. All of the above

3. Which source would have the original copy of a diary written a woman who lived in Tennessee during the Civil War?
   1. The Library of Congress American Memory Project web site
   2. The Southern Historical Collection, University of North Carolina at Chapel Hill
   3. Local public library’s collection
   4. All of the above

4. Which of the following is a primary source?
   1. A review of the film “Lincoln” by Steven Spielberg
   2. A nonfiction book about the Civil War titled *The Fall of the House of Dixie: The Civil War and the Social Revolution that Transformed the South*
   3. The Facebook privacy policy
   4. A reporter’s article about an event that happened yesterday, written from information gathered from bystanders
Exercise: Identifying Citations

Take this quiz online!

   1. Journal Article
   2. Book
   3. Book Chapter
   1. Journal Article
   2. Book
   3. Book Chapter
   1. Journal Article
   2. Book
   3. Book Chapter
   1. Journal Article
   2. Book
   3. Book Chapter
   1. Journal Article
   2. Book
   3. Book Chapter
   1. Journal Article
   2. Book
   3. Book Chapter

WHAT ARE OPEN EDUCATIONAL RESOURCES?

Open Education Resources (OERs) are resources that are available for free use. Typically you are free to retain, reuse, revise, remix, and redistribute OER content (these are known as the 5 Rs); however some licenses have different restrictions. Generally, OERs are licensed under creative commons licenses; some of these licenses include CC, CC BY, CC BY-SA, and CC BY-NC. Click here to learn more about the different licenses.

Watch this video online: https://youtu.be/-xGRztrWv-k
EXTERNAL LINKS: LIBRARY GUIDES

Links

Look at these library guides to learn more about the following topics:

- Open Access Books
- Open Access Journals
- Cite Sources

MAKE CITATIONS

Your research is done and your paper is written. What else is left to do before you can turn in your assignment?

You still have to document the sources that you used. How do you do this?

With CITATIONS!

In this lesson, you will learn:

- The basic bibliographic information required for any citation, regardless of style
- How important it is to provide accurate bibliographic information about your sources in bibliographies and works cited lists
- The common citation style formats of MLA, APA, and CSE

How Much Do You Already Know?

1. Why is proper citation of a source necessary?
1. To make sure you avoid plagiarism
   2. To give the people reading your paper the information necessary to find the source you quoted
   3. To help connect your research to other scholars
   4. All of the above

2. From the following, what basic piece of bibliographic information is missing for a citation of a chapter of a book?
   Author, Title, Publisher, Date of publication
   1. Place of publication
   2. Author and title of chapter
   3. Pages of chapter
   4. All of the above

3. From the following, what basic piece of bibliographic information is missing for a citation of an article?
   Author, Title of Article, Volume number, Date of publication, Page numbers
   1. Title of journal
   2. Issue number
   3. Place of publication
   4. Both 2.1 and 2.3

4. The same basic bibliographic information is needed for a citation of a source in the MLA, APA, and CSE style formats.
   1. True
   2. False

**Answers**

1. 1.1; Citations are important for many reasons.
2. 2.4; In a citation for a chapter of a book, the place of publication, the pages, AND the author and title of the chapter need to be included along with the other elements listed.
3. 3.4; In a citation for an article, the title of the journal AND the issue number need to be included along with the other elements listed.
4. True; You still need the same basic bibliographic information of a source no matter which format you are using for your citations.

### Why Is It Important That I Cite My Sources Accurately?

Citations are important because:

- They help others find the information that you used.
- They help establish the credibility of your own research.
- They connect your work to the work of other scholars.
- It is one way that scholars enter into a dialogue with each other.
- It is a way to honor and acknowledge the work of others who have made your own research possible.

**Hot Tip!**

Citing sources is about academic integrity. Learn about UCI's [academic honesty policy](https://www.uci.edu/about/administration/policies-and-procedures/academic-honesty-policy) to help you avoid plagiarism.
What Is the Basic Bibliographic Information Required for a Book Citation?

Author

- Instead of an author, a book can have an editor, compiler, or translator.
- There are rules for citing books that have a corporate author or no author at all.

Title of Book

Make sure to include subtitles of books as they appear on the title page.

Publisher

All publication information should be found on the title page.

Place of Publication

Make sure to retrieve publication information from the book itself and not from the library catalog or online database.

Date of Publication

If the date of publication is not on the title page, look through the first few pages of the book until you find it.

What Bibliographic Information is Required for a Book Chapter Citation?

You need the same bibliographic information as a book, but you MUST add the author, title and page numbers of the specific chapter you are citing.

What Is the Basic Bibliographic Information Required for a Journal Article Citation?

Author

There are rules for formatting for more than one author, a corporate author, or no author at all.

Title of Article

Make sure to find the title of the article on the first page of the article and not from the table of contents or the cover of the journal.

Title of Journal

The title of the journal is just as important as the title of the article when citing from scholarly journals. You need both!
Volume and Issue Number

you can find the volume and issue number on the title page, the front cover of the journal, or on the article itself.

Date of Publication

You can also find the year the journal was published on the title page, front cover of the journal, or on the article itself.

Page Numbers

Remember to include the page numbers of the entire article and not just the pages where you found the information you’re citing.

My Professor Says I Have To Use MLA Format For My Works Cited List. What Does That Mean?

There are many different formats for citing the sources you use in your research. Here are a few.

<table>
<thead>
<tr>
<th>Format</th>
<th>Discipline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern Language Association (MLA)</td>
<td>Humanities</td>
</tr>
<tr>
<td>American Psychological Association</td>
<td>Social Science</td>
</tr>
<tr>
<td>(APA)</td>
<td>Education</td>
</tr>
<tr>
<td></td>
<td>Business</td>
</tr>
<tr>
<td>Council of Science Editors (CSE)</td>
<td>Life Sciences</td>
</tr>
<tr>
<td></td>
<td>Physical Sciences</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
</tr>
</tbody>
</table>

Regardless of which format you use, you must include the same basic bibliographic information when citing a source.

Hot Tip!

For some examples of bibliographic information in different formats, visit the LibGuide to Citations

What If I’m Using An Electronic Copy Of A Book Or An Article?

Depending on which citation style you are using, you will need to differentiate between print and online copies. Each style has its own rules for formatting this information.

For example, you might need to include the online database where you retrieved the information. Including a URL of a journal or website can be appropriate for some citations. Many online sources now include a Digital Object Identifier (DOI) for the text. A DOI is a unique identifier assigned to the online content in order to locate that content on the Internet.

URLs and DOIs are not enough for a citation. You still must include the basic bibliographic information when citing a source.
What If I Can’t Find An Author?

There are common situations where legitimate publications might not have an obvious author. Each style format has rules for citing materials with no author.

Corporate Author

Publications produced by government agencies or professional associations often have a corporate author.

Edited Volume

Edited works are most common with books

News Magazine Articles

Articles from sources like Time Magazine or Newsweek are written by journalists but often don’t include the author’s name.

Be cautious when you cannot find any author to cite. The sources you use should be from authors who are experts in their field.

This is great, but most of my sources are blogs, videos I found on YouTube, and public websites. How do I cite those?

A word to the wise—if your assignment requires you to use scholarly sources, and most of your information comes from blogs, YouTube videos, and websites, you need to Ask a Librarian how to find scholarly books and articles.

Information from those sources will impress your professor in a way that information from websites and YouTube won’t.

Are There Tools To Help Me With Citations?

There are lots of online citation making tools available. The library name for them is “bibliographic management software.” Some have to be downloaded to your computer or mobile device, while others have a web interface.

Bibliographic management software makes formatting citations easier, but you still have to use your brain and check to see that all of necessary information has been imported and formatted correctly.
Some examples include:

- Citation Machine
- Noodle Tools
- Zotero
- Turn it in

Remember, nothing replaces logical thinking. Always consult the format handbook for the rules.

Test Yourself: What Have You Learned?

1. Other than avoiding plagiarism, why is it important to cite sources accurately?
   1. To acknowledge the research of the scholars who made your work possible.
   2. To establish credibility of your research.
   3. To connect your research to the work of other scholars.
   4. All of the above.

2. What can be a problem when relying on online citation tools?
   1. They may not format the citation correctly.
   2. They are too expensive.
   3. Information from the library catalog or an online database can export incorrectly.
   4. Both 2.1 and 2.3.

3. What information is missing from the citation of this journal article?
   1. Volume and issue number
   2. Title of journal
   3. Title of article
   4. Nothing is missing

4. When citing a source you retrieved online, all you need is a DOI or URL.
   1. True
   2. False

5. Which information sources are best to use for your research assignment?
   1. Scholarly books and articles
   2. Blogs and website articles
   3. Any article as long as it comes from Google Scholar
   4. All of the above

6. What information is missing from the citation of a book chapter?
   1. Title of book
   2. Title of chapter
   3. Page numbers of chapter
   4. Publisher

Answers

1. All of the above; Citing sources is about more than just plagiarism
2. 2.1 and 2.3; Online tools cannot replace your brain. Make sure your citation information is correct and formatted properly yourself.
3. 3.2; We have the title of the article but it looks like we are missing the title of the journal, which is just as important.
4. False; A proper citation must have all the basic bibliographic elements to be complete.
5. 5.1; There are written by experts in their field who use current and accurate research.
6. 6.4; We see the place of publication Oxford, but there is no information on the name of the publisher.
UNDERSTANDING URLS

URL stands for Uniform Resource Locator.

A URL is just the internet address for any given webpage:

Understanding the component parts of a URL can be helpful in a variety of situations. Here are just a few reasons why understanding URLs is useful:

- The URL often reveals key information about a site
- An understanding of URLs provides the needed foundation for many advanced search strategies
- A heightened attention to URLs helps searchers recognize fraudulent sites

Each section below focuses on a different part of the URL. At the end of the webtext is a quiz that you can take to test your understanding of URLs.

Locate the protocol

The “protocol” is the first part of URL. Some browsers simplify how addresses are displayed by hiding the protocol: for example, in Chrome and Firefox, http://writingcommons.org displays as writingcommons.org

The protocol https indicates that information sent through the page will be encrypted, and therefore harder to read if some third party intercepts the information. (The next time you are entering a username and password on a page, check for the “https” protocol.)

Locate the domain name

The “domain name” identifies the site that contains the page you are viewing. It appears just before the first single slash (/). If there is no single slash, then the domain name is whatever appears at the end of the URL.

For example, the following URLs all refer to pages on the Writing Commons site:

- http://writingcommons.org/open-text/information-literacy
- writingcommons.org/open-text/research-methods-methodologies/integrate-evidence/incorporate-evidence/1030-synthesizing-your-research-findings
If you look carefully, you will see that most browsers try to help users out by boldfacing the domain name in the address bar.

Example

http://www.writingcommons.org/open-text/information-literacy

Being able to locate the domain name in a URL allows you to identify the entity that hosts the page you are viewing—a piece of information that is often crucial to understanding the nature of your source.

Recognize sub-directories

Elements of the URL that appear after the domain indicate different sub-directories. For example:

http://writingcommons.org/open-text/information-literacy/rhetorical-analysis

In the example above, “open-text,” “information-literacy,” and “rhetorical-analysis” are sub-directories of the domain writingcommons.org. Think of these as folders within folders.

Recognize subdomains

Subdomains are similar to sub-directories in that they provide a way for website developers to separate content, but subdomains appear before the domain name in the URL. Don’t let this trip you up. The domain name is still the content that appears pressed up against the first single slash (/) or—if there is no single slash—at the very end of the URL.

For example, the domain name in all of the following URLs is google.com

- www.google.com
- books.google.com
- https://accounts.google.com/Login

Pay attention to the placement of the dots. The following is not a Google page:

www.mgoogle.com

Here the domain is mgoogle.com, not google.com

Recognize top-level domains

In the domain name writingcommons.org, the “top-level domain” is .org. The top-level domain .org was originally intended for use by non-profit organizations—and many non-profits continue to use it—but it is now open to anyone.
In the domain name amazon.com, the top-level domain is .com. Short for “commercial,” .com is the most common top-level domain in the world and is now used for a wide variety of sites—not just the sites of commercial enterprises.

Some top-level domains have retained their original meanings and are especially helpful to know:

<table>
<thead>
<tr>
<th>domain</th>
<th>description</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td>.edu</td>
<td>university site</td>
<td><a href="http://www.nu.edu">http://www.nu.edu</a></td>
</tr>
<tr>
<td>.gov</td>
<td>government site</td>
<td><a href="http://www.senate.gov">http://www.senate.gov</a></td>
</tr>
<tr>
<td>.mil</td>
<td>military site</td>
<td><a href="http://www.army.mil">http://www.army.mil</a></td>
</tr>
</tbody>
</table>

Newer top-level domains such as .museum, .bike, and .clothing are not yet widely used.

Some domains include a country domain extension—or “country code top level domain.”

Here are some examples:

<table>
<thead>
<tr>
<th>code</th>
<th>country</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td>.in</td>
<td>India</td>
<td>indianrail.gov.in</td>
</tr>
<tr>
<td>.de</td>
<td>Germany</td>
<td><a href="http://www.spiegel.de">www.spiegel.de</a></td>
</tr>
<tr>
<td>.ca</td>
<td>Canada</td>
<td><a href="http://www.cbc.ca">www.cbc.ca</a></td>
</tr>
<tr>
<td>.jp</td>
<td>Japan</td>
<td><a href="http://www.nicovideo.jp">www.nicovideo.jp</a></td>
</tr>
<tr>
<td>.uk</td>
<td>United Kingdom</td>
<td><a href="http://www.ima.org.uk">www.ima.org.uk</a></td>
</tr>
</tbody>
</table>

Pay attention to country domain extensions. When present in a URL, they represent a core component of the domain. Note, for example, that hydra.com and hydra.com.gr are different domains. The two are unrelated sites run by unrelated entities.

For a comprehensive list of top-level domains, consult one of the following:

- Wikipedia: List of Internet top-level domains
- IANA Root Zone Database

Use your understanding of URLs to enhance your web searching

Once you understand URLs, certain kinds of advanced search strategies become easier to conceptualize, remember, and implement—for example, filtering by domain and top-level domain.

Filter by top-level domain

If you know that the kind of information you are seeking is most likely to appear on a site with a particular type of top-level domain, you can restrict your search to this type of site using the site: search operator.

For example, if you are seeking government documents on the topic of student loans, then a search for student loans site:gov will return only results with the top-level domain gov, filtering out a large number of sites that are not relevant to your research needs.
Filter by domain

If you know the domain of the site on which your information will appear, you can use site: to search only that site.

For example, a search for sample tests site:dmv.ca.gov will return only pages located on the California Department of Motor Vehicles (DMV) website (the domain of which is dmv.ca.gov).

The site: operator works in all major search engines (Google, Bing, Baidu, DuckDuckGo, etc.).

Practice identifying deceptive URLs

The immediate benefit of the drill below will be to improve your ability to distinguish between real and fraudulent sites, but the exercise will also help you sharpen your overall URL-analysis skills by heightening your attention to the component parts of URLs.

A) Which of the following are eBay.com web pages? Do not go to the sites. (Some sites masquerading as legitimate sites may contain harmful underlying code). Just examine the URLs.


4. http://68.112.112.34:8866/ebay.htm

5. http://signin.ebay.com@10.19.29.2


B) Find the domain name in this URL:


Answers

A) eBay page?

<table>
<thead>
<tr>
<th>URL</th>
<th>Answer</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://pages.ebay.com">http://pages.ebay.com</a></td>
<td>YES</td>
<td>This is an eBay page. The domain name is ebay.com</td>
</tr>
<tr>
<td><a href="http://movies.half.ebay.com">http://movies.half.ebay.com</a></td>
<td>YES</td>
<td>This is an eBay page. The domain name is ebay.com (&quot;movies&quot; and &quot;half&quot; indicate subdomains).</td>
</tr>
<tr>
<td><a href="http://pages.ebey.com">http://pages.ebey.com</a></td>
<td>NO</td>
<td>This is not an eBay page. Note that “ebay” is misspelled as ebey.</td>
</tr>
<tr>
<td><a href="http://68.112.112.34:8866/ebay.htm">http://68.112.112.34:8866/ebay.htm</a></td>
<td>NO</td>
<td>This is not an eBay page. The first single slash (/) is not preceded by the domain name ebay.com.</td>
</tr>
<tr>
<td><a href="http://signin.ebay.com@10.19.29.2">http://signin.ebay.com@10.19.29.2</a></td>
<td>NO</td>
<td>This is not an eBay page. Notice that there is no slash (/) after “ebay.com.”</td>
</tr>
<tr>
<td>No./Yes</td>
<td>URL Description</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>6. <a href="http://page.@ebay.com">http://page.@ebay.com</a> This is not an eBay page. The actual domain is @ebay.com, not ebay.com. (@ebay.com is as different from ebay.com as zebay.com, bebay.com, mebay.com, etc. One character can make all the difference.)</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>7. <a href="http://signin-ebay.com">http://signin-ebay.com</a> This is not an eBay page. If the hyphen were a period, we’d be fine. But it isn’t. As in the example above with @, the hyphen could be any character and be just as wrong.</td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>8. <a href="http://www.ebay.com/electronics/ipad">http://www.ebay.com/electronics/ipad</a> This is an eBay page. The domain name is ebay.com. The first single slash (/) is directly preceded by .ebay.com</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>9. <a href="http://www.ebay.deals.com">http://www.ebay.deals.com</a> This is not an eBay page. The domain name is deals.com (not ebay.com).</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>10. <a href="http://www.ebay.pro">http://www.ebay.pro</a> This is not an eBay page. The domain name is ebay.pro (not ebay.com).</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>11. <a href="http://www.ebay.com.bb/motors/motorcycles">http://www.ebay.com.bb/motors/motorcycles</a> This is not an eBay page. The domain name is ebay.com.bb (not ebay.com).</td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>12. <a href="http://www.ebay.com/itm/A-Planet-of-Viruses-by-Carl-Zimmer-2011-Hardcover-/191063912359">http://www.ebay.com/itm/A-Planet-of-Viruses-by-Carl-Zimmer-2011-Hardcover-/191063912359</a> This is an eBay page. The domain name is ebay.com. The first slash is directly preceded by .ebay.com</td>
<td></td>
</tr>
</tbody>
</table>

B) The domain name in the following URL is bernadinec.com (not bankofamerica.com). Notice that bernadinec.com is what appears just before the first single slash (/): 

http://www.bankofamerica.com.sas.signon.do.detect.2.signin.sessionid.rmrflbqjlokjcpczgs.oxcsvcpdsoeseeytje.yucfnjtidbvnurindex.php?pageType=708XeMWZamp;cust=redacted@redacted.redactedamp;l=IWXS3AlBXVSahQRhgTDr=https://sitekassas/signon.do?SignIn&SMSESSIONID=ASERTFGUY2I94O0389GYBH23JNMKUYH83JMN12I90U82HJNASDKOASD9AS8D&i=...
EVALUATE: ASSESSING YOUR RESEARCH PROCESS AND FINDINGS

Introduction

In 2010, a textbook being used in fourth grade classrooms in Virginia became big news for all the wrong reasons. The book, *Our Virginia* by Joy Masoff, had caught the attention of a parent who was helping her child do her homework, according to an article in *The Washington Post*. Carol Sheriff was a historian for the College of William and Mary and as she worked with her daughter, she began to notice some glaring historical errors, not the least of which was a passage which described how thousands of African Americans fought for the South during the Civil War.

Further investigation into the book revealed that, although the author had written textbooks on a variety of subjects, she was not a trained historian. The research she had done to write *Our Virginia*, and in particular the information she included about Black Confederate soldiers, was done through the Internet and included sources created by groups like the Sons of Confederate Veterans, an organization which promotes views of history that de-emphasize the role of slavery in the Civil War.
How did a book with errors like these come to be used as part of the curriculum and who was at fault? Was it Masoff for using untrustworthy sources for her research? Was it the editors who allowed the book to be published with these errors intact? Was it the school board for approving the book without more closely reviewing its accuracy?

There are a number of issues at play in the case of *Our Virginia*, but there’s no question that evaluating sources is an important part of the research process and doesn’t just apply to Internet sources. Using inaccurate, irrelevant, or poorly researched sources can affect the quality of your own work. Being able to understand and apply the concepts that follow is crucial to becoming a more savvy user and creator of information.

The Evaluate pillar states that individuals are able to review the research process and compare and evaluate information and data. It encompasses important knowledge and abilities.

They understand

- The information and data landscape of their learning/research context
- Issues of quality, accuracy, relevance, bias, reputation and credibility relating to information and data sources
- How information is evaluated and published, to help inform their personal evaluation process
- The importance of consistency in data collection
- The importance of citation in their learning/research context

They are able to

- Distinguish between different information resources and the information they provide
- Choose suitable material on their search topic, using appropriate criteria
- Assess the quality, accuracy, relevance, bias, reputation and credibility of the information resources found
- Assess the credibility of the data gathered
- Read critically, identifying key points and arguments
- Relate the information found to the original search strategy
- Critically appraise and evaluate their own findings and those of others
- Know when to stop
Proficiencies in the Evaluate pillar

The first section of this chapter will talk about some of the ideas and concepts behind evaluating sources (the abilities in the above list), while the second section will give you the opportunity to put your evaluation skills into practice.

Distinguishing Between Information Resources

Information is published in a variety of formats, each with its own special considerations when it comes to evaluation. Consider the following formats.

Social Media

Social media is a quickly rising star in the landscape of information gathering. Facebook updates, tweets, wikis, and blogs have made information creators of us all and have a strong influence not just on how we communicate with each other but also on how we learn about current events or discover items of interest. Anyone can create or contribute to social media and nothing that’s said is checked for accuracy before it’s posted for the world to see. So do people really use social media for research? Currently, the main use for social media like tweets and
Facebook posts is as primary sources that are treated as the objects under study rather than sources of information on a topic. But now that the Modern Language Association has a recommended way to cite a tweet, social media may, in fact, be gaining credibility as a resource.

News Articles

These days, social media will generally be among the first to cover a big news story, with news media writing an article or report after more information has been gathered. News articles are written by journalists who either report on an event they have witnessed firsthand, or after making contact with those more directly involved. The focus is on information that is of immediate interest to the public and these articles are written in a way that a general audience will be able to understand. These articles go through a fact-checking process, but when a story is big and the goal is to inform readers of urgent or timely information, inaccuracies may occur. In research, news articles are often best treated as primary sources, especially if they were published immediately after a current event.

Magazine Articles

While news articles and social media tend to concentrate on what happened, how it happened, who it happened to, and where it happened, magazine articles are more about understanding why something happened, usually with the benefit of at least a little hindsight. Writers of magazine articles also fall into the journalist category and rely heavily on investigation and interviews for research. Fact-checking in magazine articles tends to be more accurate because magazines publish less frequently than news outlets and have more time to get facts right. Depending on the focus of the magazine, articles may cover current events or just items of general interest to the intended audience. The language may be more emotional or dramatic than the factual tone of news articles, but the articles are written at a similar reading level so as to appeal to the widest audience possible. A magazine article is considered a popular source rather than a scholarly one, which gives it less weight in a research context but doesn't take away the value completely.

Scholarly Articles

Scholarly articles are written by and for experts in a field and generally describe formal research studies or experiments conducted to provide new insight on a topic rather than reporting current events or items of general interest. You may have heard the term “peer review” in relation to scholarly articles. This means that before an article is published, it undergoes a review process in order to confirm that the information is accurate and the research it discusses is valid. This process adds a level of credibility to the article that you would not find in a magazine or news article. Scholarly articles tend to be long and feature specialized language that is not easily understood by someone who does not already have some level of expertise on the topic. Though they may not be as easy to use, they carry a lot of weight in a research context, especially if you are working in a field related to science or technology. These sources will give you information to build on in your own original research.

Books

Books have been a staple of the research process since Gutenberg invented the printing press because a topic can be covered in more depth in a book than in most other types of sources. Also, the conventional wisdom for books is that anyone can write one, but only the best ones get published. This is becoming less true as books are published in a wider variety of formats and via a wider variety of venues than in previous eras, which is something to be aware of when using a book for research purposes. For now, the editing process for formally published books is still in place and research in the humanities, which includes topics such as literature and history, continues to be published primarily in this format.

Choosing Materials

When choosing a source for your research, what criteria do you usually use? Gauging whether the source relates to your topic at all is probably one. How high up it appears on the results list when you search may be another. Beyond that, you may base your decision at least partly on how easy it is to access.
These are all important criteria, to varying degrees, but there are other criteria you may want to keep in mind when deciding if a source will be useful to your research.

Quality

Scholarly journals and books are traditionally considered to be higher quality information sources because they have gone through a more thorough editing process that ensures the quality of their content. Generally, you also pay more to access these sources or may have to rely on a library or university to pay for access for you. Information on the Internet can also be of a high quality but there is less of a quality assurance process in place for much of that information. In the current climate, the highest quality information even on the Internet often requires a subscription or other form of payment for access.

Clues to a source’s level of quality are closely related to thinking about how the source was produced, including what format it was published in and whether it is likely to have gone through a formal editing process prior to publication.

Accuracy

A source is accurate if the information it contains is correct. Sometimes it’s easy to tell when a piece of information is simply wrong, especially if you have some prior knowledge of the subject. But if you’re less familiar with the subject, inaccuracies can be harder to detect, especially when they come in subtler forms such as exaggerations or inconsistencies.

To determine whether a source is accurate, you need to look more deeply at the content of the source, including where the information in the source comes from and what evidence the author uses to support their views and conclusions. It also helps to compare your source against another source. A reader of Our Virginia may not have reason to believe the information the author cites from the Sons of Confederate Veterans website is inaccurate, but if they compared the book against another source, the inconsistencies might become more apparent.

Relevance

Relevance has to do with deciding whether the source actually relates to your topic and, if it does, how closely it relates. Some sources may be an exact match; for others, you may need to consider a particular angle or context before you can tell whether the source applies to your topic. When searching for relevant sources, you should keep an open mind—but not too open. Don’t pick something that’s not really related just because it’s on the first page or two of results or because it sounds good.

You can assess the relevance of a source by comparing it against your research topic or research question. Keep in mind that the source may not need to match on all points, but it should match on enough points to be usable for your research beyond simply satisfying a requirement for an assignment.

Bias

An example of bias is when someone expresses a view that is one-sided without much consideration for information that might negate what they believe. Bias is most prevalent in sources that cover controversial issues where the author may attempt to persuade their readers to one side of the issue without giving fair consideration to the other side of things. If the research topic you are using has ever been the cause of heated debate, you will need to be especially watchful for any bias in the sources you find.

Bias can be difficult to detect, particularly when we are looking at persuasive sources that we want to agree with. If you want to believe something is true, chances are you’ll side with your own internal bias without consideration for whether a source exhibits bias. When deciding whether there is bias in a source, look for dramatic language and images, poorly supported evidence against an opposing viewpoint, or a strong leaning in one direction.
Reputation

Is the author of the source you have found a professor at a university or a self-published blogger? If the author is a professor, are they respected in their field or is their work heavily challenged? What about the publication itself? Is it held in high regard or relatively unknown? Digging a little deeper to find out what you can about the reputation of both the author and the publication can go a long way toward deciding whether a source is valuable.

You can investigate the reputation of an author by looking at any biographical information that is available as part of the source. Looking to see what else the author has published and whether this information has positive reviews is also important in establishing whether the author has a good reputation. The reputation of a publication can also be investigated through reviews, word-of-mouth by professionals in the field, or online databases that keep track of statistics related to a journal’s credibility.

Credibility

Credibility has to do with the believability or trustworthiness of a source based on evidence such as information about the author, the reputation of the publication, and how well-formatted the source is. How likely would you be to use a source that was written by someone with no expertise on a topic or a source that appeared in a publication that was known for featuring low quality information? What if the source was riddled with spelling and formatting errors? Looking at sources like these should inspire more caution.

Objectively, credibility can be determined by taking into account all of the other criteria discussed for evaluating a source. Knowing that some types of sources, such as scholarly journals, are generally considered more credible than others, such as self-published websites, may also help. Subjectively, deciding whether a source is credible may come down to a gut feeling. If something about a source doesn’t sit well with you, you may decide to pass it over.

Identifying Key Points and Arguments

Evaluating information about the source from its title, author, and summary information is only the first step. The evaluation process continues when you begin to read the source in more detail and make decisions about how (or whether) you will ultimately use it for your own research.

When you begin to look more deeply at your source, pay close attention to the following features of a document.

Introduction

The purpose of the introduction to any piece that has one is to give information about what the reader can expect from the source as a whole. There are different types of introductions, including forewords and prefaces that may be written by the author of the book or by someone else with knowledge of the subject. Introductory sections can include background information on why the topic was chosen, background on the author’s interest in the topic, context pertaining to why the topic is important, or the lens through which the topic will be explored. Knowing this information before diving in to the body of the work will help you understand the author’s approach to the topic and how it might relate to the approach you are taking in your own research.

Table of Contents

Most of the time, if your source is a book or an entire website, it will be divided into sections that each cover a particular aspect of the overall topic. It may be necessary to read through all of these sections in order to get a “big picture” understanding of the information being discussed or it may be better to concentrate only on the areas that relate most closely to your own research. Looking over the table of contents or menu will help you decide whether you need the whole source or only pieces of it.
List of References

If the source you’re using is research-based, it should have a list of references that usually appear at the end of the document. Reviewing these references will give you a better idea of the kind of work the author put into their own research. Did they put as much work into evaluating their sources as you are? Can you tell from the citations if the sources used were credible? When were they published? Do they represent a fair balance of perspectives or do they all support a limited point of view? What information does the author use from these sources and in what way does he or she use that information? Use your own research skills to spy on the research habits of others to help you evaluate the source.

Evaluating Your Findings

In the case of Our Virginia, the author used a biased source as part of her research and the inaccurate information she got from that source affected the quality of her own work. Likewise, if anyone had used her book as part of their research, it would have set off a chain reaction, since whatever information they cited from Our Virginia would naturally have to be called into question, possibly diminishing the value of their own conclusions.

Evaluating the sources you use for quality, accuracy, relevance, bias, and credibility is a good first step in making sure this doesn’t happen, but have you ever thought about evaluating the sources used by your own sources? This takes extra time, but looking at the reference list, bibliography, or notes section of any source you use to gauge the quality of the research done by the author of that source can be an important extra step.

Knowing When to Stop

For some researchers, the process of searching for and evaluating sources is a highly enjoyable, rewarding part of doing research. For others, it’s a necessary evil on the way to constructing their own ideas and sharing their own conclusions. Whichever end of the spectrum you most closely identify with, here are a few ideas about the ever-important skill of knowing when to stop.

You’ve satisfied the requirements for the assignment and/or your curiosity on the topic

If you’re doing research as part of a course assignment, chances are you’ve been given a required number of sources. Novice researchers may find this number useful to understand how much research is considered appropriate for a particular topic. However, a common mistake is to focus more on the number of sources than on the quality of those sources. Meeting that magic number is great, but not if the sources used are low quality or otherwise inappropriate for the level of research being done.

You have a deadline looming

Nothing better inspires forward motion in a research project than having to meet a deadline, whether it’s set by a professor, an advisor, a publisher, or yourself. Time management skills are especially useful, but since research is a cyclical process that sometimes circles back on itself when you discover new knowledge or change direction, planning things out in minute detail may not work. Leaving yourself enough time to follow the twists and turns of the research and writing process goes a long way toward getting your work in when it’s expected.

You need to change your topic

You’ve been searching for information on your topic for a while now. Every search seems to come up empty or full of irrelevant information. You’ve brought your case to a research expert, like a librarian, who has given advice on how to adjust your search or how to find potential sources you may have previously dismissed. Still nothing. It could be that your topic is too specific or that it covers something that’s too new, like a current event that hasn’t made it far enough in the information cycle yet. Whatever the reason, if you’ve exhausted every available avenue
and there truly is no information on your topic of interest, this may be a sign that you need to stop what you’re doing and change your topic.

You’re getting overwhelmed

The opposite of not finding enough information on your topic is finding too much. You want to collect it all, read through it all, and evaluate it all to make sure you have exactly what you need. But now you’re running out of room on your flash drive, your Dropbox account is getting full, and you don’t know how you’re going to sort through it all and look for more. The solution: stop looking. Go through what you have. If you find what you need in what you already have, great! If not, you can always keep looking. You don’t need to find everything in the first pass. There is plenty of opportunity to do more if more is needed!

From Theory to Practice

Looking back, the *Our Virginia* case is more complicated than it may have first appeared. It wasn’t just that the author based her writing on research done through the Internet. It was the nature of the sources she used and the effect using those sources ultimately had on the quality of her own work. These mistakes happened despite a formal editing process that should have ensured better accuracy and an approval process by the school board that should have evaluated the material more closely. With both of these processes having failed, it was up to one of the book’s readers, the parent of a student who compared the information against her own specialized knowledge, to figure it all out.

Now that you know more about the theory behind evaluating sources, it’s time to apply the theory. The following section will help you put source evaluation into perspective using something called the CRAAP test. You’ll also have the opportunity to try out your new skills with several hands-on activities.

Evaluating Resources in Practice

When you begin evaluating sources, what should you consider? The CRAAP test is a series of common evaluative elements you can use. The CRAAP test was developed by librarians at California State University at Chico and it gives you a good, overall set of elements to look for when evaluating a resource. Let’s consider what each of these evaluative elements means.

**Currency**

One of the most important and interesting steps to take as you begin researching a subject is selecting the resources that will help you build your thesis and support your assertions. Certain topics require you to pay special attention to how current your resource is—because they are time sensitive, because they have evolved so much over the years, or because new research comes out on the topic so frequently. When evaluating the currency of an article, consider the following:

- When was the item written, and how frequently does the publication it is in come out?
- Is there evidence of newly added or updated information in the item?
- If the information is dated, is it still suitable for your topic?
- How frequently does information change about your topic?

**Exercise: Assess Currency**

Assessing currency means understanding the importance of timely information

Imagine that you are writing a paper for a Political Science class on Japan’s environmental policy since the Kyoto Treaty. Identify one resource that you would find helpful in your research, and one resource that you
would find less helpful. Write one sentence explaining why you would or would not use each resource, paying special attention to the currency of each item.

Relevance

Understanding what resources are most applicable to your subject and why they are applicable can help you focus and refine your thesis. Many topics are broad and searching for information on them produces a wide range of resources. Narrowing your topic and focusing on resources specific to your needs can help reduce the piles of information and help you focus in on what is truly important to read and reference. When determining relevance consider the following:

- Does the item contain information relevant to your argument or thesis?
- Read the article’s introduction, thesis, and conclusion.
- Scan main headings and identify article keywords.
- For book resources, start with the index or table of contents—how wide a scope does the item have? Will you use part or all of this resource?
- Does the information presented support or refute your ideas?
- If the information refutes your ideas, how will this change your argument?
- Does the material provide you with current information?
- What is the material's intended audience?

Exercise: Find Relevant Sources

Relevance is the importance of the information for your specific needs

You are researching a paper where you argue that vaccinations have no connection to autism. Which of these resources would you consider relevant? Why or why not?


Authority

Understanding more about your information’s source helps you determine when, how, and where to use that information. Is your author an expert on the subject? Do they have some personal stake in the argument they are making? What is the author or information producer’s background? When determining the authority of your source, consider the following:

- What are the author’s credentials?
- What is the author's level of education, experience, and/or occupation?
- What qualifies the author to write about this topic?
- What affiliations does the author have? Could these affiliations affect their position?
- What organization or body published the information? Is it authoritative? Does it have an explicit position or bias?
Exercise: Identify Authoritative Sources

Authority is the source of the information—the author’s purpose and what their credentials and/or affiliations are.

The following items are all related to a research paper on women in the workplace. Write two sentences for each resource explaining why the author or authors might or might not be considered authoritative in this field:


Accuracy

Determining where information comes from, if evidence supports the information, and if the information has been reviewed or refereed can help you decide how and whether to use a source. When determining the accuracy of a source, consider the following:

- Is the source well-documented? Does it include footnotes, citations or a bibliography?
- Is information in the source presented as fact, opinion or propaganda? Are biases clear?
- Can you verify information from referenced information in the source?
- Is the information written clearly and free of typographical and grammatical mistakes? Does the source look to be edited before publication? A clean, well-presented paper does not always indicate accuracy, but usually at least means more eyes have been on the information.

Exercise: Find Accurate Sources

Accuracy is the reliability, truthfulness, and correctness of the content.

Which of the following articles are peer reviewed? How do you know? How did you find out? Were you able to access the articles to examine them?


Purpose

Knowing why information was created is a key to evaluation. Understanding the reason or purpose of the information, if the information has clear intentions, or if the information is fact, opinion or propaganda will help you decide how and why to use information

- Is the author’s purpose to inform, sell, persuade, or entertain?
- Does the source have an obvious bias or prejudice?
- Is the article presented from multiple points of view?
- Does the author omit important facts or data that might disprove their argument?
- Is the author’s language informal, joking, emotional, or impassioned?
- Is the information clearly supported by evidence?
Exercise: Identify the Information Purpose

Purpose is the reason the information exists—determine if the information has clear intentions or purpose and if the information is fact, opinion, or propaganda.

Take a look at the following sources. Why do you think this information was created? Who is the creator?

- http://www.chevron.com/globalissues/climatechange/
- http://www.beefnutrition.org/
- http://zapatopi.net/treeoctopus/
- Your Brain on Video Games http://www.ted.com/talks/daphne_bavelier_your_brain_on_video_games.html

Conclusion

When you feel overwhelmed by the information you are finding, the CRAAP test can help you determine which information is the most useful to your research topic. How you respond to what you find out using the CRAAP test will depend on your topic. Maybe you want to use two overtly biased resources to inform an overview of typical arguments in a particular field. Perhaps your topic is historical and currency means the past hundred years rather than the past one or two years. Use the CRAAP test, be knowledgeable about your topic, and you will be on your way to evaluating information efficiently and well!
Finding information is not the end of research. You want information that supports the point you’re trying to make. Some sources can be outdated, biased, or just plain wrong, and using that information makes it a lot more difficult for you to present a convincing argument.

*Taking the time to critically evaluate information as you find it will help you to avoid wrong turns in the research process.*

How Can You Know If Information Is Appropriate for Your Research?

Consider the source. You can apply the CAARP test:

- Currency
- Authority
- Accuracy
- Relevance
- Purpose

Clue 1: Currency

Currency is important because information can quickly become obsolete. Supporting your thesis statement with facts that have been superseded by new research or recent events weakens your argument. Of course, not all assignments require the most current information; older materials can provide an historical or comprehensive understanding of your topic.

How Do You Know If the Timeliness of Your Information Is Appropriate?

- When was the information published or last updated?
- Have newer articles been published on your topic?
- Are links or references to other sources up to date?
- Is your topic in an area that changes rapidly, like technology or popular culture?

Clue 2: Authority

Authority is important in judging the credibility of the author’s assertions. In a trial regarding DNA evidence, a jury gives far more authority to what a genetics specialist has to say compared to someone off the street.

How Do You Know If an Author Is an Authority on Your Topic?

- What are the author’s credentials?
- Is the author affiliated with an educational institution or prominent organization?
- Can you find information about the author from reference books or the Internet?
- Do other books or articles cite the author?

Clue 3: Accuracy

How Do You Know If Your Source Is Accurate?

- Are there statements you know to be false?
• Are there errors in spelling, punctuation, or grammar?
• Was the information reviewed by editors or subject experts before it was published?
• What citations or references support the author’s claims?
• What do other people have to say about the topic?

Clue 4: Relevance

Relevance is important because you are expected to support your ideas with pertinent information. A source detailing Einstein’s marriage and family life would not be germane to his theories in physics.

How Do You Know If Your Source Is Relevant?

• Does the information answer your research question?
• Does the information meet the stated requirements of the assignment?
• Is the information too technical or too simplified for you to use?
• Does the source add something new to your knowledge of your topic?

Clue 5: Purpose

Purpose is important because books, articles, and Web pages exist to educate, entertain, or sell a product or point of view. Some sources may be frivolous or commercial in nature, providing inadequate, false, or biased information. Other sources are more ambiguous concerning their partiality. Varied points of view can be valid, as long as they are based upon good reasoning and careful use of evidence.

How Do You Determine the Purpose of Your Source?

• Why did the author or publisher make this information available?
• Is there an obvious bias or prejudice?
• Are alternative points of view presented?
• Does the author omit important facts or data that might disprove a claim?
• Does the author use strong or emotional language?

Apply the CAARP Test

<table>
<thead>
<tr>
<th>Questions</th>
</tr>
</thead>
</table>
| 1. Your research question is “What are the social benefits and liabilities for tribes developing casinos on Indian reservations?” Select the source that would likely be more current for your topic.  
   1. A book published in 1998 about gaming on American Indian lands  
   2. Pechanga.net, Indian gaming news on the internet  
2. Your research question is “What are the social benefits and liabilities for tribes developing casinos on Indian reservations?” Which database would be more likely to point you to articles relevant to your topic?  
   1. Sociological abstracts  
   2. Biological abstracts  
3. Your research question is “What are the social benefits and liabilities for tribes developing casinos on Indian reservations?” Which source would likely be more authoritative on your topic?  
   1. A peer-reviewed article published in UNLV Gaming Research & Review  
   2. An article published in Sports Illustrated  
4. Your research question is “What are the social benefits and liabilities for tribes developing casinos on Indian reservations?” Which source is more likely to be accurate?  
   1. Employment statistics from a newsletter published by a grassroots organization opposed to gambling |
2. Employment statistics from the U.S. Department of Labor website

5. Your research question is “What are the social benefits and liabilities for tribes developing casinos on Indian reservations?” Which source would more likely suit the purpose of your report?
   1. Pechanga.net, Indian gaming news on the Internet
   2. A peer-reviewed article published in UNLV Gaming Research & Review

Answers

1. Internet resources like Pechanga.net are generally more current than books; a website should indicate the date it was last updated. A book published in 1998 will not be as current as most websites, although it may provide good background information.

2. Sociological Abstracts indexes journals that focus on social consequences of human behavior, which is more relevant to your topic. Biological Abstracts indexes journals in the life sciences, which would not likely cover social aspects of your topic.

3. An article in a peer-reviewed journal is more likely to have been written by an expert and will have been evaluated by other experts before it is published. Writers for Sports Illustrated are not likely to have expertise in social issues surrounding gambling.

4. The U.S. government is considered a reliable source for statistics. You can identify a government website by the “.gov” at the end of the URL. A grass roots organization opposed to gambling may use legitimate statistics but exclude those that don’t support a specific agenda.

5. The title UNLV Gaming Research & Review is a clue that the journal is likely to publish studies related to issues surrounding gaming. Pechanga.net would probably give you a handle on what’s going on in the world of Indian gaming, but it would not provide scholarly research.

An article we found in UNLV Gaming Research & Review meets all our criteria:

<table>
<thead>
<tr>
<th>Title: A Special Look at Indian Gaming.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authors: Nykiet, Ronald A. † <a href="mailto:mykiet@uh.edu">mykiet@uh.edu</a></td>
</tr>
<tr>
<td>Source: UNLV Gaming Research &amp; Review Journal</td>
</tr>
<tr>
<td>Abstract: This article probes into the Native American gaming industry and infrastructure development as well. In the past two decades, casino development in the state of Connecticut, the Mashantucket Pequot, and the Mohegan have improved the tribal economy. The impact has not only been dramatic, it has been extensive. The sphere of influence includes the tribal nations, local townships, seacoast area, the state, and the region. In addition to the geographic impact, these two developments have had a positive impact on the Native American gaming industry.</td>
</tr>
<tr>
<td>Author Affiliations: †Professor at the University of Houston Hotel College</td>
</tr>
<tr>
<td>Persistent link to this record: <a href="http://search.epnet.com/login.aspx?direct=true&amp;db=aph&amp;an=15154162">http://search.epnet.com/login.aspx?direct=true&amp;db=aph&amp;an=15154162</a></td>
</tr>
<tr>
<td>Database: Academic Search Premier</td>
</tr>
</tbody>
</table>

The criteria for evaluating sources are just guidelines to help you think critically about the information you find. Depending upon how you are using the information, some criteria may be more useful than others:

- For finding just a few facts, accuracy is more important than relevance.
- Reading a book that’s out of date can still add to your understanding of a subject, especially if the author is often cited as an expert or if your topic is in a field that doesn’t change quickly, like the humanities.
- A biased source can contribute relevant facts and data. The National Rifle Association compiles plenty of data to promote its agenda. It’s your job to support or refute the arguments of impartial authors.

In each of these situations, relying on more than one source for information will help you decide what is or isn’t accurate and whether something is relevant to your assignment. Think about how the new information fits in with what you already know and how you want to present your argument. Making notes about and organizing information helps you keep track of what might or might not be useful to your project.
Let’s Wrap Up

Think about information resources as “evidence.”
Viewing information as a tool to prove a point or support an argument is a useful starting point for evaluation.

Don't assume that one format of information is better than others.
All kinds of information should be evaluated carefully, including books, articles and web sites.

Evaluation is an art, not a science.
There is no “one size fits all” set of guidelines for this important activity.

Test Yourself!

1. Which of the following questions should you ask yourself when considering the relevance of a potential source?
   1. Was the source published in the past five years?
   2. Does the source add something new to your knowledge of the topic?
   3. Is the source free of bias?
   4. Is the author an established expert in the field?

2. In which type of research would currency be most important as you consider which sources to use?
   1. Health Sciences/Medicine
   2. Literature
   3. History
   4. Philosophy

3. Citing corroborating sources reinforces the ___________ of an article.
   1. accuracy
   2. currency
   3. relevance
   4. purpose

4. In gathering data for your project about freedom of information conflicts in China, which resource will provide the most accurate and least biased information?
   1. Chinese newspapers
   2. American newspapers
   3. The article “Status of Media in China” from the Encyclopedia of International Media and Communication
   4. An interview with your uncle who immigrated to the US from Tibet.

5. All of the following statements are true except one. Which statement is FALSE?
   1. All research assignments require the most current information possible.
   2. Internet resources are generally more current than books.
   3. A web site should indicate the date it was last updated.
   4. Reading a book that’s out of date can still add to your understanding of a subject.

6. A grass roots organization opposed to gambling would be a good source for accurate statistics to support your research on the social benefits and liabilities for tribes developing casinos on Indian reservations.
   1. true
   2. false

Answers

1. 1.2: A source is relevant when it adds something new to your knowledge of the topic. Relevance is important because you are expected to support your ideas with pertinent information.
2. 2.1: When doing research in a field that changes quickly, like medicine or health, currency is especially important.
3. 3.1: Citing corroborating sources is one way of reinforcing the accuracy of an article.
4. 4.3
5. 5.1
6. false: A grass roots organization opposed to gambling would not be a good source for accurate statistics to support your research on the social benefits and liabilities for tribes developing casinos on Indian reservations. A grass roots organization opposed to gambling may use legitimate statistics but exclude those that don’t support a specific agenda.
# INFORMATION LITERACY, CHAPTER 6

## INTRODUCTION

### Learning Outcomes

By the end of this unit you will be able to:

- Use bibliographical software if appropriate to manage information
- Cite printed and electronic sources using suitable referencing styles
- Create appropriately formatted bibliographies
- Demonstrate awareness of issues relating to the rights of others including ethics, data protection, copyright, plagiarism, and any other intellectual property issues
- Meet standards of conduct for academic integrity
- Use appropriate data management software and techniques to manage data

### Licensing & Attributions

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## MANAGE: ORGANIZING INFORMATION EFFECTIVELY AND ETHICALLY

Now that you have gone through the processes involved to find and evaluate information, the next step is to start working with it. This is where the Manage pillar comes in: it focuses on the need to organize information professionally and ethically.

Individuals understand:

- Their responsibility to be honest in all aspects of information handling and dissemination (e.g. copyright, plagiarism, and intellectual property issues)
- The need to adopt appropriate data-handling methods
- The role they play in helping others in information seeking and management
- The need to keep systematic records
- The importance of storing and sharing information and data ethically
- The role of professionals, such as data managers and librarians, who can advise, assist, and support with all aspects of information management.

They are able to:

- Use bibliographical software if appropriate to manage information
Proficiencies in the Manage pillar

It is wonderful to have access to information. It empowers us humans, with data and knowledge that leads us throughout our busy days and helps us organize our leisure time more efficiently. GPS devices and mobile phones help us get to unfamiliar destinations. We can find places to eat, to stay, and to get entertainment. All of this information is at our fingertips due to modern technology. We all take advantage of this technology to some degree and use this information to our advantage.
But there is another type of information—not just the kind that provides directions. We seek such information when we are ill and need to look up medical advice. We also seek information when in school—very few subjects require only the use of a textbook. We need to search for information and then use it in our intellectual work, because every paper or project produced in college is a product of someone’s creativity.

So how should we handle this product of creativity (a.k.a information)? Let’s think about a simple example: apple picking in the fall. It is a popular thing to do, especially here in the Northeast where most of the authors of this textbook live. People come to the farm, get bags or baskets, gather apples, and then line up to weigh them and pay. The farmers’ hard work is being rewarded.

Now imagine a different situation. You worked hard and wrote a very good paper and your roommate just copied a couple of paragraphs and inserted them into her own paper because the topics were related. Was this fair? How were you rewarded for your hard work? Nobody is saying that your roommate should have paid you, as you would pay the farmer for apples. But she should not use your intellectual capital without attribution to you! What she did was an act of plagiarism—you will read more about it soon!

You might publish an article in your college newsletter. This article is your intellectual personal property and you hold the copyright, which means that no one has the right to reproduce all or any part of it (i.e. copy it) without your permission. If your roommate decides to use some information from your article in her paper, she should provide a citation (the information that will help the reader identify and find your article should they decide to do so). If she is using direct quotes from your article, again, she would need to put double quotes around your words and provide information about the author (you, in this instance) to avoid plagiarism. Keep reading to find useful information about avoiding plagiarism.

Copyright and plagiarism are just two aspects of intellectual property that you need to deal with. You have to respect copyright, i.e. the rights of the author and avoid plagiarism. However, there are more aspects to it. Have you heard of patents? If you are planning a career in science and technology-related fields then you also have to learn more about patents. Patents deal with creators’ rights to their invention of new machinery or processes. Plants and design can also be patented. You can find useful information at the United States Patent and Trademarks Office (USPTO). Trademarks and trade secrets are other aspects of intellectual property that you may have to deal with.

In addition to being aware of plagiarism, patents, trademarks, and trade secrets, you need to be mindful of open access issues, which relate to valuable research data and academic publications posted online for everybody to read. However, you cannot always just use the data from open access sources. You often need to ask the author for permission. Many open access publications use Creative Commons licensing. You can read more about open access in the Science Literacy chapter.

There is a lot to learn about using information legally and ethically, but this knowledge will empower you in your academic work and ultimately allow you to succeed. The following examples and tips will get you off to a good start.

**Unintentional Plagiarism**

Have you ever thought about why teachers and professors seem to spend way too much time urging everyone to be sure to cite all of their sources properly? You’ve heard it all before: footnote this, endnote that, put this in the bibliography, capitalize this word, where are the italics, the commas, periods, hanging indents, yada yada yada! It’s enough to make you give up and just wing it. But hold on a second while you gather your thoughts. Why do your professors always spend so much time urging you to do something that seems to have little practical purpose?

**Scenario**

Jackie was working on her 10-page research paper at the last minute. It was 3:30 am and her paper was due in class at 9:00 am. She finished the last sentence at 5:15 am, did a spellcheck and voila! Done! Groggy yet awake she went to class, turned in the paper and waited for her grade. She received an email from her professor that read, “There are some major issues with your research paper that I need to discuss with you. Please see me.” Uh oh. What could it be?
When she nervously went to see him, Professor Muntz told Jackie that she hadn’t cited any of her sources, and because she included a lot of direct quotes in her paper, she was guilty of plagiarism. She received an F on her paper and may be referred to the school administration for academic dishonesty.

Was she really guilty of something that bad? In fact, yes she was. In this chapter we will discuss the importance of managing your information sources and some tips on how to easily and effectively avoid Jackie’s pitfall.

Real World Cases

Students often feel that they are being singled out in regard to plagiarism and academic dishonesty. But that is far from the case. There are numerous examples of scholars and other professionals who have been caught plagiarizing. One such person is Doris Kearns Goodwin, a famous historian who wrote the noted Team of Rivals: the Political Genius of Abraham Lincoln (2006). She included material in an earlier book, The Fitzgeralds and the Kennedys (1987), from three other sources without citing it, according to an article written by Michael Nelson. (Note: Nelson, Michael. “The good, the bad, and the phony: Six famous historians and their critics,” The Virginia Quarterly Review, 78, no. 3 (2002): 377–394.) Although she has since published other works, her reputation has been tarnished, and people may not take her work as seriously because of this. Unfortunately, as Nelson points out in his article, she is not the only well-known historian caught plagiarizing.

Another example, with a dramatic outcome, is that of Eugene Tobin. He was the president of Hamilton College in New York State, when it was discovered that he had included plagiarized material in speeches he had given over the course of almost a decade. He resigned from his position as the head of this prestigious institution, admitting his guilt. (Note: Isserman, Maurice. “Plagiarism: A lie of the mind,” The Chronicle of Higher Education, 49, no. 34 (2003): B12.) Other college presidents and administrators have also been caught violating academic trust: if you try a search using the terms plagiarism and college president, you may be dismayed at the number of results.

Like some of the historians Nelson cites in his article, many students fall into a trap when they do research because they fail to mention where they found all of their information. Thousands of students in schools, colleges, and universities are guilty of committing plagiarism, but often they don’t know they are plagiarizing.

Let’s look at plagiarism and how to avoid it, and then continue on to some other intellectual property issues you may need to deal with.

What is Plagiarism?

In short, plagiarism is when you use words, thoughts, or ideas that belong to someone else without giving them credit. In the classroom (and in the world of publishing), documenting your information sources is the only way others can tell how thorough and careful you’ve been in researching your topic. If you don’t tell readers where your information came from, they may think (and many do) that you either made up the information or “stole” it. Failing to cite your sources is plagiarism.

By managing the sources in your papers, you encourage others to do the same and you can be a go-to expert for your friends and classmates when they need help with how to find out how to cite sources properly. The information and advice you impart may help them avoid serious difficulties. Some students truly don’t know that they are doing something wrong when they paraphrase information without citing the information source. They might feel that paraphrasing the words of someone who is clearly an expert on the topic is the best way to write an accurate paper. And because they aren’t quoting it directly, it doesn’t need quote marks or attribution, does it? While the penalties they receive might (and this is a big “might”) be less severe than someone who buys a paper online or copies and pastes big sections of material into their work, the penalties could still be substantial. Raising your friends’ awareness so they won’t face this situation would be a kind thing to do.

Keeping Track of Your Sources

Try this the next time you do research. If you find some great articles on your topic, collect the following information about each as soon as you realize they will be helpful resources:
• Author name(s)
• Title of the article
• Name of the journal
• The volume number
• The issue number
• The date of the issue
• The name of the database where you found the article

Or, if you found a book, note the following once you think it might contain useful information:

• Author name(s)
• Title of book
• Place of publication
• Publisher’s name
• Year of publication

Or, if you found a website you want to use, collect the following details before you leave the site:

• Author name(s)
• Title of article or webpage
• Title of overall website
• The date of the webpage (if any)
• The URL (or web address)

You might be able to get some of this information with a simple screenshot, but be sure to fill in any missing elements.

This information is often referred to as bibliographic information or metadata. It consists of essential information that identifies the information resource used to inform a research project.

You may not use every single item that you found when you gathered your sources, but having a list of all of the sources you considered will help you keep track of everything you use for your paper.

As you read each source, write down any of the authors’ ideas, quotes, or thoughts you want to use and be sure to write down page numbers, if the source provides them. When you put your paper together, you will then have all the information you need to properly cite any quote, idea, or thought that came from each source.

Reference Management Software

Many researchers take the time to gather all of this information before they start writing. However, when they are ready to compile their footnotes or bibliography they can’t find their preliminary notes. It may be the case that some notes are in one notebook, other notes are in a file in their computer and still others are missing entirely. Fortunately, software has been developed that helps researchers manage their source material. You may have heard of some of these reference management products. Endnote, Refworks, Mendelay, and Zotero, among others, all help manage the information gathering and retrieval process.

In addition to providing one central location for all of your references, these reference managers can:

• import bibliographic information directly from a library catalog database,
• provide additional space for personal notations,
• create a bibliography or list of references in a variety of citation styles such as APA, MLA, Chicago, and more.

Some academic libraries provide access to Endnote or Refworks. If your library does not, Zotero is available free for use with the Firefox browser and Mendelay is also available at no charge.
When to Cite

Now that you have gathered all of your information resources, you need to be mindful about how you used them in your research project. There are some very firm rules about what constitutes plagiarism:

- If you copy a sentence or paragraph verbatim (exactly) from a book, article, website, blog posting, or anywhere online or in print, you must provide information on the author and the publication in which the sentence or paragraph appears. This is known as "citing a source."
- If you use some of the exact phrases in a sentence or paragraph, even if you are not copying the whole sentence or paragraph, you must cite your source.
- If you use original information that you have obtained from an interview or conversation with someone, you must cite your source.
- If you do not use the exact sentence or phrase but paraphrase it, or use the ideas inherent in the exact sentence or phrase, you must cite your source.
- If you reprint images, maps, diagrams, charts, or tables, you must cite your source.
- If you embed video files or audio files into your work, you must cite your source.

Exercise: Plagiarism Quiz

The following paragraph is from an article titled, “Hydraulic Fracturing Overview: Growth of the Process and Safe Drinking Water Concerns” in the March 1, 2012 issue of Congressional Digest.

The use of hydraulic fracturing continues to increase significantly, as more easily accessible oil and gas reservoirs have declined and companies move to develop unconventional oil and gas formations. Hydraulic fracturing is used for oil and/or gas production in all 33 U.S. states where oil and natural gas production takes place. According to industry estimates, hydraulic fracturing has been applied to more than 1 million wells nationwide. (p. 71)

Which of the following sentences does not plagiarize?

1. a. As of March 2012, hydraulic fracturing has been applied to more than 1 million wells nationwide.
2. b. Hydraulic fracturing has become more prevalent nationwide. More than one million wells have been created.
3. c. According to the Congressional Digest, more than one million wells in the United States use hydraulic fracturing (Congressional Digest, 71).
4. d. None of the sentences contain plagiarism.

Citation Styles

Citing sources and avoiding plagiarism should always be an author’s intent, but it is easy to get confused about how to cite. Citation styles were introduced in the Gather chapter, but it is worth repeating that there are many different citation styles. The three styles that are used most often are APA (American Psychology Association), MLA (Modern Language Association), and Chicago. There are no hard and fast rules about when to use each style. Professors often have a preference for one style over another, so make sure that you check with your instructor about which style they prefer.

Creating properly formatted citations has become easier in recent years with the introduction of reference management software and citation generators. A citation generator is software that will help to correctly format your citations. Some popular citation generators are Noodlebib and Easybib, both are available for a fee. There are also free citation generators available online. You can search the web to retrieve them. These generators are handy to use but they often contain errors so it is important to check the results for accuracy. The following resources are useful tools for all writers.

- *MLA Handbook for Writers of Research Papers*
You should be able to locate the three manuals in the reference section of your library. *Citation Fox* is available online.

**Where to Go For Help**

Even if you are a very organized person and have diligently collected bibliographic information on all of the information resources that you consulted during the research process, you may misplace essential information on a resource. You may think that since you can't find this information, you will be unable to use it. But there is another option—consult a librarian. Librarians have comprehensive knowledge about how information is organized and retrieved. They also have a wealth of information resources at their fingertips. Even if you can't retrace your steps to find the missing data, it is likely that a librarian will be able to help you find the bibliographic information you need. Librarians can also help you determine when and how to cite your work. They may even be able to help you navigate citation generators and reference managers. Librarians at your library are available to help you in person, by telephone, and via email and chat. Consult your library's website for contact information.

**Ethical Issues and Intellectual Property**

The Manage pillar includes the practice of professional and ethical use of information. Ethical treatment of information assumes that you are treating an author's rights appropriately and avoiding an act of academic dishonesty such as plagiarism. As a creator of information yourself, you should understand the importance of respecting other authors’ rights and following the general rules set forth in legal documents (see the Useful Links about Intellectual Property section for citations to some of these documents).

There are many examples of intellectual property issues that you can find in the media. For example, in June 2013 as the authors were working on this textbook, the Supreme Court of the United States overturned the law that had previously allowed gene patenting. It might sound strange, but up until now if you were a scientist who studied the human genome and happened to discover a new gene, under the earlier law, you could patent it, thus assuring that whenever a person needed to have a medical test involving the gene they would have to pay you as a patent holder. These types of tests usually weren't covered by insurance companies and were very expensive.

As an information creator, you want to be respectfully treated by others. That is why you should constantly strive to improve your ability to practice fair treatment of other authors’ works, including being cognizant of copyright, patents, and other issues associated with intellectual property.

**Academic Integrity**

You have already learned about plagiarism, often enemy number one when it comes to academic success involving research and writing. But there are other issues under the larger umbrella of academic dishonesty. First of all, every academic institution has a set of academic regulations that explain what is expected of students. Students are required to make themselves familiar with these rules.

Other examples of dishonesty that are mentioned in academic regulations are multiple submissions (one may not submit one project for two different classes), cheating on examinations, and forgery. Professors are dismayed when they have to talk to the students about these issues because, inherently, every teacher wants to believe that his or her students are honest. Unfortunately, plagiarism is so common that educators have begun using plagiarism detection software, such as Turnitin (see the Useful Links section). You obviously don't want to be identified as committing plagiarism by this software.

It is imperative to understand that everybody has to be accountable for their own work and respectful of the work of others. Future scholarship depends on the accuracy and integrity of prior scholarship. That is why, when doing research one must use the information produced by other people responsibly, i.e. provide citations within the text and a list of references at the end of the paper with full citation information that will allow retrieval of the document. Remember what you have learned in this chapter about managing your sources and citation style. If
you are diligent about applying this knowledge and careful about giving credit where credit is due, you should have no worries.

Bibliography


CitationFox, 2011. http://library.albany.edu/cfox


VIDEO: ME? PLAGIARIZE?

Watch this video online: https://youtu.be/TdMg7Yu4mPs

UTILIZING

You’ve identified, located, and evaluated information created by other people. Now it’s time to utilize that information.

The final part of the research process is to communicate and support your conclusions. Citing sources gathered during your research helps you build your argument. Including graphics or other creative expressions can illustrate a point or add impact to your project.

Incorporating the work of others is acceptable in academic writing, but you have a responsibility to let your audience know when you are using someone else’s ideas and where you found that information.

Honesty

Our society places high value on honesty and the concept of fair play. We are taught from a young age that it is not nice to take things that belong to other people.
Dishonesty, Theft, Plagiarism, and Copyright

Plagiarism and violation of copyright are essentially stealing words, ideas, or creative works–intellectual property that rightfully belongs to someone else.

Plagiarism

- Borrowing the idea or opinion of someone else without giving the person credit
- Restating or paraphrasing a passage without citing the original author
- Borrowing facts or statistics that are not common knowledge without proper acknowledgement

Famous Faces of Plagiarism

Stephen Ambrose (1936–2002), a highly regarded historian and writer, was accused of plagiarizing several passages of one of his later books. Although Ambrose had noted the original sources in footnotes, he had neglected to use quotation marks for passages he reproduced. Plagiarism stained Ambrose’s reputation even after his death.

Harvard student Kaavya Viswanathan (born 1987) authored her first novel at the age of 17. A major publisher offered her a six-figure advance and released the book in 2006. DreamWorks SKG bought the rights to make it into a movie. Everything was great for Kaavya until a reader found that she had plagiarized passages from another writer. Viswanathan’s novel was pulled from bookstores and DreamWorks dropped the film project. Her career as a novelist may have come to an embarrassing end.

George Harrison (1943–2001), formerly of the Beatles, was accused of musical copyright infringement of the Chiffon’s “He’s So Fine” in his own song, “My Sweet Lord.” A judge ruled that Harrison had subconsciously plagiarized the 1962 tune, ordering him to pay $587,000 in damages. The case continued for over 20 years. Plagiarism cost Harrison a great deal of legal time and money.

Why Should You Care?

Do the right thing with your research and writing.

- If you use someone else’s ideas, give them credit. How do you feel when someone takes credit for your ideas?
- Your professor assigns research projects to help you learn. You cheat yourself when you substitute someone else’s work for your own.

Avoid the consequences for doing the wrong thing.

- Society punishes thieves; plagiarists are thieves.
- If you plagiarize, you will eventually be caught. And you will be punished.

What are the consequences of plagiarism? Colleges and universities have policies regarding plagiarism and other forms of academic dishonesty. One example, the Notre Dame Academic Code of Honor, is available in multiple formats and easily accessible.

In plain English, if you’re caught plagiarizing or cheating, you could receive

- additional work to make up for the plagiarized project
- an F for the course
- suspension from the University

But they can’t punish you unless they catch you, right?
The technology that makes plagiarizing so easy also makes it easy to get caught. Professors expect you to be honest. But if your paper looks suspicious, professors can use search engines, library databases, and specialized software to confirm your work is not original.

You tell us—is it plagiarism?

1. Using this website:
   1. No, it’s an original paper, guaranteed plagiarism-free.
   2. Yes, because Joe Student purchased a paper and handed it in as his own work.

2. Using this text:
   1. Editorial Reviews
      Amazon.com
      In his debut novel, The Kite Runner, Khaled Hosseini accomplishes what very few contemporary novelists are able to do. He manages to provide an educational and eye-opening account of a country’s political turmoil—in this case, Afghanistan—while also developing characters whose heartbreaking struggles and emotional triumphs resonate with readers long after the last page has been turned over. And he does this on his first try.

        Coming of Age 2

        in The Kite Runner, author Khaled Hosseini gives an educational and eye-opening account of Afghanistan’s political turmoil. I found his characters’ heartbreaking struggles and emotional triumphs to be very moving.

   1. No, it’s not plagiarism. Joe Student did not copy the text word for word. Besides, Amazon is not a “real” author.
   2. Yes, this is plagiarism because Joe Student used someone else’s ideas and words without giving them credit.
3. Using this information:

<table>
<thead>
<tr>
<th>Source</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thousands of workers</td>
</tr>
<tr>
<td>1988</td>
<td>3,119.0</td>
</tr>
<tr>
<td></td>
<td>3,524</td>
</tr>
<tr>
<td>2003</td>
<td>5,253.0</td>
</tr>
</tbody>
</table>

Politicans and pundits have expressed concerns about U.S. companies outsourcing operations or services overseas. Do foreign companies download jobs to America? Subsidiaries of foreign-owned corporations operating in the United States employed over 5 million workers in 2003 (Zeile, 2005). Foreign companies like Honda, Nestle, Nokia,

References


1. No, it’s not plagiarism. Credit to the source is given in both the text and the list of references.
2. Yes, this is plagiarism. Joe Student did not use quotation marks.

Answers

1. Yes: Putting your name on a paper written by someone else, whether a friend wrote it for you or you bought it, is plagiarism. Even though the web site alleges that the paper purchased by Joe Student is original, turning in a paper written by someone else is unethical—and pretty easy for professors to spot.
2. Yes: This is plagiarism. Using someone else’s words—even in a different order—is stealing if you don’t give the original author credit. You might get away with simply reorganizing someone else’s words—until your professor realizes you do not have an extraordinary command of the English language.
3. No: This is not plagiarism. Quotation marks are used when citing someone’s exact words. When you paraphrase, simply include an in-text citation or footnote.

You can avoid plagiarism by:

- Taking careful notes, writing down the citation for the source, and indicating page numbers.
- Using quotations when copying the words of an author.
- Giving credit to the original author in the text and bibliography of your paper.
- Not procrastinating. You are more likely to plagiarize—either accidentally or on purpose—when you are in a rush.

Citations

To give credit to your sources, you should use a recognized citation style. Some commonly used styles are APA (American Psychological Association) and MLA (Modern Language Association). Whether professors tell you which style to use or let you choose, they will expect you to stick to one style consistently within your paper.
Each style includes rules for how to arrange details like author, title, publication date, retrieval date, etc. These details may vary depending on what you are citing:

- Books
- Articles from print journals or newspapers
- Articles obtained from databases like Academic Search Premier or PsycINFO
- Web sites
- Email communication

You can find rules for proper citation in style guides available online or at the Libraries, or you can ask a librarian for help.

Here are some links that may be useful to you as you polish your papers:

- Hesburgh Libraries eReference Shelf, Citing Sources
- Purdue Online Writing Lab (OWL)

### Test Your Knowledge about Citations

1. Which is the correct citation for this article:


   **Database:** Academic Search Premier

   The proper way to cite an article from an online database in APA style is: Author (year). Article title. Journal Title. Volume number (issue number), pages. Retrieved [date] from [database name].


2. Which is the correct citation for this article:

   **TITLE:** Playoff or bust: the bowl championship series debate hits congress (again).
   **PUB:** St. Thomas Law Review
   **DETAIL:** Leslie Bauknight Nixon. 21.3 (Spring 2009) p365 Word Count:659.

   The proper way to cite an article from an online database in MLA is: Author(s). “Title of Article.” Title of Journal Volume. Issue (Year); page numbers. Database name. Web. Date accessed. [Note: MLA normally double-spaces citations; these examples are single-spaced to fit a small area].


### Answers

1. 1.1: In the first example, the author, title, and other elements needed for APA style are listed here in the correct order. In the second example, the article title and journal title are reversed, and the page number is incorrect. Picky? A reader wanting the original article would struggle to find the nonexistent journal, Coastal & Marine
Copyright

Plagiarism is using someone else’s ideas without giving them credit and is considered dishonest.

*Copying, performing publishing, or distributing someone else’s work may also be illegal.* Anyone who creates an original work—including books, articles, music, computer programs, artwork, movies, videos, choreography, or architectural designs—has legal protection under U.S. copyright laws. An original work is automatically protected as soon as it is created; it doesn’t have to be published or registered with the Copyright Office. Registering a copyright makes it easier to collect damages if infringement occurs.

Copyright has legal and often financial dimensions, where plagiarism is more a matter of ethics and academic reputation. The legal system imposes consequences for copyright violation, and an institution imposes consequences for plagiarism.

Violations of Copyright

Just giving the original creator credit is not enough when you use a significant portion of a work. *You violate copyright when you fail to get the copyright holder’s permission to:*

- email copies of an article to all of your classmates.
- download popular music that was put on the Internet illegally.
- make copies of commercial software or music to give to your friends.
- download images to use on your own web site.

Copyright law protects the right of an author, artist, designer, or performer to earn income and recognition for creative works.

Public Domain

Copyrights do expire. Works eventually enter the public domain and may be freely used. Current laws extend copyright protection for the life of the author plus 70 years. Laws have changed over the years, so you would need to find what law was in effect when a work was created to determine if that work is still protected.
Fair Use

Copyright law also protects individuals wanting to reproduce parts of a work for nonprofit purposes. Using a small portion of a work for scholarship or criticism is generally seen as fair use and does not require getting permission from the copyright holder. Whether use of a work is considered fair depends on

- the nature of the original work
- how the copy is to be used
- what portion of the original is copied
- the possible effect reproducing the work will have on the value or market for the work

If you photocopy a few measures of music to include in your paper, that's fair use. However, if you make enough copies of the sheet music to give to everyone in the school choir, you are stealing income the publisher should have received from the sale of multiple copies and you have violated copyright.

Copyright laws are complicated and fair use is not always clear-cut. It’s better to err on the side of caution than to face a copyright infringement suit.
Review of the Utilizing Process

Let's wrap up the process of utilizing:

**Give credit to your sources**
Lifting material directly from any source without giving credit to the original author or creator is dishonest and risky.

**Use a recognized style guide**
Consistency in citing sources is an expectation for academic work.

**Respect the creative work of others**
Copyright laws protect persons who create original works, as well as scholars wishing to analyze those works.

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### Questions

1. APA and MLA style guides both refer to:
   1. Library classification systems
   2. Databases covering fashion journals
   3. Guides to using call numbers
   4. Formats for citing sources used in a paper.

2. Which of the following is not plagiarism?
   1. Borrowing the idea or opinion of someone else without giving the person credit.
   2. Summarizing an author’s main point and citing the source, giving credit to the original author.
   3. Restating or paraphrasing a passage without citing the original author.
   4. Borrowing facts or statistics that are not common knowledge without proper acknowledgment.

3. All of the following statements about copyright are true except one. Which one is FALSE?
   1. Copyright law protects the right of an author, artist, designer, or performer to earn income and recognition for creative works.
   2. You violate copyright when you fail to get the copyright holder’s permission to email copies of an article to all of your classmates.
   3. Anyone who creates an original work -including books, articles, music, computer programs, artwork, movies, videos, choreography, or architectural designs has legal protection under U.S. copyright laws.
   4. An original work must be registered with the Copyright Office in order to be protected under U.S. copyright laws.

4. You are analyzing a book for a history class and you jotted down an excellent description of the book written by a historian. You lost the citation, so you reorganize the words of the historian and include them in your paper without a citation. This is:
   1. Plagiarism, because you are using another person’s ideas without giving him or her credit.
   2. OK to do, because you are using his ideas but not his actual wording.
   3. OK to do, because the description of the book is common knowledge.
   4. A copyright violation because you did not get permission to use the historian’s ideas.

5. Using someone’s words without citing the original author is not considered plagiarism as long as you reorganize or paraphrase the words.
   1. True
   2. False

6. Which is a violation of copyright?
   1. Emailing copies of an article to all of your classmates without permission of the copyright holder.
   2. Downloading popular music that was put on the Internet illegally.
   3. Making copies of commercial software or music to give to your friends without permission.
   4. Downloading images to use on your own web site without permission of the copyright holder.
   5. All of the above
Answers

1. 1.4: APA and MLA style guides are two different formats for citing sources used in your paper.
2. 2.2: Summarizing an author’s main point and citing the source, giving credit to the original author is not considered plagiarism.
3. 3.4: An original work does not have to be registered with the Copyright Office in order to be protected under U.S. copyright laws.
4. 4.1: Using another person’s ideas even if you reorganize the words, without giving him or her credit, is plagiarism.
5. False: Using someone’s words without citing the original author is still considered plagiarism even if you reorganize or paraphrase the words.
6. All of the above: All of the instances described above are violations of copyright.

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INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

• Use the information and data found to address the original question.
• Summarize documents and reports verbally and in writing.
• Incorporate new information into the context of existing knowledge.
• Analyze and present data appropriately.
• Synthesize and appraise new and complex information from different sources.
• Communicate effectively using appropriate writing styles in a variety of formats.
• Communicate effectively verbally.
• Select appropriate publications and dissemination outlets in which to publish if appropriate.

PRESENT: SHARING WHAT YOU’VE LEARNED

Scenario

Norm Allknow from the Identify chapter has done a lot of work since the last time we saw him. His research supports his thesis statement and he’s got something to say. Now he needs to figure out how to say it.

He writes a 10-page paper starting with his thesis statement, followed by some facts from his research, and then briefly concludes that he has proved his point. He hands it in to his teacher and he’s finished. Except that he starts to feel like he just did an awful lot of work for an audience of one person. Who else might be interested and how might he reach them? How can he communicate his message in ways other than a straightforward paper? How can he get the most out of his effort?

Presenting the Results of Your Research

In earlier chapters we discussed how to identify a research topic and how to focus in on specific questions that we hoped to answer. Then we discussed ways to search for, organize, and evaluate information that would help to answer those questions. Now it's time to think about the best way (or ways) to present the information.
Individuals adept at the Present pillar can apply the knowledge they have gained. They can present the results of their research, synthesize new and old information and data to create new knowledge, and disseminate their work in a variety of ways.

They understand

- The difference between summarizing and synthesizing
- That different forms of writing/presentation style can be used to present information to different communities
- That data can be presented in different ways
- Their personal responsibility to store and share information and data
- Their personal responsibility to disseminate information & knowledge
- How their work will be evaluated
- The processes of publication
- The concept of attribution
- That individuals can take an active part in the creation of information through traditional publishing and digital technologies (e.g. blogs, wikis)

They are able to

- Use the information and data found to address the original question
- Summarize documents and reports verbally and in writing
- Incorporate new information into the context of existing knowledge
- Analyze and present data appropriately
- Synthesize and appraise new and complex information from different sources
- Communicate effectively using appropriate writing styles in a variety of formats
- Communicate effectively verbally
- Select appropriate publications and dissemination outlets in which to publish if appropriate
- Develop a personal profile in the community using appropriate personal networks and digital technologies (e.g. discussion lists, social networking sites, blogs, etc.)
Proficiencies in the Present pillar

Processing What You Find

In many or even most cases, during the process of finding a variety of information sources, you will begin to develop an answer to your research question. Even if you feel that you’ve already found the proof you need to support your thesis, it is still important to review the information and data you have to be sure you’re clear about what it is (and isn’t) telling you. Be careful not to let your own opinion lead you into a misinterpretation of your sources.

One useful way to consolidate the information you’ve found is to summarize what you think it says, and then find a definite source for each specific item in your summary. You can start by filling in the final box in the chart below, from the Identify chapter.
However, an expanded version of this same box can tell you a lot more about where the information is from, and will also prove useful when you need to cite a specific bit of information in your bibliography. In the left column of the following box, list what you have learned, bit by bit. In the right column, list where you found it. If it was found in more than one source, list them all and think about which one you find to be the most reliable or useful. Depending on where and how you present your findings, you may be called upon to defend your sources, so it pays to be prepared for this.

<table>
<thead>
<tr>
<th>What do you already Know about your topic?</th>
<th>What do you Want to know about your topic?</th>
<th>How will you find information on your topic?</th>
<th>What have you Learned about your topic?</th>
</tr>
</thead>
</table>

This exercise is just one way to process your information and may not be the best way for everyone. Summarizing in paragraph form is another way to accomplish the same task, with the added benefit that what you write in the summary can often become part of your final product. Just be careful that you aren’t using paraphrased material without properly citing the source it came from. Verbally summarizing your findings, and especially your arguments in favor of your conclusions, to a friend, classmate, or teacher is an excellent way to confirm your mastery of the topic. While the means of summarizing can vary, the key at this point is to make sure you understand what you’ve found and how it relates to your topic and research question.

Now that you’re confident in your knowledge of your topic, you can formally answer your original research question when you present what you’ve found. Did your original thesis/hypothesis turn out to be true? If so, say so! If not, why not? Be sure you’re able to state specifics that prove or disprove your projections. Was anything a surprise? Do any of your findings suggest future research possibilities?
One of the most satisfying parts of doing research is having something to add to a topic’s base of knowledge. Think about what you found in relation to your original research question and compare it to all of the sources you examined on your topic. Did you discover something new? If your research involved experiments, you may have new results or data sets that others can use. Even if you didn’t generate new data, maybe you saw new connections between existing sources that no one has written about before. Think about this as you begin to put together the presentation of your findings, you may have something to share!

Choosing How to Present

The way you finally present your research findings is largely dependent on your original goals. If you were researching for a class project, it’s likely that the teacher provided you with fairly specific requirements and it would obviously be a good idea to stick to them.

Even if you did initially do the research for a class project though, you may find yourself in a situation similar to Norm at the beginning of the chapter, wanting to share your work more widely. You’ve already done the work, so why not get all the benefit you can?

Some of the more common ways of presenting information are discussed below, but the descriptions of them are not exhaustive and remember that these are not nearly all of the options. In addition, you can often combine more than one method of presentation to highlight different elements of your findings or to reach multiple audiences.

Written

Writing is the most established way to share your research findings. Benefits of writing include the ability to proofread, edit, and rewrite to get your presentation exactly right. Done skillfully, writing can hold your audience’s attention and effectively deliver information. Done poorly, it can confuse or bore your audience to the point that they stop reading. To avoid this second possibility, if at all possible, have someone read your writing before you give it to the final audience. Take constructive criticism to heart, so that your voice is clearly heard.

- **Traditional Paper.** One of the most common ways to present research findings, especially for students, is in a short paper written as a class assignment. The way this type of paper is formatted is determined by the teacher, and is fairly straightforward. The goal is usually to demonstrate to the teacher that you have understood the topic and can draw some conclusions from what you’ve learned.

- **Thesis/Dissertation.** At higher levels of education, you may be called upon to write a thesis paper or even a dissertation. At this point, you are entering the realm of high level professional or scholarly expertise, and will be expected to produce original ideas and the necessary supporting research to contribute to your field. The type of writing in theses and dissertations varies depending on the subject area, but generally these manuscripts are longer and more detailed than a traditional class paper. They also use more discipline-specific language, and can take several years to complete.

- **Scholarly Journal Article.** Articles published in scholarly journals undergo a peer-review process (see the Evaluate chapter) to ensure that they are reliable and significant additions to the literature on a topic. If you get to a point in your research where you feel you have a contribution that others could use, investigate the possibility of submitting an article for publication, especially if your research is relevant to your intended career. It can be difficult to determine which journal to submit your article to, so don’t hesitate to ask teachers, colleagues, or even the editor of the journal if your article’s content is appropriate.

- **Blog/Tweet/Other Social Media.** A relatively new option for getting your information out to a wide audience is to use social media tools. If you have your own blog or website you can easily publish your findings for the entire world to see (getting people to actually look at it is another issue, with many possible solutions). You can also use Facebook, Twitter or other tools to let people know what you’re working on and to direct them to more detailed information that you’ve posted elsewhere online. While this may seem unusual, it is becoming more and more popular for researchers to share work online as it progresses, so that other interested parties can contribute and ask questions, making the final product more robust, whatever form it ends up taking.
Spoken

Presenting information verbally might seem easier than writing or terrifying, depending on your experience and personality. Ideally you will be thoroughly prepared and able to clearly explain your findings, while also being able to respond effectively to unanticipated questions. It takes practice and a deep knowledge of your topic to do this—even the best speakers get flustered once in a while. Don’t be afraid to say you don’t know the answer and always offer to follow up on a question.

- **Class Presentation/Speech.** As with the class paper, a class presentation is one of the first experiences most students will have with verbally presenting their research. One great benefit of this type of presentation is that you will most likely receive detailed feedback on how well it was received and perhaps even get some suggestions on how to improve your delivery. Your fellow students will also be faced with the same task and can even provide this type of feedback before the actual presentation takes place.

- **Conference Presentation or Poster Session.** As your expertise on a topic grows, you may want to reach a wider audience. You will also want to reach an audience that is interested in your topic. An excellent place to find this audience is at a professional conference in your field. Aside from the many other benefits of attending professional conferences, presenting at a conference will help you begin to make yourself known to other researchers in similar subject areas. Responding to audience questions will give you the chance to prove that you really know your material or, alternately, can point out gaps in your knowledge that may lead to new research opportunities. Poster sessions are a great way to get your feet wet, as your poster will be available for you to refer to and the atmosphere is not quite as overwhelming as standing in front of a full audience for a presentation.

Audiovisual

Visual images can have an immediate impact on how your audience reacts to and understands your presentation. Choose them wisely and use them at appropriate times! You can read more about how different visualizations of information affect the way that information is received in the Visual Literacy chapter. Below are just a few brief thoughts about how you might use visuals in your presentations.

- **Powerpoint/Prezi/Other Presentation Software.** Powerpoint has been around long enough that most everyone knows it. For many purposes a slideshow that you speak over, or even a slideshow that is posted online for individual viewing, can succinctly get your point across. Newer presentation tools such as Prezi use a similar underlying idea but enable you to create more dynamic presentations directly online. Keep in mind that in most cases, tools such as these are meant to accompany a speaker and to use them effectively takes forethought and practice.

- **Images.** Images can be powerful tools to grab attention, condense information, and tell your story. Different types of images can be useful in different contexts. In an art class you may use reproductions of famous paintings or drawings, or images you’ve created on your own. In a business class, graphs and charts may be more appropriate. Just make sure the images you choose actually make your presentation more effective rather than distracting attention from your main point.

- **Song.** Keeping your audience in mind, don’t be afraid to present your material in an unusual manner. If you can create a song (as one example), you may make your audience curious enough to stay around for more detailed information later!

- **Video.** With the tools available now, it is possible to create a quality video product to present your information without extensive training or a lot of money. New online tools are constantly being introduced (and retired, unfortunately) which enable you to enter your content (words, images, video, etc.) and have it processed into a completed video in a short amount of time. Your library is also likely to have tools available for you to use to create video and audio projects, including not only the editing software, but often the video cameras, microphones, and hard drives you’ll need to create original content. Don’t hesitate to ask a librarian for both access and help using these resources. Many libraries also offer introductory courses on the software they provide to get you off to a running start.

Choosing a Presentation Format

The examples above give you an idea of the variety of presentation venues available, but its up to you to decide which is most appropriate at a given time. If you’re unsure, experiment.
Exercise: Present Your Information in Different Formats

Take what you’ve learned about your topic and express it as a written paragraph, a 140 character tweet, and a Prezi. Try to draw a picture that clearly explains your findings. Which of these seems most complete? Which seems most effective? Which seems most attention grabbing? Which was the hardest to do? Attempting this exercise might help you to make your decision about which format to use, although there are other things to consider first, particularly your intended audience.

Audience

Who you plan to present to affects how, when, and what you will present. If you’re presenting your findings in a paper that only your teacher will ever see, you will focus exclusively on what that teacher has asked for. When you’re presenting for a less well-defined audience however, you must imagine what they may already know (or not) about your topic, as well as what might interest them and what forms of presentation might be most appealing to them.

Exercise: Plan for Your Audience

<table>
<thead>
<tr>
<th>Audience</th>
<th>What might they know?</th>
<th>What presentation methods might appeal most?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher of the class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experts at a conference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your family at a holiday gathering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A group of elementary school students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newscaster interviewing you</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How do the different audiences affect what you might or might not include in your presentation about your topic? How do they affect the ways you might choose to present the information?

Many times you will present to an audience composed of various groups or unknown groups (particularly if you’re posting the presentation online). If you’ve considered a number of different audiences and chosen the content and methods most likely to appeal to most of them, your chances of success will be higher than if you only include what is most interesting to you.

Your Role in Creating and Sharing Information

When you finally do publish the results of your research, there are some things to think about in terms of what happens next.

What will you do with the information now that you’re finished with it? If you’ve written a paper for a class there may be only one copy. Do you save it and the associated notes you’ve made in case you need them later or do you throw it away once you get the grade? It can be difficult to project what may be useful in the future.

If you’ve published more widely, there are likely to be more copies, either physical or digital. Who is responsible for maintaining those copies? In a more formal situation such as a scholarly journal, the article will be maintained as part of the archives of that journal. (However, there are some questions about online-only journals. What happens if the journal goes out of business? Some journals have contingency plans for this, but not all.) If you’ve given a speech, do you keep the notes? If you’ve published on a blog, are you archiving the blog, or will it disappear once you stop using it? Even if you decide to save absolutely everything, unless you have a plan for organizing it, you may not be able to find a specific item when you need it.

Another consideration about what happens after your work is shared is what the reaction to it might be. This depends on the audience, but if you’ve created something really interesting or important, you may find that there is follow-up to be done. You might just be responding to comments on a blog posting or you could find yourself presenting your findings at conferences and continuing to develop your research on the topic. There may be negative feedback as well, and this is where thinking ahead about how you can support each of your arguments is important. Online, of course, there may be everything from kudos to spam and you’ll have to decide how seriously to take all of that feedback. As time goes by, you may find that your work is being cited by other researchers, which is a wonderful validation of your efforts.

You are a Creator of Information

During the research process, at times it can feel as if you are just collecting what others have written or said, and that your presentation is just going to repeat what is already known on the topic. While this may be true for introductory-level papers, once you know a little more about your topic, you will be synthesizing what you’ve discovered, and drawing your own conclusions. Once you publish these conclusions you will have created new information.

Before the advent of online tools, publishing your new information was difficult and often expensive. It was hard to reach a large audience because of the physical limitations of producing and distributing paper copies of publications. Now anyone can publish anything and make it available to the entire Internet-connected world in a matter of seconds. This means that you have a great opportunity to share your ideas and to communicate with people around the world who are interested in similar topics. It also means that you have to carefully consider what you publish because anyone, even an unintended audience, can find what you’ve published.

In addition to being able to share information freely, you also have access to tools to create and edit audio and video materials that were prohibitively expensive to create or adapt not too long ago. You can now share more interactive and engaging material with a wider audience than ever before. This is a great opportunity and a great responsibility—use it wisely!
Wider Connections

When you begin to share your own work, you gain insight into the processes of producing and publishing information, which will help you the next time you need to find sources for a research project. Now that you know what it took for you to produce information in a given format, you know what other creators had to do to produce their work. This can help you decide which sources will be most reliable and valuable for your own research.

Presenting your information is usually considered the final step in the research process. You tell the audience what you’ve found out and you go home. However, as we’ve seen, sometimes in the process of presenting or preparing to present, you uncover new questions and need to identify that new information need. Or you may discover that what you thought was a reliable source was not so reliable and you need to evaluate a little more. The research process is not linear, but a continuous cycle with various entry and exit points that change depending on your goals, topic, and methods. Ideally, for those who enjoy it, it never ends!
WORD UNIT 1

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

• Open a Document
• Save a Document
• Apply Basic Text Format
• Type Text
• Cut and Copy Text
• Paste Text
• Use the Format Painter
• Use Nested Folders
• Open a Document
• Save a Document
• Understand Show/Hide Format
• Use Basic Keyboard Functions
• Practice Basic Text Entry
• Create a Simple Bulleted List

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ONE AND TWO

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Watch this video online: https://youtu.be/bmSEcAgrsOU

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WORD UNIT 2

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

- Check Spelling and Grammar
- Insert Hyperlinks
- Change Font Style
- Set Tab Stops
- Insert and Modify Headers and Footers
- Create a Title Page
- Insert a Page Break
- Set Document's Margin
- Insert a Page Number
- Insert a Page Border

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WORD UNIT 3

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

- Insert and Format Images
- Create Multiple Columns
- Insert Column Break
- Use Bullets
- Format Paragraphs
- Create a Cover Letter
- Create a Resume
- Apply Templates and Themes
- Create Columns and Rows
- Insert Section Breaks

VIDEOS: MICROSOFT WORD 2013 LECTURES FIVE AND SIX

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Watch this video online: https://youtu.be/L4ct2EEcueM
EXCEL UNIT 1

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

- Create a Blank Workbook
- Save a Workbook
- Modify an Excel Spreadsheet
- Enter Text Values in Excel Cells
- Merge and Center Text
- Apply Styles
- Create Basic Formulas
- Format an Excel Spreadsheet
- Merge and Center Cells
- Use Basic Functions
- AutoSum – Max – Min – Average
- Use Fill Handle
- Copy and Move Cell Entries
- Apply Styles

VIDEOS: MICROSOFT EXCEL LECTURES ONE AND TWO

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Watch this video online: https://youtu.be/GTbd4y1CtrU
EXCEL UNIT 2

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

• Use Absolute Cell Ref.
• Apply Number Format
• Use the AutoSum Function
• Create a Formula
• Apply Conditional Formatting
• Move Cells
• Format a Workbook Tabs
• Insert Column Chart
• Insert a Pie Chart
• Move a Chart
• Apply Conditional Format

VIDEOS: MICROSOFT EXCEL LECTURES THREE AND FOUR

Watch this video online: https://youtu.be/f0-M3pqSD_g

Watch this video online: https://youtu.be/Ot6Erlhv4dk
EXCEL UNIT 3

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:
- Calculate a Loan Payment
- Insert =NOW()
- Insert Headers and Footers
- Use Drop Down List
- Use the PMT Function
- Create Basic Formulas
- Lock and Unlock Cells
- Protect Spreadsheet
- Print View
- Preview Page Break
- Auto-Fit Page Contents

VIDEO: MICROSOFT EXCEL LECTURE FIVE

Watch this video online: https://youtu.be/m8ZOdFWK34
POWERPOINT

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

• Create a Blank Presentation
• Save a Presentation
• Apply a Design Theme
• Compare Presentation Views
• Format Text
• Insert SmartArt
• Insert & Modify Shapes
• Edit & Duplicate Slides
• Insert Header & Footer
• Apply Animation and Transition
• Demote and Promote
• Add Speaker Notes
• Modify Handout
• Change Print Options

VIDEOS: MICROSOFT POWERPOINT LECTURES ONE AND TWO

Watch this video online: https://youtu.be/nMcvCem6ibE

Watch this video online: https://youtu.be/rV-FTwX1fGU
INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

• Describe the types of personal computers including workstation, desktop computers, all-in-one, laptops, desktop replacement, netbooks, and tablets. Describe the differences between the types.
• Discuss each part of the typical personal computer and what it does, including the case, power supply, processor, motherboard, main memory, hard disk, display, video card, keyboard and mouse.
• Define software
• Distinguish between system software and application software
• Identify contemporary personal computer operating systems

Reading Note

As you read Personal Computers you make skip the sections titled “History,” “Market and Sales,” and “Average Selling Price,” if you’d like. These sections go beyond our learning outcomes.

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A personal computer is a general-purpose computer whose size, capabilities and original sale price make it useful for individuals, and is intended to be operated directly by an end-user with no intervening computer operator. This contrasts with the batch processing or time-sharing models that allowed larger, more expensive minicomputer and mainframe systems to be used by many people, usually at the same time. A related term is “PC” that was initially an acronym for “personal computer,” but later became used primarily to refer to the ubiquitous Wintel platform.

Software applications for most personal computers include, but are not limited to, word processing, spreadsheets, databases, web browsers and e-mail clients, digital media playback, games and myriad personal productivity and special-purpose software applications. Modern personal computers often have connections to the Internet, allowing access to the World Wide Web and a wide range of other resources. Personal computers may be connected to a local area network (LAN), either by a cable or a wireless connection. A personal computer may be a desktop computer or a laptop, netbook, tablet or a handheld PC.

Early computer owners usually had to write their own programs to do anything useful with the machines, which even did not include an operating system. The very earliest microcomputers, equipped with a front panel, required hand-loading of a bootstrap program to load programs from external storage (paper tape, cassettes, or eventually diskettes). Before very long, automatic booting from permanent read-only memory became universal. Today’s users have access to a wide range of commercial software, freeware and free and open-source software, which are provided in ready-to-run or ready-to-compile form. Software for personal computers, such as applications and video games, are typically developed and distributed independently from the hardware or OS manufacturers, whereas software for many mobile phones and other portable systems is approved and distributed through a centralized online store. (Note: Conlon, Tom (January 29, 2010), The iPad’s Closed System: Sometimes I Hate Being Right, Popular Science, retrieved 2010-10-14, “The iPad is not a personal computer in the sense that we currently understand.”) (Note: “Steve Jobs Offers World ‘Freedom From Porn’”, Gawker, May 15, 2010, retrieved 2010-10-14)

Since the early 1990s, Microsoft operating systems and Intel hardware have dominated much of the personal computer market, first with MS-DOS and then with Windows. Popular alternatives to Microsoft’s Windows operating systems include Apple’s OS X and free open-source Unix-like operating systems such as Linux and BSD. AMD provides the major alternative to Intel’s processors.

History

The Programma 101 was the first commercial “desktop personal computer”, produced by the Italian company Olivetti and invented by the Italian engineer Pier Giorgio Perotto, inventor of the magnetic card system. The project started in 1962. It was launched at the 1964 New York World’s Fair, and volume production began in 1965, the computer retailing for $3,200. (Note: "The incredible story of the first PC, from 1965". Pingdom. Retrieved August 28, 2012.)

NASA bought at least ten Programma 101s and used them for the calculations for the 1969 Apollo 11 Moon landing. Then ABC used the Programma 101 to predict the presidential election of 1969, and the U.S. military used the machine to plan their operations in the Vietnam War. The Programma 101 was also used in schools, hospitals, government offices. This marked the beginning of the era of the personal computer.
In 1968, Hewlett-Packard was ordered to pay about $900,000 in royalties to Olivetti after their Hewlett-Packard 9100A was ruled to have copied some of the solutions adopted in the Programma 101, including the magnetic card, the architecture and other similar components. (Note: Ibid.)

The Soviet MIR series of computers was developed from 1965 to 1969 in a group headed by Victor Glushkov. It was designed as a relatively small-scale computer for use in engineering and scientific applications and contained a hardware implementation of a high-level programming language. Another innovative feature for that time was the user interface combining a keyboard with a monitor and light pen for correcting texts and drawing on screen. (Note: Pospelov, Dmitry.)


In what was later to be called the Mother of All Demos, SRI researcher Douglas Engelbart in 1968 gave a preview of what would become the staples of daily working life in the 21st century: e-mail, hypertext, word processing, video conferencing and the mouse. The demonstration required technical support staff and a mainframe time-sharing computer that were far too costly for individual business use at the time.

By the early 1970s, people in academic or research institutions had the opportunity for single-person use of a computer system in interactive mode for extended durations, although these systems would still have been too expensive to be owned by a single person.

In 1973 the IBM Los Gatos Scientific Center developed a portable computer prototype called SCAMP (Special Computer APL Machine Portable) based on the IBM PALM processor with a Philips compact cassette drive, small CRT and full function keyboard. SCAMP emulated an IBM 1130 minicomputer in order to run APL\1130. (Note: IBM Archives. http://www03.ibm.com/ibm/history/exhibits/pc/pc_1.html) In 1973 APL was generally available only on mainframe computers, and most desktop sized microcomputers such as the Wang 2200 or HP 9800 offered only BASIC. Because SCAMP was the first to emulate APL\1130 performance on a portable, single user computer, PC Magazine in 1983 designated SCAMP a “revolutionary concept” and “the world’s first personal computer.” (Note: IBM Archives.) (Note: PC Magazine, Vol. 2, No. 6, November 1983, “SCAMP: The Missing Link in the PC’s Past?”) This seminal, single user portable computer now resides in the Smithsonian Institution, Washington, D.C. Successful demonstrations of the 1973 SCAMP prototype led to the IBM 5100 portable microcomputer launched in 1975 with the ability to be programmed in both APL and BASIC for engineers, analysts, statisticians and other business problem-solvers. In the late 1960s such a machine would have been nearly as large as two desks and would have weighed about half a ton. (Note: IBM Archives.)

Another seminal product in 1973 was the Xerox Alto, developed at Xerox’s Palo Alto Research Center (PARC), it had a graphical user interface (GUI) which later served as inspiration for Apple Computer’s Macintosh, and Microsoft’s Windows operating system. Also in 1973 Hewlett Packard introduced fully BASIC programmable microcomputers that fit entirely on top of a desk, including a keyboard, a small one-line display and printer. The Wang 2200 microcomputer of 1973 had a full-size cathode ray tube (CRT) and cassette tape storage. (Note: Jim Battle (August 9, 2008). "The Wang 2200". Wang2200.org. Jim Battle. Retrieved November 13, 2013.) These were generally expensive specialized computers sold for business or scientific uses. The introduction of the microprocessor, a single chip with all the circuitry that formerly occupied large cabinets, led to the proliferation of personal computers after 1975.
Early personal computers—generally called microcomputers—were often sold in a kit form and in limited volumes, and were of interest mostly to hobbyists and technicians. Minimal programming was done with toggle switches to enter instructions, and output was provided by front panel lamps. Practical use required adding peripherals such as keyboards, computer displays, disk drives, and printers. Micral N was the earliest commercial, non-kit microcomputer based on a microprocessor, the Intel 8008. It was built starting in 1972 and about 90,000 units were sold.

In 1976 Steve Jobs and Steve Wozniak sold the Apple I computer circuit board, which was fully prepared and contained about 30 chips. The Apple I computer differed from the other hobby computers of the time at the beckoning of Paul Terrell owner of the Byte Shop who gave Steve Jobs his first purchase order for 50 Apple I computers only if the computers were assembled and tested and not a kit computer so he would have computers to sell to everyone, not just people that could assemble a computer kit. The Apple I as delivered was still a kit computer as it did not have a power supply, case, or keyboard as delivered to the Byte Shop.

The first successfully mass marketed personal computer was the Commodore PET introduced in January 1977, but back-ordered and not available until later in the year. At the same time, the Apple II (usually referred to as the "Apple") was introduced (Note: "Apple II History". Apple II History. Retrieved May 8, 2014.) (June 1977), and the TRS-80 from Tandy Corporation/Tandy Radio Shack in summer 1977, delivered in September in a small number. Mass-market ready-assembled computers allowed a wider range of people to use computers, focusing more on software applications and less on development of the processor hardware.

During the early 1980s, home computers were further developed for household use, with software for personal productivity, programming and games. They typically could be used with a television already in the home as the computer display, with low-detail blocky graphics and a limited color range, and text about 40 characters wide by 25 characters tall. Sinclair Research, (Note: "Sinclair Research website". Retrieved 2014-08-06.) a UK company, produced the ZX Series: the ZX80 (1980), ZX81 (1981), and the ZX Spectrum; the latter was introduced in 1982, and totaled 8 million unit sold. Following came the Commodore 64, totaled 17 million units sold. (Note: Reimer, Jeremy (December 2, 2012). "Personal Computer Market Share: 1975–2004". Retrieved 2013-02-09.)

In the same year, the NEC PC-98 was introduced, which was a very popular personal computer that sold in more than 18 million units. (Note: "Computing Japan". Computing Japan (LINC Japan). 54-59: 18. 1999. Retrieved February 6, 2012. "...its venerable PC 9800 series, which has sold more than 18 million units over the years, and is the reason why NEC has been the number one PC vendor in Japan for as long as anyone can remember.”) Another famous personal computer, the revolutionary Amiga 1000, was unveiled by Commodore on July 23, 1985 at the Vivian Beaumont Theater in the Lincoln Center in New York. The Amiga 1000 featured a multitasking, windowing operating system, color graphics with a 4096-color palette, stereo sound, Motorola 68000 CPU, 256 kB RAM, and 880 kB 3.5-inch disk drive, for US$1,295. (Note: Polsson, Ken. "Chronology of Amiga Computers". Retrieved May 9, 2014.)
Somewhat larger and more expensive systems (for example, running CP/M), or sometimes a home computer with additional interfaces and devices, although still low-cost compared with minicomputers and mainframes, were aimed at office and small business use, typically using "high resolution" monitors capable of at least 80 column text display, and often no graphical or color drawing capability.

Workstations were characterized by high-performance processors and graphics displays, with large-capacity local disk storage, networking capability, and running under a multitasking operating system.

Eventually, due to the influence of the IBM PC on the personal computer market, personal computers and home computers lost any technical distinction. Business computers acquired color graphics capability and sound, and home computers and game systems users used the same processors and operating systems as office workers. Mass-market computers had graphics capabilities and memory comparable to dedicated workstations of a few years before. Even local area networking, originally a way to allow business computers to share expensive mass storage and peripherals, became a standard feature of personal computers used at home.

In 1982 “The Computer” was named Machine of the Year by *Time* Magazine.

In the 2010s, several companies such as Hewlett-Packard and Sony sold off their PC and laptop divisions. As a result, the personal computer was declared dead several times during this time. (Note: Angler, Martin. "Obituary: The PC is Dead". JACKED IN. Retrieved February 12, 2014.)
Market and Sales

In 2001, 125 million personal computers were shipped in comparison to 48,000 in 1977. (Note: Kanellos, Michael (June 30, 2002). "personal computers: More than 1 billion served". CNET News. Retrieved 2010-10-14.) More than 500 million personal computers were in use in 2002 and one billion personal computers had been sold worldwide from the mid-1970s up to this time. Of the latter figure, 75% were professional or work related, while the rest were sold for personal or home use. About 81.5% of personal computers shipped had been desktop computers, 16.4% laptops and 2.1% servers. The United States had received 38.8% (394 million) of the computers shipped, Europe 25% and 11.7% had gone to the Asia-Pacific region, the fastest-growing market as of 2002. The second billion was expected to be sold by 2008. (Note: Ibid.) Almost half of all households in Western Europe had a personal computer and a computer could be found in 40% of homes in United Kingdom, compared with only 13% in 1985. (Note: "Computers reach one billion mark". BBC News. July 1, 2002. Retrieved 2010-10-14.)


As of June 2008, the number of personal computers in use worldwide hit one billion, (Note: "Worldwide PC use to reach 1 billion by 2008: report". CBC News. Retrieved June 12, 2007.) while another billion is expected to be reached by 2014. Mature markets like the United States, Western Europe and Japan accounted for 58% of the worldwide installed PCs. The emerging markets were expected to double their installed PCs by 2012 and to take 70% of the second billion PCs. About 180 million computers (16% of the existing installed base) were expected to be replaced and 35 million to be dumped into landfill in 2008. The whole installed base grew 12% annually. (Note:

Based on International Data Corporation (IDC) data for Q2 2011, for the first time China surpassed US in PC shipments by 18.5 million and 17.7 million respectively. This trend reflects the rising of emerging markets as well as the relative stagnation of mature regions. (Note: "China hits tech milestone: PC shipments pass US". August 23, 2011.)

In the developed world, there has been a vendor tradition to keep adding functions to maintain high prices of personal computers. However, since the introduction of the One Laptop per Child foundation and its low-cost XO-1 laptop, the computing industry started to pursue the price too. Although introduced only one year earlier, there were 14 million netbooks sold in 2008. (Note: "4P Computing - Negroponte's 14 Million Laptop Impact". OLPC News. December 11, 2008. Retrieved 2010-10-14.) Besides the regular computer manufacturers, companies making especially rugged versions of computers have sprung up, offering alternatives for people operating their machines in extreme weather or environments. (Note: Conrad H. Blickenstorfer. "Rugged PC leaders". Ruggedpcreview.com. Retrieved 2010-10-14.)

<table>
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<tr>
<th>Source</th>
<th>Date</th>
<th>Lenovo</th>
<th>HP</th>
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<td>IDC (Note: &quot;PC Rebound in Mature Regions Stabilizes Market, But Falls Short of Overall Growth in the Second Quarter of 2014&quot;. International Data Corporation.)</td>
<td>Q2 2014</td>
<td>19.6%</td>
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<td>Gartner (Note: &quot;After Two Years of Decline, Worldwide PC Shipments Experienced Flat Growth in Second Quarter of 2014&quot;. Gartner.)</td>
<td>Q2 2014</td>
<td>19.2%</td>
<td>17.7%</td>
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Deloitte consulting firm predicted that in 2011, smartphones and tablet computers as computing devices would surpass the PCs sales. (Note: Tablets, smartphones to outsell PCs http://news.yahoo.com/s/afp/20110210/tc_afp/itinternettelecomequipmentmobileconsumerproduct) As of 2013, worldwide sales of PCs had begun to fall as many consumers moved to tablets and smartphones for gifts and personal use. Sales of 90.3 million units in the 4th quarter of 2012 represented a 4.9% decline from sales in the 4th quarter of 2011. (Note: "Gartner Says Declining Worldwide PC Shipments in Fourth Quarter of 2012 Signal Structural Shift of PC Market". Gartner.Com (Press release). January 14, 2013. Retrieved January 18, 2013.) Global PC sales fell sharply in the first quarter of 2013, according to IDC data. The 14% year-over-year decline was the largest on record since the firm began tracking in 1994, and double what analysts had been expecting. (Note: "Feeble PC industry stumbles to steep sales drop during 1st quarter as Windows makeover flops." Washington Times. Associated Press. April 10, 2013. Retrieved April 11, 2013.) (Note: Nick Wingfield (April 10, 2013). "PC Sales Still in a Slump, Despite New Offerings". New York Times. Retrieved April 11, 2013.) The decline of Q2 2013 PC shipments marked the fifth straight quarter of falling sales. (Note: "Steve Ballmer's retirement leaves Microsoft in a replacement crisis". August 24, 2013.) “This is horrific news for PCs,” remarked an analyst. “It’s all about mobile computing now. We have definitely reached the tipping point.” (Note: "Feeble PC industry stumbles to steep sales drop during 1st quarter as Windows makeover flops." Data from Gartner Inc. showed a similar decline for the same time period. (Note: Ibid.) China’s Lenovo Group bucked the general trend as strong sales to first time buyers in the developing world allowed the company’s sales to stay flat overall. (Note: Ibid.) Windows 8, which was designed to look similar to tablet/smartphone software, was cited as a contributing factor in the decline of new PC sales. “Unfortunately, it seems clear that the Windows 8 launch not only didn’t provide a positive boost to the PC market, but appears to have slowed the market,” said IDC Vice President Bob O’Donnell. (Note: Nick Wingfield (April 10, 2013).)

In August 2013, Credit Suisse published research findings that attributed around 75% of the operating profit share of the PC industry to Microsoft (operating system) and Intel (semiconductors). (Note: "The Apple Vs. Samsung Title Fight for Mobile Supremacy". The Financialist. Credit Suisse. August 8, 2013. Retrieved August 13, 2013.)
According to IDC, in 2013 PC shipments dropped by 9.8% as the greatest drop-ever in line with consumers trends to use mobile devices. (Note: John Fingas (March 4, 2014). "PC shipments faced their steepest-ever drop in 2013").

Average Selling Price

Selling prices of personal computers, unlike other consumer commodities, steadily declined due to lower costs of production and manufacture. Capabilities of the computers also increased. In 1975, an Altair kit sold for only around US $400, but required customers to solder components into circuit boards; peripherals required to interact with the system in alphanumeric form instead of blinking lights would add another $2,000, and the resultant system was only of use to hobbyists. (Note: Marvin B. Sussman Personal Computers and the Family Routledge, 1985 ISBN 0-86656-361-X, page 90)

At their introduction in 1981, the US $1,795 price of the Osborne 1 and its competitor Kaypro was considered an attractive price point; these systems had text-only displays and only floppy disks for storage. By 1982, Michael Dell observed that a personal computer system selling at retail for about $3,000 US was made of components that cost the dealer about $600; typical gross margin on a computer unit was around $1,000. (Note: Kateri M. Drexler Icons of business: an encyclopedia of mavericks, movers, and shakers, Volume 1, Greenwood Publishing Group, 2007 ISBN 0-313-33863-9 page 102) The total value of personal computer purchases in the US in 1983 was about $4 billion, comparable to total sales of pet food. By late 1998, the average selling price of personal computer systems in the United States had dropped below $1,000. (Note: Nancy Weil, Average PC Price drops below $1000, PC World December 1998, Retrieved November 17, 2010)

For Microsoft Windows systems, the average selling price (ASP) showed a decline in 2008/2009, possibly due to low-cost netbooks, drawing $569 for desktop computers and $689 for laptops at U.S. retail in August 2008. In 2009, ASP had further fallen to $533 for desktops and to $602 for notebooks by January and to $540 and $560 in February. (Note: Joe Wilcox (April 16, 2009). "Netbooks Are Destroying the Laptop Market and Microsoft Needs to Act Now". eWeek. Retrieved 2010-10-14.) According to research firm NPD, the average selling price of all Windows portable PCs has fallen from $659 in October 2008 to $519 in October 2009. (Note: Shane O'Neill (December 2, 2009). "Falling PC Prices Pit Microsoft Against PC Makers". Retrieved 2010-10-14.)

Terminology

“PC” is an initialism for “personal computer.” However, it is used in a different sense: It means a personal computers with an Intel x86-compatible processor running Microsoft Windows (sometimes called Wintel). “PC” is used in contrast with “Mac”, an Apple Macintosh computer. (Note: (a)"Mac" vs. PC Debate". intel.com. Intel. Retrieved 5 October 2014. Finnie, Scot (8 June 2007). (b) "Mac vs. PC cost analysis: How does it all add up?". Computerworld. Computerworld, Inc. Retrieved 5 October 2014. (c) Ackerman, Dan (22 August 2013). "Don't buy a new PC or Mac before you read this". CNET. CBS Interactive. Retrieved 5 October 2014. (d) Haslam, Karen (11 December 2013). "Mac or PC? Ten reasons why Macs are better than PCs". Macworld. IDG. Retrieved 5 October 2014.) This sense of the word is used in Get a Mac advertisement campaign that run between 2006 to 2009, as well as its rival, I'm a PC campaign, that appeared on 2008.
Types

Stationary

Workstation

A workstation is a high-end personal computer designed for technical, mathematical, or scientific applications. Intended primarily to be used by one person at a time, they are commonly connected to a local area network and run multi-user operating systems. Workstations are used for tasks such as computer-aided design, drafting and modeling, computation-intensive scientific and engineering calculations, image processing, architectural modeling, and computer graphics for animation and motion picture visual effects. (Note: Ralston, Anthony; Reilly, Edwin (1993). "Workstation". Encyclopedia of Computer Science (Third Edition ed.). New York: Van Nostrand Reinhold. ISBN 0-442-27679-6.)

Desktop Computer

Prior to the widespread usage of PCs, a computer that could fit on a desk was remarkably small, leading to the “desktop” nomenclature. More recently, the phrase usually indicates a particular style of computer case. Desktop computers come in a variety of styles ranging from large vertical tower cases to small models which can be tucked behind an LCD monitor. In this sense, the term “desktop” refers specifically to a horizontally oriented case, usually intended to have the display screen placed on top to save desk space. Most modern desktop computers have separate screens and keyboards.

Gaming Computer

A gaming computer is a standard desktop computer that typically has high-performance hardware, such as a more powerful video card, processor and memory, in order to handle the requirements of demanding video games, which are often simply called “PC games.” A number of companies, such as Alienware, manufacture prebuilt gaming computers, and companies such as Razer and Logitech market mice, keyboards and headsets geared toward gamers.

Single Unit

Single-unit PCs (also known as all-in-one PCs) are a subtype of desktop computers that combine the monitor and case of the computer within a single unit. The monitor often utilizes a touchscreen as an optional method of user input, but separate keyboards and mice are normally still included. The inner components of the PC are often located directly behind the monitor and many of such PCs are built similarly to laptops.
Nettop

A subtype of desktops, called nettops, was introduced by Intel in February 2008, characterized by low cost and lean functionality. A similar subtype of laptops (or notebooks) is the netbook, described below. The product line features the new Intel Atom processor, which specifically enables nettops to consume less power and fit into small enclosures.

Home Theater PC

A home theater PC (HTPC) is a convergence device that combines the functions of a personal computer and a digital video recorder. It is connected to a TV set or an appropriately sized computer display, and is often used as a digital photo viewer, music and video player, TV receiver, and digital video recorder. HTPCs are also referred to as media center systems or media servers. The general goal in a HTPC is usually to combine many or all components of a home theater setup into one box. More recently, HTPCs gained the ability to connect to services providing on-demand movies and TV shows.

HTPCs can be purchased pre-configured with the required hardware and software needed to add television programming to the PC, or can be cobbled together out of discrete components, what is commonly done with software support from MythTV, Windows Media Center, GB-PVR, SageTV, Famulent or LinuxMCE.

Portable

Laptop

A laptop computer or simply laptop, also called a notebook computer, is a small personal computer designed for portability. Usually, all of the hardware and interfaces needed to operate a laptop, such as the graphics card, audio devices or USB ports (previously parallel and serial ports), are built into a single unit. Laptops contain high-capacity batteries that can power the device for extensive periods of time, enhancing portability. Once the battery charge is depleted, it will have to be recharged through a power outlet. In the interests of saving power, weight and space, laptop graphics cards are in many cases integrated into the CPU or chipset and use system RAM, resulting in reduced graphics performance when compared to an equivalent desktop machine. For this reason, desktop or gaming computers are usually preferred to laptop PCs for gaming purposes.

One of the drawbacks of laptops is that, due to the size and configuration of components, usually relatively little can be done to upgrade the overall computer from its original design. Internal upgrades are either not manufacturer-recommended, can damage the laptop if done with poor care or knowledge, or in some cases impossible, making the desktop PC more modular. Some internal upgrades, such as memory and hard disk drive upgrades are often easily performed, while a display or keyboard upgrade is usually impossible. Just as desktops, laptops also have the same possibilities for connecting to a wide variety of devices, including external displays, mice, cameras, storage devices and keyboards, which may be attached externally through USB ports and other less common ports such as external video.

A subtype of notebooks, called subnotebook, has most of the features of a standard laptop computer, but with smaller physical dimensions. Subnotebooks are larger than hand-held computers, and usually run full versions of
desktop or laptop operating systems. Ultra-Mobile PCs (UMPC) are usually considered subnotebooks, or more specifically, subnotebook tablet PCs, which are described below. Netbooks are sometimes considered to belong to this category, though they are sometimes separated into a category of their own (see below).

**Desktop Replacement**

A desktop replacement computer (DTR) is a personal computer that provides the full capabilities of a desktop computer while remaining mobile. Such computers are often actually larger, bulkier laptops. Because of their increased size, this class of computers usually includes more powerful components and a larger display than generally found in smaller portable computers, and can have a relatively limited battery capacity or none at all in some cases. Some use a limited range of desktop components to provide better performance at the expense of battery life. Desktop replacement computers are sometimes called *desknotes*, as a portmanteau of words “desktop” and “notebook,” though the term is also applied to desktop replacement computers in general. (Note: Desktop notebooks stake their claim, accessed October 19, 2007)

**Netbook**

Netbooks, also called mini notebooks or subnotebooks, are a subgroup of laptops (Note: Erica Ogg (August 20, 2009). "Time to drop the Netbook label". CNN.) acting as a category of small, lightweight and inexpensive laptop computers suited for general computing tasks and accessing web-based applications. They are often marketed as “companion devices”, with an intention to augment other ways in which a user can access computer resources. (Note: Ibid.)Walt Mossberg called them a “relatively new category of small, light, minimalist and cheap laptops.” (Note: Walt Mossberg (August 6, 2009). "New Netbook Offers Long Battery Life and Room to Type". The Wall Street Journal Online, Personal Technology.) By August 2009, CNET called netbooks “nothing more than smaller, cheaper notebooks.” (Note: Erica Ogg (August 20, 2009).)

Initially, the primary defining characteristic of netbooks was the lack of an optical disc drive, requiring it to be a separate external device. This has become less important as flash memory devices have gradually increased in capacity, replacing the writable optical disc (e.g. CD-RW, DVD-RW) as a transportable storage medium.

At their inception in late 2007—as smaller notebooks optimized for low weight and low cost (Note: "Cheap PCs Weigh on Microsoft!". Business Technologies, The Wall Street Journal. December 8, 2008)—netbooks omitted key features (e.g., the optical drive), featured smaller screens and keyboards, and offered reduced specifications and computing power. Over the course of their evolution, netbooks have ranged in their screen sizes from below five inches (Note: "UMID Netbook Only 4.8”". Elitezoom.com. Retrieved 2010-10-14.) to over 13 inches, (Note: "CES 2009 - MSI Unveils the X320 "MacBook Air Clone" Netbook". Futurelooks.com. 2009-01-07. Retrieved 2010-10-14.) with weights around ~1 kg (2-3 pounds). Often significantly less expensive than other laptops, (Note: Netbook Trends and Solid-State Technology Forecast (PDF). pricegrabber.com. p. 7. Retrieved 2009-01-28.) by mid-2009 netbooks had been offered to users “free of charge”, with an extended service contract purchase of a cellular data plan. (Note: Light and Cheap, Netbooks Are Poised to Reshape PC Industry; The New York Times, April 1, 2009, retrieved 2010-10-14, “AT&T announced on Tuesday that customers in Atlanta could get a type of compact PC called a netbook for just 50 US$ if they signed up for an Internet service plan... 'The era of a perfect Internet computer for 99 US$ is coming this year,’ said Jen-Hsun Huang, the chief executive of Nvidia, a maker of PC graphics chips that is trying to adapt to the new technological order."
In the short period since their appearance, netbooks have grown in size and features, converging with new smaller and lighter notebooks. By mid-2009, CNET noted that “the specs are so similar that the average shopper would likely be confused as to why one is better than the other,” noting “the only conclusion is that there really is no distinction between the devices.” (Note: Erica Ogg (August 20, 2009).)

Tablet

A tablet is a type of portable PC that de-emphasizes the use of traditional input devices (such as a mouse or keyboard) by using a touchscreen display, which can be controlled using either a stylus pen or finger. Some tablets may use a “hybrid” or “convertible” design, offering a keyboard that can either be removed as an attachment, or a screen that can be rotated and folded directly over top the keyboard.

Some tablets may run a traditional PC operating system such as Windows or Linux; Microsoft attempted to enter the tablet market in 2002 with its Microsoft Tablet PC specifications, for tablets and convertible laptops running Windows XP. However, Microsoft’s early attempts were overshadowed by the release of Apple’s iPad; following in its footsteps, most modern tablets use slate designs and run mobile operating systems such as Android and iOS, giving them functionality similar to smartphones. In response, Microsoft built its Windows 8 operating system to better accommodate these new touch-oriented devices. (Note: "Tablet PC Redux?", Paul Thurrott's Supersite for Windows. Retrieved October 6, 2013.)

Ultra-Mobile PC

The ultra-mobile PC (UMPC) is a specification for small-configuration tablet PCs. It was developed as a joint development exercise by Microsoft, Intel and Samsung, among others. Current UMPCs typically feature the Windows XP, Windows Vista, Windows 7, or Linux operating system, and low-voltage Intel Atom or VIA C7-M processors.

Pocket PC

A pocket PC is a hardware specification for a handheld-sized computer (personal digital assistant, PDA) that runs the Microsoft Windows Mobile operating system. It may have the capability to run an alternative operating system like NetBSD or Linux. Pocket PCs have many of the capabilities of modern desktop PCs.

Numerous applications are available for handhelds adhering to the Microsoft Pocket PC specification, many of which are freeware. Some of these devices also include mobile phone features, actually representing a smartphone. Microsoft-compliant Pocket PCs can also be used with many other add-ons like GPS.
receivers, barcode readers, RFID readers and cameras. In 2007, with the release of Windows Mobile 6, Microsoft dropped the name Pocket PC in favor of a new naming scheme: devices without an integrated phone are called Windows Mobile Classic instead of Pocket PC, while devices with an integrated phone and a touch screen are called Windows Mobile Professional. (Note: New Windows Mobile 6 Devices :: Jun/Jul 2007 [dead link])

Hardware

Computer hardware is a comprehensive term for all physical parts of a computer, as distinguished from the data it contains or operates on, and the software that provides instructions for the hardware to accomplish tasks. The boundary between hardware and software might be slightly blurry, with the existence of firmware that is software “built into” the hardware.

An exploded view of a modern personal computer and peripherals: (1) Scanner; (2) CPU (Microprocessor); (3) Memory (RAM); (4) Expansion cards (graphics cards, etc.); (5) Power supply; (6) Optical disc drive; (7) Storage (Hard disk or SSD); (8) Motherboard; (9) Speakers; (10) Monitor; (11) System software; (12) Application software; (13) Keyboard; (14) Mouse; (15) External hard disk; (16) Printer

Mass-market consumer computers use highly standardized components and so are simple for an end user to assemble into a working system. A typical desktop computer consists of a computer case that holds the power supply, motherboard, hard disk drive, and often an optical disc drive. External devices such as a computer monitor or visual display unit, keyboard, and a pointing device are usually found in a personal computer.

The motherboard connects all processor, memory and peripheral devices together. The RAM, graphics card and processor are in most cases mounted directly onto the motherboard. The central processing unit (microprocessor chip) plugs into a CPU socket, while the memory modules plug into corresponding memory sockets. Some motherboards have the video display adapter, sound and other peripherals integrated onto the motherboard, while others use expansion slots for graphics cards, network cards, or other I/O devices. The graphics card or sound card may employ a break out box to keep the analog parts away from the electromagnetic radiation inside the computer case. Disk drives, which provide mass storage, are connected to the motherboard with one cable, and to the power supply through another cable. Usually, disk drives are mounted in the same case as the
motherboard; expansion chassis are also made for additional disk storage. For extended amounts of data, a tape drive can be used or extra hard disks can be put together in an external case.

The keyboard and the mouse are external devices plugged into the computer through connectors on an I/O panel on the back of the computer case. The monitor is also connected to the I/O panel, either through an onboard port on the motherboard, or a port on the graphics card.

Capabilities of the personal computers hardware can sometimes be extended by the addition of expansion cards connected via an expansion bus. Standard peripheral buses often used for adding expansion cards in personal computers include PCI, PCI Express (PCIe), and AGP (a high-speed PCI bus dedicated to graphics adapters, found in older computers). Most modern personal computers have multiple physical PCI Express expansion slots, with some of the having PCI slots as well.

Computer Case

A computer case is an enclosure that contains the main components of a computer. They are usually constructed from steel or aluminum combined with plastic, although other materials such as wood have been used. Cases are available in different sizes and shapes; the size and shape of a computer case is usually determined by the configuration of the motherboard that it is designed to accommodate, since this is the largest and most central component of most computers.

The most popular style for desktop computers is ATX, although microATX and similar layouts became very popular for a variety of uses. Companies like Shuttle Inc. and AOpen have popularized small cases, for which FlexATX is the most common motherboard size.

Power Supply Unit

The power supply unit (PSU) converts general-purpose mains AC electricity to direct current (DC) for the other components of the computer.

The rated output capacity of a PSU should usually be about 40% greater than the calculated system power consumption needs obtained by adding up all the system components. This protects against overloading the supply, and guards against performance degradation.

Processor

The central processing unit, or CPU, is a part of a computer that executes instructions of a software program. In newer PCs, the CPU contains over a million transistors in one integrated circuit chip called the microprocessor. In most cases, the microprocessor plugs directly into the motherboard. The chip generates so much heat that the PC builder is required to attach a special cooling device to its surface; thus, modern CPUs are equipped with a fan attached via heat sink.
IBM PC compatible computers use an x86-compatible microprocessor, manufactured by Intel, AMD, VIA Technologies or Transmeta. Apple Macintosh computers were initially built with the Motorola 680×0 family of processors, then switched to the PowerPC series; in 2006, they switched to x86-compatible processors made by Intel.

**Motherboard**

The motherboard, also referred to as system board or main board, is the primary circuit board within a personal computer, and other major system components plug directly into it or via a cable. A motherboard contains a microprocessor, the CPU supporting circuitry (mostly integrated circuits) that provide the interface between memory and input/output peripheral circuits, main memory, and facilities for initial setup of the computer immediately after power-on (often called boot firmware or, in IBM PC compatible computers, a BIOS or UEFI).

In many portable and embedded personal computers, the motherboard houses nearly all of the PC’s core components. Often a motherboard will also contain one or more peripheral buses and physical connectors for expansion purposes. Sometimes a secondary daughter board is connected to the motherboard to provide further expandability or to satisfy space constraints.

**Main Memory**

A PC’s main memory is a fast primary storage device that is directly accessible by the CPU, and is used to store the currently executing program and immediately needed data. PCs use semiconductor random access memory (RAM) of various kinds such as DRAM, SDRAM or SRAM as their primary storage. Which exact kind is used depends on cost/performance issues at any particular time.

Main memory is much faster than mass storage devices like hard disk drives or optical discs, but is usually volatile, meaning that it does not retain its contents (instructions or data) in the absence of power, and is much more expensive for a given capacity than is most mass storage. As a result, main memory is generally not suitable for long-term or archival data storage.
Hard Disk

Mass storage devices store programs and data even when the power is off; they do require power to perform read and write functions during usage. Although flash memory has dropped in cost, the prevailing form of mass storage in personal computers is still the hard disk drive.

If the mass storage controller provides additional ports for expandability, a PC may also be upgraded by the addition of extra hard disk or optical disc drives. For example, BD-ROMs, DVD-RWs, and various optical disc recorders may all be added by the user to certain PCs. Standard internal storage device connection interfaces are PATA, Serial ATA and SCSI.

Solid state drives (SSDs) are a much faster (but also a much more expensive) replacement for traditional mechanical hard disk drives.

Visual Display Unit

A visual display unit, computer monitor or just display, is a piece of electrical equipment, usually separate from the computer case, which displays visual images without producing a permanent computer record. A display device is usually either a CRT or some form of flat panel such as a TFT LCD. Multi-monitor setups are also quite common.

The display unit houses an electronic circuitry that generates its picture from signals received from the computer. Within the computer, either integral to the motherboard or plugged into it as an expansion card, there is pre-processing circuitry to convert the microprocessor’s output data to a format compatible with the display unit’s circuitry. The images from computer monitors originally contained only text, but as graphical user interfaces emerged and became common, they began to display more images and multimedia content.

The term “monitor” is also used, particularly by technicians in broadcasting television, where a picture of the broadcast data is displayed to a highly standardized reference monitor for confidence checking purposes.

Video Card

The video card—otherwise called a graphics card, graphics adapter or video adapter—processes the graphics output from the motherboard and transmits it to the display. It is an essential part of modern multimedia-enriched computing. On older models, and today on budget models, graphics circuitry may be integrated with the motherboard, but for modern and flexible machines, they are connected by the PCI, AGP, or PCI Express interface.

When the IBM PC was introduced, most existing business-oriented personal computers used text-only display adapters and had no graphics capability. Home computers at that time had graphics compatible with television signals, but with low resolution by modern standards owing to the limited memory available to the eight-bit processors available at the time.
Keyboard

A keyboard is an arrangement of buttons that each correspond to a function, letter, or number. They are the primary devices used for inputting text. In most cases, they contain an array of keys specifically organized with the corresponding letters, numbers, and functions printed or engraved on the button. They are generally designed around an operator's language, and many different versions for different languages exist.

In English, the most common layout is the QWERTY layout, which was originally used in typewriters. They have evolved over time, and have been modified for use in computers with the addition of function keys, number keys, arrow keys, and keys specific to an operating system. Often, specific functions can be achieved by pressing multiple keys at once or in succession, such as inputting characters with accents or opening a task manager. Programs use keyboard shortcuts very differently and all use different keyboard shortcuts for different program specific operations, such as refreshing a web page in a web browser or selecting all text in a word processor.

Mouse

A computer mouse is a small handheld device that users hold and slide across a flat surface, pointing at various elements of a graphical user interface with an on-screen cursor, and selecting and moving objects using the mouse buttons. Almost all modern personal computers include a mouse; it may be plugged into a computer’s rear mouse socket, or as a USB device, or, more recently, may be connected wirelessly via an USB dongle or Bluetooth link.

In the past, mice had a single button that users could press down on the device to “click” on whatever the pointer on the screen was hovering over. Modern mice have two, three or more buttons, providing a “right click” function button on the mouse, which performs a secondary action on a selected object, and a scroll wheel, which users can rotate using their fingers to “scroll” up or down. The scroll wheel can also be pressed down, and therefore be used as a third button. Some mouse wheels may be tilted from side to side to allow sideways scrolling. Different programs make use of these functions differently, and may scroll horizontally by default with the scroll wheel, open different menus with different buttons, etc. These functions may be also user-defined through software utilities.

Mice traditionally detected movement and communicated with the computer with an internal “mouse ball”, and used optical encoders to detect rotation of the ball and tell the computer where the mouse has moved. However, these systems were subject to low durability, accuracy and required internal cleaning. Modern mice use optical technology to directly trace movement of the surface under the mouse and are much more accurate, durable and almost maintenance free. They work on a wider variety of surfaces and can even operate on walls, ceilings or other non-horizontal surfaces.
Other Components

All computers require either fixed or removable storage for their operating system, programs and user-generated material. Early home computers used compact audio cassettes for file storage; these were at the time a very low cost storage solution, but were displaced by floppy disk drives when manufacturing costs dropped, by the mid-1980s.

Initially, the 5.25-inch and 3.5-inch floppy drives were the principal forms of removable storage for backup of user files and distribution of software. As memory sizes increased, the capacity of the floppy did not keep pace; the Zip drive and other higher-capacity removable media were introduced but never became as prevalent as the floppy drive.

By the late 1990s, the optical drive, in CD and later DVD and Blu-ray Disc forms, became the main method for software distribution, and writeable media provided means for data backup and file interchange. As a result, floppy drives became uncommon in desktop personal computers since about 2000, and were dropped from many laptop systems even earlier. (The NeXT computer introduced in 1988 did not include a floppy drive, which at the time was unusual.)

A second generation of tape recorders was provided when videocassette recorders were pressed into service as backup media for larger disk drives. All these systems were less reliable and slower than purpose-built magnetic tape drives. Such tape drives were uncommon in consumer-type personal computers but were a necessity in business or industrial use.

Interchange of data such as photographs from digital cameras is greatly expedited by installation of a card reader, which is often compatible with several forms of flash memory devices. It is usually faster and more convenient to move large amounts of data by removing the card from the mobile device, instead of communicating with the mobile device through a USB interface.

A USB flash drive performs much of the data transfer and backup functions formerly done with floppy drives, Zip disks and other devices. Mainstream operating systems for personal computers provide built-in support for USB flash drives, allowing interchange even between computers with different processors and operating systems. The compact size and lack of moving parts or dirt-sensitive media, combined with low cost and high capacity, have made USB flash drives a popular and useful accessory for any personal computer user.

The operating system can be located on any storage, but is typically installed on a hard disk or solid-state drive. A Live CD represents the concept of running an operating system directly from a CD. While this is slow compared to storing the operating system on a hard disk drive, it is typically used for installation of operating systems, demonstrations, system recovery, or other special purposes. Large flash memory is currently more expensive than hard disk drives of similar size (as of mid-2014) but are starting to appear in laptop computers because of their low weight, small size and low power requirements.

A proper ergonomic design of a personal computer workplace is necessary to prevent repetitive strain injuries, which can develop over time and can lead to long-term disability.
Computer communications involve internal modem cards, modems, network adapter cards, and routers. Common peripherals and adapter cards include headsets, joysticks, microphones, printers, scanners, sound adapter cards (as a separate card rather than located on the motherboard), speakers and webcams.

Software

Computer software is any kind of computer program, procedure, or documentation that performs some task on a computer system. (Note: "Wordreference.com: WordNet 2.0". Princeton University, Princeton, NJ. Retrieved 2007-08-19.) The term includes application software such as word processors that perform productive tasks for users, system software such as operating systems that interface with computer hardware to provide the necessary services for application software, and middleware that controls and co-ordinates distributed systems.

Software applications are common for word processing, Internet browsing, Internet faxing, e-mail and other digital messaging, multimedia playback, playing of computer game, and computer programming. The user of a modern personal computer may have significant knowledge of the operating environment and application programs, but is not necessarily interested in programming nor even able to write programs for the computer. Therefore, most software written primarily for personal computers tends to be designed with simplicity of use, or “user-friendliness” in mind. However, the software industry continuously provide a wide range of new products for use in personal computers, targeted at both the expert and the non-expert user.

Operating System

An operating system (OS) manages computer resources and provides programmers with an interface used to access those resources. An operating system processes system data and user input, and responds by allocating and managing tasks and internal system resources as a service to users and programs of the system. An operating system performs basic tasks such as controlling and allocating memory, prioritizing system requests, controlling input and output devices, facilitating computer networking, and managing files.

Common contemporary desktop operating systems are Microsoft Windows, OS X, Linux, Solaris and FreeBSD. Windows, OS X, and Linux all have server and personal variants. With the exception of Microsoft Windows, the designs of each of the them were inspired by or directly inherited from the Unix operating system, which was developed at Bell Labs beginning in the late 1960s and spawned the development of numerous free and proprietary operating systems.

Microsoft Windows


OS X

OS X (formerly Mac OS X) is a line of operating systems developed, marketed, and sold by Apple Inc. OS X is the successor to the original Mac OS, which had been Apple’s primary operating system since 1984. OS X is a Unix-
based graphical operating system, and Snow Leopard, Leopard, Lion, Mountain Lion, and the new Mavericks are version titles. The most recent version of OS X is entitled OS X Yosemite.

On iPhone, iPad and iPod, versions of iOS (which is an OS X derivative) are available from iOS 1.0 to the recent iOS 8.

Linux

Linux is a family of Unix-like computer operating systems. Linux is one of the most prominent examples of free software and open source development: typically all underlying source code can be freely modified, used, and redistributed by anyone. (Note: "Linux Online — About the Linux Operating System". Linux.org. Retrieved 2007-07-06.) The name “Linux” refers to the Linux kernel, started in 1991 by Linus Torvalds. The system’s utilities and libraries usually come from the GNU operating system, announced in 1983 by Richard Stallman. The GNU contribution is the basis for the alternative name GNU/Linux. (Note: Weeks, Alex (2004). "1.1". Linux System Administrator’s Guide (version 0.9 ed.). Retrieved 2007-01-18.)

Known for its use in servers, with the LAMP application stack as one of prominent examples, Linux is supported by corporations such as Dell, Hewlett-Packard, IBM, Novell, Oracle Corporation, Red Hat, Canonical Ltd. and Sun Microsystems. It is used as an operating system for a wide variety of computer hardware, including desktop computers, netbooks, supercomputers, (Note: Lyons, Daniel (March 15, 2005). "Linux rules supercomputers". Forbes. Retrieved 2007-02-22.) video game systems, such as the PlayStation 3 (until this option was removed remotely by Sony in 2010 (Note: Patrick Seybold (March 28, 2010). "PS3 Firmware (v3.21) Update". PlayStation.Blog. Retrieved March 29, 2010.)), several arcade games, and embedded devices such as mobile phones, portable media players, routers, and stage lighting systems.

Applications

Generally, a computer user uses application software to carry out a specific task. System software supports applications and provides common services such as memory management, network connectivity and device drivers, all of which may be used by applications but are not directly of interest to the end user. A simplified analogy in the world of hardware would be the relationship of an electric light bulb (an application) to an electric power generation plant (a system): the power plant merely generates electricity, not itself of any real use until harnessed to an application like the electric light that performs a service that benefits the user.

Typical examples of software applications are word processors, spreadsheets, and media players. Multiple applications bundled together as a package are sometimes referred to as an application suite. Microsoft Office and OpenOffice.org, which bundle together a word processor, a spreadsheet, and several other discrete applications, are typical examples. The separate applications in a suite usually have a user interface that has some commonality making it easier for the user to learn and use each application. Often, they may have some capability to interact with each other in ways beneficial to the user; for example, a spreadsheet might be able to be embedded in a word processor document even though it had been created in the separate spreadsheet application.
End-user development tailors systems to meet the user's specific needs. User-written software include spreadsheet templates, word processor macros, scientific simulations, graphics and animation scripts; even email filters are a kind of user software. Users create this software themselves and often overlook how important it is.

**Gaming**

PC gaming is popular among the high-end PC market. Gaming platforms like Steam (software) and GOG.com (as well as competitive e-sports titles like League of Legends) are largely responsible for PC systems overtaking console revenue in 2013. (Note: [http://www.kotaku.com.au/2014/04/pc-gaming-revenue-has-now-overtaken-console-gaming/](http://www.kotaku.com.au/2014/04/pc-gaming-revenue-has-now-overtaken-console-gaming/))

**Toxicity**

Toxic chemicals found in computer hardware include lead, mercury, cadmium, chromium, plastic (PVC), and barium. In a raw materials breakdown, computer is about 17% lead, copper, zinc, mercury, and cadmium; 23% is plastic, 14% is aluminum, and 20% is iron.

Lead is found in a cathode ray tube (CRT) display, and on all of the printed circuit boards and most expansion cards. Mercury is located in the screen's fluorescent lamp, in the laser light generators in the optical disk drive, and in the round, silver-looking batteries on the motherboard. Plastic is found mostly in the housing of the computation and display circuitry.

While daily end-users are not exposed to these toxic elements, the danger arises during the computer recycling process, which involves manually breaking down hardware and leads to the exposure of a measurable amount of lead or mercury. A measurable amount of lead or mercury can easily cause serious brain damage or ruin drinking water supplies. Computer recycling is best handled by the electronic waste (e-waste) industry, and kept segregated from the general community dump.

**Electronic Waste Regulation**


Organizations, such as the Silicon Valley Toxics Coalition, Basel Action Network, Toxics Link India, SCOPE, and Greenpeace have contributed to these efforts. In the absence of comprehensive national legislation or regulation on the export and import of electronic waste, the Silicon Valley Toxics Coalition and BAN (Basel Action Network) teamed up with 32 electronic recyclers in the US and Canada to create an e-steward program for the orderly disposal of manufacturers and customers electronic waste. The Silicon Valley Toxics Coalition founded the Electronics TakeBack Coalition, a coalition that advocates for the production of environmentally friendly products. The TakeBack Coalition works with policy makers, recyclers, and smart businesses to get manufacturers to take full responsibility of their products.

There are organizations opposing EPR regulation, such as the Reason Foundation. They see flaws in two principal tenants of EPR: First EPR relies on the idea that if the manufacturers have to pay for environmental harm, they will adapt their practices. Second EPR assumes the current design practices are environmentally inefficient. The Reason Foundation claims that manufacturers naturally move toward reduced material and energy use.
INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

- Recognize input and output devices as peripherals
- Identify input devices including mice, keyboards, imaging devices and microphones
- Identify pointing devices
- Identify imaging devices
- Identify display devices
- Differentiate between input and output, and between input and output devices
- Identify output devices including speakers, printers, monitors, and projectors
- Understand the meaning of volatile and non-volatile, and identify examples of each
- Distinguish primary memory (for example, RAM) from secondary memory.

COMPUTER DEVICES

Peripheral


There are three different types of peripherals:

- Input, used to interact with, or send data to the computer (mouse, keyboards, etc.)
- Output, which provides output to the user from the computer (monitors, printers, etc.)
- Storage, which stores data processed by the computer (hard drives, flash drives, etc.)
Human Machine Interface (HMI) peripherals.

Overview

A peripheral device is generally defined as any auxiliary device such as a computer mouse or keyboard, that connects to and works with the computer in some way. Other examples of peripherals are expansion cards, graphics cards, image scanners, tape drives, microphones, loudspeakers, webcams, and digital cameras. RAM—random access memory—straddles the line between peripheral and primary component; it is technically a storage peripheral, but is required for every major function of a modern computer and removing the RAM will effectively disable any modern machine. Many new devices such as digital watches, smartphones and tablet computers have interfaces which allow them to be used as a peripheral by a full computer, though they are not host-dependent as other peripheral devices are. According to the most technical definition, the only pieces of a computer not considered to be peripherals are the central processing unit, power supply, motherboard, and computer case.

Usually, the word peripheral is used to refer to a device external to the computer case, like a scanner, but the devices located inside the computer case are also technically peripherals. Devices that exist outside the computer case are called external peripherals, or auxiliary components, Examples are: “Many of the external peripherals I own, such as my scanner and printer, connect to the peripheral ports on the back of my computer.” (Note: "Peripheral Definition". Support.about.com. 2012-04-10. Retrieved 2012-11-02.) Devices that are inside the case such as internal hard drives or CD-ROM drives are also peripherals in technical terms and are called internal peripherals, but may not be recognized as peripherals by laypeople.

In a system on a chip, peripherals are incorporated into the same integrated circuit as the central processing unit. They are still referred to as “peripherals” despite being permanently attached to (and in some sense part of) their host processor.

Common Peripherals

- Input
  - Keyboard
  - Computer mouse
  - Graphic tablet
• Touchscreen
• Barcode reader
• Image scanner
• Microphone
• Webcam
• Game controller
• Light pen
• Scanner
• Digital camera
• Output
  • Computer display
  • Printer
  • Projector
  • Speaker
• Storage devices
  • Floppy disk drive
  • Flash drive
  • Disk drive
  • Smartphone or Tablet computer storage interface
  • CD/DVD drive
• Input/Output
  • Modem
  • Network interface controller (NIC)

Input Devices

In computing, an input device is a peripheral (piece of computer hardware equipment) used to provide data and control signals to an information processing system such as a computer or other information appliance. Examples of input devices include keyboards, mice, scanners, digital cameras and joysticks.

Many input devices can be classified according to:

• modality of input (e.g. mechanical motion, audio, visual, etc.)
• the input is discrete (e.g. key presses) or continuous (e.g. a mouse’s position, though digitized into a discrete quantity, is fast enough to be considered continuous)

Pointing devices, which are input devices used to specify a position in space, can further be classified according to:

• Whether the input is direct or indirect. With direct input, the input space coincides with the display space, i.e. pointing is done in the space where visual feedback or the pointer appears. Touchscreens and light pens involve direct input. Examples involving indirect input include the mouse and trackball.
• Whether the positional information is absolute (e.g. on a touch screen) or relative (e.g. with a mouse that can be lifted and repositioned)

Direct input is almost necessarily absolute, but indirect input may be either absolute or relative. For example, digitizing graphics tablets that do not have an embedded screen involve indirect input and sense absolute positions and are often run in an absolute input mode, but they may also be set up to simulate a relative input mode like that of a touchpad, where the stylus or puck can be lifted and repositioned.

Input and output devices make up the hardware interface between a computer and a scanner or 6DOF controller.

Keyboards

A keyboard is a human interface device which is represented as a layout of buttons. Each button, or key, can be used to either input a linguistic character to a computer, or to call upon a particular function of the computer. They act as the main text entry interface for most users. Traditional keyboards use spring-based buttons, though newer variations employ virtual keys, or even projected keyboards. It is typewriter like device composed of a matrix of switches.
Examples of types of keyboards include:

- Keyer
- Keyboard
- Lighted Program Function Keyboard (LPFK)

### Pointing Devices

Pointing devices are the most commonly used input devices today. **A pointing device** is any human interface device that allows a user to input spatial data to a computer. In the case of mice and touchpads, this is usually achieved by detecting movement across a physical surface. Analog devices, such as 3D mice, joysticks, or pointing sticks, function by reporting their angle of deflection. Movements of the pointing device are echoed on the screen by movements of the pointer, creating a simple, intuitive way to navigate a computer’s graphical user interface (GUI).

### Composite Devices

Input devices, such as buttons and joysticks, can be combined on a single physical device that could be thought of as a composite device. Many gaming devices have controllers like this. Technically mice are composite devices, as they both track movement and provide buttons for clicking, but composite devices are generally considered to have more than two different forms of input.

- Game controller
- Gamepad (or joypad)
- Paddle (game controller)
- Jog dial/shuttle (or knob)
- Wii Remote

### Imaging and Input Devices

Video input devices are used to digitize images or video from the outside world into the computer. The information can be stored in a multitude of formats depending on the user’s requirement.

- Digital camera
- Digital camcorder
- Portable media player
- Webcam
- Microsoft Kinect Sensor
- Image scanner
- Fingerprint scanner
- Barcode reader
- 3D scanner
• Laser rangefinder
• Eye gaze tracker

Medical Imaging
• Computed tomography
• Magnetic resonance imaging
• Positron emission tomography
• Medical ultrasonography

Audio Input Devices
Audio input devices are used to capture sound. In some cases, an audio output device can be used as an input device, in order to capture produced sound.
• Microphones
• MIDI keyboard or other digital musical instrument

Output Devices
An output device is any piece of computer hardware equipment used to communicate the results of data processing carried out by an information processing system (such as a computer) which converts the electronically generated information into human-readable form. (Note: "Data Processing Concept" (PDF). The National Institute of Open Schooling (NIOS). pp. 24–37. Retrieved 2 June 2012.) (Note: "Definition of: output device". Encyclopedia. The Computer Language Company Inc. Retrieved 2 June 2012.)

Display Devices
A display device is an output device that visually conveys text, graphics, and video information. Information shown on a display device is called soft copy because the information exists electronically and is displayed for a temporary period of time. Display devices include CRT monitors, LCD monitors and displays, gas plasma monitors, and televisions. (Note: Lemley, Linda. "Chapter 6: Output". Discovering Computers. University of West Florida. Retrieved 3 June 2012.)

Input/Output
There are many input and output devices such as multifunction printers and computer-based navigation systems that are used for specialised or unique applications. (Note: "Data Processing Concept") In computing, input/output refers to the communication between an information processing system (such as a computer), and the outside world. Inputs are the signals or data received by the system, and outputs are the signals or data sent from it.

Examples
These examples of output devices also include input/output devices. (Note: "Input devices, processing and output devices". GCSE Bitesize. BBC. Retrieved 2 June 2012.) (Note: Kim, Daeryong. "Hardware Output Devices". Fundamental Microcomputer Information Technology. The University of Mississippi. Retrieved 2 June 2012.) Printers and visual displays are the most common type of output device for interfacing to people, but voice is becoming increasingly available. (Note: "Output device". A Dictionary of Computing. Oxford University Press. 2008. Retrieved 3 June 2012.)
• Speakers
• Headphones
• Screen (Monitor)
Computer Memory

In computing, memory refers to the devices used to store information for use in a computer. The term primary memory is used for storage systems which function at high-speed (i.e. RAM), as a distinction from secondary memory, which provides program and data storage that is slow to access but offer higher memory capacity. If needed, primary memory can be stored in secondary memory, through a memory management technique called "virtual memory." An archaic synonym for memory is store. (Note: A.M. Turing and R.A. Brooker (1952). 
Programmer's Handbook for Manchester Electronic Computer Mark II. University of Manchester.)

Volatile Memory

Volatile memory is computer memory that requires power to maintain the stored information. Most modern semiconductor volatile memory is either Static RAM (see SRAM) or dynamic RAM (see DRAM). SRAM retains its contents as long as the power is connected and is easy to interface to but uses six transistors per bit. Dynamic RAM is more complicated to interface to and control and needs regular refresh cycles to prevent its contents being lost. However, DRAM uses only one transistor and a capacitor per bit, allowing it to reach much higher densities and, with more bits on a memory chip, be much cheaper per bit. SRAM is not worthwhile for desktop system memory, where DRAM dominates, but is used for their cache memories. SRAM is commonplace in small embedded systems, which might only need tens of kilobytes or less.

Forthcoming volatile memory technologies that hope to replace or compete with SRAM and DRAM include Z-RAM, TTRAM, A-RAM and ETA RAM.

Non-Volatile Memory

Non-volatile memory is computer memory that can retain the stored information even when not powered. Examples of non-volatile memory include read-only memory (see ROM), flash memory, most types of magnetic computer storage devices (e.g. hard disks, floppy discs and magnetic tape), optical discs, and early computer storage methods such as paper tape and punched cards.

Forthcoming non-volatile memory technologies include FeRAM, CBRAM, PRAM, SONOS, RRAM, Racetrack memory, NRAM and Millipede.
INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

- Identify three categories of software
- Identify families of operating systems.
- Describe what an operating system does
- Describe what a utility is
- Define booting
- Distinguish between the creation of the Internet and the World Wide Web
- Identify services on the internet
- Identify dangers on the internet
- Define ISP
- Identify methods of connecting to the Internet

SOFTWARE

Software

Computer software (often called just software) is

made of one or more computer programs. Sometimes it means one specific program, or it can mean all the software on a computer, including the applications and the operating system. Applications are programs that do a specific thing, such as a game or a word processor. The operating system (Mac OS, Microsoft Windows, Linux, etc.) is software that helps the applications run, and controls the display and the keyboard.

The word software was first used in the late 1960s to show the difference from computer hardware, which are the parts of a machine that can be seen and touched. Software is the instructions
that the computer follows. Before compact discs (CDs) or Internet downloads, software came on “soft media” like paper punch cards, magnetic discs or magnetic tape.

If you compare computers to music and musical instruments you can think of hardware as being the instruments and software being the musical notes.

The word firmware is sometimes used to describe a style of software that is made specially for a particular type of computer (or other electronic device) and is usually stored on a Flash memory or ROM chip in the computer. Firmware usually refers to a piece of software that directly controls a piece of hardware, for example the firmware for a CD drive or the firmware for a modem.

Categories

Computer software can be put into categories based on common function, type, or field of use. There are three broad classifications:

1. **Application software** are the computer programs for performing user tasks such as word processing and web browsers.
2. **System software** is used to start and run computer systems and networks. This includes operating systems.
3. **Computer programming tools** (also known as Development Software) are used to create application and system software. This is done by translating and combining computer program source code and libraries into executable RAMs. These include compilers and linkers.

Operating System

An **operating system** (also called an OS) is a piece of software that is needed to run the programs on a computer or a mobile device. The programs that run on an operating system talk to the hardware.

Common Families of Operating Systems

- **Linux**
  - Debian (derivatives include Ubuntu, Mint, Trisquel)
  - Red Hat (derivatives include Fedora, CentOS, Blag)
  - Arch (derivatives include Parabola)
  - Gentoo (derivatives include Ututo XS)
  - Slackware
  - Android

- **BSD**
  - FreeBSD
  - Mac OS X
  - OpenBSD
  - NetBSD

- **Microsoft Windows**
  - Windows 1.0
  - Windows 3.x
  - Windows NT 4.0
  - Windows NT 5.0
  - Windows NT 6.0
  - Windows 95
  - Windows 98
  - Windows 2000
  - Windows ME
  - Windows XP
  - Windows Vista
  - Windows 7
Windows 8
Windows 8.1
Windows 10

iOS
iOS 4
iOS 5
iOS 6
iOS 7
iOS 8

Android
CyanogenMod
Replicant

Be Family
BeOS
Magnussoft ZETA
Haiku (operating system)

An operating system must be made up of different parts: (these can change depending on the operating system)

- kernel and drivers
- computer programs and software

Tasks Commonly Done by Operating Systems

- Interaction with the user, and management of attached devices (such as USB flash drives)
- Management of programs (things like starting and stopping them)
- Management of resources like processor time: Making sure each program gets a fair amount of power.
- The reading and writing of data
- Memory management: virtual memory, paging, swapping

What an Operating System Does

Most ordinary computer users take their operating system for granted. The easiest way to understand what an operating system does is to take a close look at what computers were like before operating systems were invented.

The earliest electronic computers did not have any operating system. If the user wanted to change what the computer was doing, the user had to open the back panel on the (then very large) computer, and change how the wires were connected. Changing what the computer did was very time consuming and required an expert.

Later, computer scientists decided to have the wires stay as they were, and feed instructions to the computer with punched cards (cards with holes that represented instructions) or magnetic tape. The computer would store the instructions in some kind of memory. This way of operating a computer is called the von Neumann architecture.

Still, computers of the time generally only had enough memory to “remember” one program at a time. If the user wanted the computer to run a different program, the user had to wipe out the first program from memory and then load another program into memory.

Computer operators and computer scientists grew tired of carrying around large stacks of punch cards. They also wanted computers to run more than one program at a time. As years of work changed or replaced computers to have more memory, computer operators and computer scientists decided that some computers could hold several programs in its memory. The computer user could then simply choose which program the user wanted to run. Running a computer this way requires a “boss” program that controls all the other programs, and asks the user what program the user wants to run. Such a boss program is called an operating system.

Having several programs in memory that can be run at any time makes some new problems. The operating system itself has to remember where the programs are at in memory. The operating system also has to prevent two programs from fighting over which one gets to use the processor.
Modern desktop or laptop computers need an operating system so that they can operate. They are usually sold with it already installed. Operating systems normally start up automatically when the user turns on the computer.

**Differences**

Operating systems can also have other differences:

- Some are real-time systems.
- Some are distributed systems.
- Most use a GUI, some use a text-based interface.

**Utility Software**

In computing, a *utility* is a program or module which is used to give a general-purpose result, for many different uses. A utility is intended for a wide range of users, rather than an “app” (application program) which might be intended to serve a specific purpose for specific users.

For example, a utility program may handle computer files or guard against computer viruses.

The word “utility” has been used to mean a "general-purpose computing tool" for many decades, since at least 1960. (Note: "What does utility program mean?", Definitions.net, June 2011 (notes "Etymology: 1960"), web: DN)  

**Booting**

Booting is what happens when a computer starts up. When you boot a computer, your processor looks in system ROM (the BIOS) for instructions and does them. They normally ‘wake up’ add-in cards and searches for the boot device. The boot device either loads the operating system or gets the operating system from someplace else.

People use the word “boot” to mean “to start a computer” or other device with electronics built in. For example, if a person wants to ask a friend to turn on a satellite phone, they would say “could you boot up the satellite phone?”.

Most operating systems call the first device it uses a boot device. This is because the computer is making itself go, as in the idiom. When we start a computer, we can often see the simple instructions the computer uses to start, then more complicated pictures or software.

The phrase “to boot” in this meaning is short for “to bootstrap”. This use is part of net jargon along with similar multi-use words like net or web. Often the computer is just called a box, so a phrase like “to boot the box” means “to start the computer”.

The term “reboot” can also be used in a different context to mean a restarting of a storyline established in previous iterations of a series of fiction.

To “reboot” is not only a computer reference, but is also sometime referenced in giving birth to cows.
INTERNET

Internet

The Internet is a large group of computers that are connected to each other. The Internet is used to send information quickly between computers around the world. It has millions of smaller domestic, academic, business, and government networks and websites, which together carry many different kinds of information (facts and details) and services. So in other words, the Internet is a network of networks.

History

The internet was made in the United States by the “United States Department of Defense Advanced Research Projects Agency” (ARPA). It was first connected in October, 1969. (Note: "A Brief History of the Internet". walthowe.com. Retrieved 13 July 2010.) The World Wide Web was created at CERN in Switzerland in 1989 by a British (UK) man named Tim Berners-Lee.

Today, people can pay money to access the Internet from Internet Service Providers. Some services on the Internet cost nothing to use. Sometimes the people who offer these free services use advertising to make money from them. The alternative (other) name, “Net” came from “Inter(net).”

Services on the Internet

The Internet is used for many things, such as electronic mail, online chat, file transfer, and the interlinked web pages and other documents of the World Wide Web.

The most used service on the Internet is the World Wide Web (which is also called the “Web”). The Web contains websites, blogs, and also wikis like Wikipedia. Webpages on the internet can be seen and read by anyone (unless the page needs a password, or it is blocked).

The second major use of the Internet is to send and receive e-mail. E-mail is private and goes from one user to another. Instant messaging (such as AIM or ICQ) is similar to email, but allows two or more people to chat to each other much faster.

Some governments think the Internet is a bad thing, and block all or part of it. For example, the Chinese government thinks that Wikipedia is bad. Many times no one in China can read it or add to it. (Note: "Chinese censors block access to Wikipedia". ITworld. Retrieved 2009-10-16.) Some parents block parts of the Internet they think are bad for children to see. Well-known examples of the whole Internet being blocked are in North Korea (Note: "Rapport @ 09 GB" (PDF). Retrieved 2009-10-16.) and Myanmar.

Dangers on the Internet

The Internet can also be a dangerous place. Information that people put on the Internet is not always checked, and some may not be true. Some may even be harmful. Also, if someone sends information through the internet, sometimes other people can read it even when they are not supposed to. For example, Facebook has had some problems with privacy settings. A person can post information on a website, but this is often a bad idea unless the person is very sure of what they are doing. A good way to check for a secure website is to make sure the URL
starts with https:// instead of http://, this means it is a secure site. (This only stops other people from reading what a user types. It does not mean the website is safe)

- Some websites may trick people into downloading viruses that can harm a computer or spyware that spies on its users (looks at what they are doing and tells someone else). E-mails can also have harmful files with them as “attachments.” (Note: "Internet Safety: Internet 101 - Viruses, worms and Trojans”. Wiredsafety.org. Retrieved 2009-10-16.)
- In Internet chatrooms, people might be preying on others or trying to stalk or abuse them.
- The Internet contains content that many people find offensive such as pornography, as well as content intended to be offensive.

Uniform Resource Locator

Uniform Resource Locator (URL) is another name for a web address. URLs are made of letters, numbers and other symbols in a standard form. (Note: Uniform Resource Locators (URL)) People use them on computers by clicking a pre-prepared link or typing one into a web browser, to make the computer fetch and show some specific resource (usually a web page) from another computer (web server) on the Internet.

URLs consist of several parts:

- A protocol. Very often, this is the Hypertext Transfer Protocol (HTTP)
- Some separation characters: //
- The other computer’s name or address. It is very common, for names to start with www. (which stands for World Wide Web), but the entire name is up to that computer’s administrator.

In some cases, the URL may also contain

- The path to a document or script.
- In the case of a script, additional parameters after a question mark (?)
- Username and password needed to access a certain page
- Some text after a pound sign (#), naming a spot to skip ahead to.

The URL of this page is http://simple.wikipedia.org/w/index.php?title=Uniform_Resource_Locator

- http is the protocol
- simple.wikipedia.org is the web site
- /w/index.php is a script. That script gets parameters, title=Uniform_Resource_Locator

A shorter form, called a “relative” URL, is used when a computer could correctly fill in the full (“absolute”) URL from context. For example /wiki/URL only works for a link on wikipedia to this page on wikipedia. Absolute URLs can be shared outside of computers, even with little or no explanation.

Extensions

These are at the end of the domain name which has a period mark before it. At first there were six main extensions:

- .com – Commercial use
- .net – network / Internet Service Provider use
- .org – Organizational use
- .edu – Educational use (Schools and universities)
Today, there are many other URL extensions. These are usually either a top level domain or interest grouping. Each country has its own top level domain, for example, .ca for Canada, .us for the United States of America or .co.uk for the United Kingdom. Many countries have a government-only extension, for example the United States uses .gov or .fed.us, .gc.ca for Canada and .gov.uk for the United Kingdom. Interest group domains would include .tv (television), .pro (professionals) and .xxx (pornography). These are not used as often as the original extensions.

Internet Service Provider

An Internet service provider, or ISP, maintains, installs and provides internet connection to residential or commercial areas. Some examples of ISP clients include – homes, coffee shops, hotels, libraries, offices. They usually charge a fee for installing the connection and a monthly fee for maintaining it.

The internet is basically a web of interconnected networks – which are maintained by a huge number of different ISP’s. They keep connected around the world by giving their clients access to other ISP networks. This is called peering.

ISP’s have other services as well – Sometimes they offer e-mail and or website hosting.

There are different types of connections ISP’s can offer as well, some might be dial-up, DSL, through optical fiber wires, through a cable television connection, wireless, or even satellite, usually in remote areas. Dial-up is the slowest connection, while a direct fiber-optic connection is usually the fastest.

Dial-Up

Dial-up internet access, usually just called Dial-up, is a slow way of connecting to the Internet by using a telephone line. A modem is connected between a computer and a telephone line and then the modem is instructed to dial the phone number of an Internet service provider (ISP) to connect to the Internet. The ISP must be a dial-up service provider with several dial-up modems waiting to accept dial-up calls. This kind of internet is slower than DSL. It is not widely used in the United States, where only one out of every ten people still use it. In most parts of the world, the dial-up has been replaced by broadband.

Dial-up was the most common way of connecting to the internet from its creation until around the middle of the 2000s.
Cable Modem

A **cable modem** is a modem that can be used to deliver (usually digital) data over Cable television infrastructure. Most of the time, cable modems are used to get access to the internet using the cable television network. To do this, cable modems use some channels of the Cable TV network. A cable modem usually translates the signals it receives from Ethernet or USB into Radio frequency channels. With Voice over IP (VoIP) technology, most cable modems can now also provide telephone lines.

In terms of network technology, a cable modem is a network bridge. It operates at layer 2 of the OSI model.

Digital Subscriber Line

**DSL** (for **Digital Subscriber Loop** or **Digital Subscriber Line**) is the base for a number of technologies used to transmit digital data over a telephone line. Telephone lines only transmit a limited spectrum of signals (roughly 20 Hertz to 20,000 Hertz, for voice). This means that the other frequencies can be used to transmit data. The data is multiplexed onto the telephone line. At both ends, a device called **Splitter** (or DSL filter) separates the data part and the telephony part. DSL provides the physical layer, the lowest layer of the OSI Model. ATM or Ethernet is used as data link layer, IP at the network layer.

DSL signals can also be used without a telephony line (or multiplexed onto something else, for example Cable TV). Most are multiplexed onto telephone lines though.

At the consumer end, a DSL modem converts the signals to be able to travel on the phone line; at the other end, a DSLAM multiplexes the signals onto the internet backbone of the provider.

Most DSL lines of consumers are asymmetric. This is called ADSL and means it has a higher bit rate in one direction than in the other.

Typically, the download speed of consumer DSL services ranges from 256 kilobits per second (kbit/s) to 24,000 kbit/s, depending on DSL technology, line conditions and service level implemented. Typically, upload speed is lower than download speed for Asymmetric Digital Subscriber Line (ADSL) and equal to download speed for the rarer Symmetric Digital Subscriber Line (SDSL).

Voice and Data

DSL (or VDSL, Very highspeed Digital Subscriber Line) typically works by dividing the frequencies used in a single phone line into two primary “bands.” The ISP data is carried over the high-frequency band (25 kHz and above) while the voice is carried over the lower-frequency band (4 kHz and below). The user typically installs a DSL filter on each phone. This removes the high frequencies from the phone line, so that the phone only sends or receives the lower frequencies (the human voice). The DSL modem and the normal telephone equipment can be used on the line at the same time without interference from each other.
Equipment

The customer end of the connection consists of a Terminal Adaptor (a DSL modem). This converts data from the digital signals used by computers into a voltage signal of a suitable frequency range which is then applied to the phone line.

In some DSL variations (for example, HDSL), the terminal adapter is directly connected to the computer via a serial interface, using communication protocols such as RS-232 or V.35. In other cases (particularly ADSL), it is common for the customer equipment to be integrated with other functions, such as routing, firewalls, or other application-specific hardware and software. In this case, the entire equipment is usually referred to as a DSL router or DSL gateway.
COMPUTER SECURITY 4

INTRODUCTION

Learning Outcomes

By the end of this unit you will be able to:

• Identify goals of computer security
• Identify types of malware, and the ways the different types of malware spread
• Define cookie
• Identify the difference between http and https
• Know which is more secure: WEP, WPA, WPA2
• Define encryption
• Describe the purpose of anti-virus software
• Describe limitations of anti-virus software
• Define firewall as it applies to computer safety
• Define how backup can be used to recover from malware and other disasters

COMPUTER SECURITY

Computer security is a branch of information technology known as information security which is intended to protect computers. Computer security has three main goals:

• Confidentiality: Making sure people cannot acquire information they should not (keeping secrets)
• Integrity: Making sure people cannot change information they should not (protecting data)
• Availability: Making sure people cannot stop the computer from doing its job.

Computer security involves telling computers what they are not to do. This makes computer security unique because most programming makes computers do things. Security takes much of a computers power.

Basic computer security methods (in approximate order of strength) can be:

• Limit access to computers to “safe” users.
• Peripherals which block any “unsafe” activity.
• Firewall and antivirus software.
An example of complexity and pervasiveness of the issue is vending machines, per Hackers Lurking in Vents and Soda Machines April 7, 2014 New York Times.

Malware

Malware, short for malicious software, is a kind of software that can be installed on a computer without approval from the computer’s owner. There are different kinds of malware that can hurt computers, such as viruses and spyware. These programs can steal passwords, delete files, collect personal information, or even stop a computer from working at all. Computer security or anti-malware software is usually good at stopping malware from installing itself. When security software isn’t installed, malware can get into the computer. Getting rid of malware can be difficult, even when using programs designed to remove it.

History

People first started writing malware in the 1970s and early 1980s. Computers were very simple then. They did not have any interesting information for malware to take. Instead, people wrote malware for fun (Note: Leyden, John. "The 30-year-old prank that became the first computer virus". The Register. Retrieved 1 November 2014.) or just to show that they could. (Note: Dalakov, Georgi. "First computer virus of Bob Thomas". Retrieved 1 November 2014.) Even the most common piece of malware from this time did not do damage to people’s computers. (Note: Lee, Timothy. "How a grad student trying to build the first botnet brought the Internet to its knees". Washington Post Company. Retrieved 1 November 2014.) In fact, malware was so rare that the word “malware” was not coined until 1990. (Note: Messmer, Ellen. "Tech Talk: Where'd it Come From, Anyway?". IDG Consumer & SMB. Retrieved 11 November 2014.)

More people started using the computers in the late 1990s and early 2000s. Computers were getting more complex just as fast. (Note: File, Thom. "Computer and Internet Use in the United States". U.S. Census Bureau. Retrieved 11 November 2014.) People saw that they could use malware to get useful information now, like passwords and credit card information. So, more programmers started writing malware. The number of malware programs on the Internet has grown very quickly ever since then the late 1990s and is still growing today. (Note: "The Evolution of Malware and the Threat Landscape – a 10-Year review". Microsoft Incorporated. Retrieved 11 November 2014.) Experts think that 31.5% of the world’s computers have some type of malware installed. (Note: "Annual Report PandaLabs 2013 Summary". Panda Security. Retrieved 15 November 2014.)

Purposes

The main reason people write malware is to hurt others and make money, usually by stealing or deleting important information. The Cryptolocker computer virus, for example, makes it so a person cannot use their own computer until they pay the malware writers for a software key to unlock it. (Note: Cannell, Joshua. "Cryptolocker Ransomware: What You Need To Know". Malwarebytes Corporation. Retrieved 1 November 2014.) Another virus, CIH, tries to make it so the victim can never use their files or turn on their computer again. (Note: "Virus: DOS/CIH". F-Secure Corporation. Retrieved 1 November 2014.) Malicious keystroke logging software remembers everything a user types in and gives it to the malware author to read. (Note: Grebennikov, Nikolay. "Keyloggers: How they work and how to detect them (Part 1)". Kaspersky Labs. Retrieved 11 November 2014.)

World governments have written malware to hurt their enemies. Experts think that the United States government made a virus named Stuxnet to stop an important place in Iran from working. (Note: Kushner, David. "The Real Story of Stuxnet". IEEE. Retrieved 1 November 2014.) The Chinese government probably used a virus to stop people from protesting its decisions. (Note: Greenberg, Andy. "Evidence Mounts That Chinese Government Hackers Spread Android Malware". Forbes Media. Retrieved 1 November 2014.)
How Malware Gets Installed

There are a lot of ways malware can get onto someone’s computer. One common way is through email attachments. These attachments are usually sent from other computers that already have malware on them. (Note: "How Malware Attacks And Spreads In Your Computer". Combofix. Retrieved 2 November 2014.) When someone downloads and opens the attachment, the virus installs and uses their computer to send itself to even more people.

Another way malware installs itself is when a victim gets malware just by going to a website with the malware hidden on it. This is called drive-by downloading. A user does not have to click anything for their computer to get infected from a drive-by download. (Note: Siciliano, Robert. "What is a “Drive-By” Download?". McAfee Incorporated. Retrieved 2 November 2014.) This kind of malware attack is usually found on websites that are not used a lot or whose security methods are very old. However, even current websites that people use all the time can host drive-by downloads when someone hacks the site.

People who write malware also get their programs onto computers by attaching them to real programs that people want. This is most common with pirated programs. This is because the downloder was doing something illegal and cannot complain to the authorities without getting in trouble themselves. (Note: "How Malware Attacks And Spreads In Your Computer." However, some non-piracy websites also put malware (or other unwanted programs that are almost as bad as malware) in a download with real, legal software in a process known as bundling. Computer security experts complain about websites that bundle real software with malware. Their complaints do not always stop the websites from bundling. (Note: Lemos, Robert. "Security pros slam Cnet Download.com's bundling". InfoWorld Incorporated. Retrieved 2 November 2014.)

Kinds of Malware

There are many different kinds of malware. Each acts a different way.

- **Viruses** are a kind of malware that need a user-run program to work. (Note: "What Is the Difference: Viruses, Worms, Trojans, and Bots?". Cisco Systems, Incorporated. Retrieved 3 November 2014.) They cannot copy themselves or move from one computer to another without a program to host it. Viruses are very common in pirated programs. (Note: "How Malware Attacks And Spreads In Your Computer.") They can harm computers in many different ways, like deleting files and stealing passwords. (Note: "What Is the Difference: Viruses, Worms, Trojans, and Bots?"

- **Worms** are a lot like viruses and can cause the same kinds of damage. However, they’re able to move through the internet and copy themselves onto computers without help from a host program. This makes them more dangerous than a virus. (Note: "What Is the Difference: Viruses, Worms, Trojans, and Bots?") Worms are usually found in emails and drive-by downloads. (Note: Siciliano, Robert.)

- **Trojan horses** are like a much more dangerous version of a virus. They need a user to agree to run a program to work and cannot copy themselves from one computer to another. However, trojan horses can make the same problems a normal virus can make. They can also allow the malware writer to control the victim’s computer, install more malware, steal bank data, and more. (Note: "What is a Trojan Virus?". Kaspersky Lab. Retrieved 3 November 2014.) For example, ransomware is a type of trojan horse that stops a victim from using their files until they pay the person who wrote the malware. (Note: Cannell, Joshua.) Experts think that trojan horses are the most common type of malware in existence. (Note: "Annual Report PandaLabs 2013 Summary.")

- **Adware** is a type of malware that earns the program authors money with advertising. These programs show users ads and force them to use websites that make money for the malware writers. Adware will also find personal information about the victim (such as their age, race, and job). This is so the malware authors can sell the information to other people. (Note: "What is Adware?". Kaspersky Labs. Retrieved 3 November 2014.) A user can usually uninstall adware easier than most malware. However, this is still difficult to do without a specially-designed program. (Note: "Adware". Bleeping Computer LLC. Retrieved 3 November 2014.)

- **Spyware** is a more dangerous kind of adware that steals more information from a user. Spyware can steal someone’s Internet traffic, account passwords, and anything they have typed into their computers. Spyware is also much harder to uninstall than adware is. (Note: Beal, Vangie. "The Difference Between Adware & Spyware". Quinstreet Incorporated. Retrieved 3 November 2014.)
Why Computers get Malware

There are a few reasons why computers get programs a user didn’t mean to install. One common reason is because of regular programs that have software bugs. Malware can use bugs, such as a buffer overflow, to make a program do something it was not designed to do. (Note: Schwarz, Thomas. "Buffer Overflow Attack". COEN, SCU. Retrieved 6 November 2014.) Malware can also get onto a computer if it tricks a user into putting it there themselves. This can happen when a user plugs in a USB flash drive that has a virus on it already. (Note: Mills, Elinor. "USB devices spreading viruses". CBS Interactive Incorporated. Retrieved 6 November 2014.) Malware also commonly uses social engineering to get users to run it, like pretending to be an important email attachment for work. Some malware even pretends to be an anti-malware program to get people to run it. (Note: "Social Engineering". Kaspersky Labs. Retrieved 6 November 2014.)

How Malware is Stopped

Since malware is such a big problem, many companies make programs to try to stop it. These anti-malware programs have a lot of different ways to find malware. One is static analysis, which looks at the source code of a program before it is run. Then, if the program is similar to malware the static analysis program has seen before, the anti-malware program will stop the code from running. Another way of finding malware is dynamic analysis. Dynamic analysis runs only part of a program it is checking. If this part of the program tries to do anything that could be bad or harmful, the anti-malware program will not let the program run. (Note: "Heuristic analysis in Kaspersky Internet Security 2012". Kaspersky Lab. Retrieved 4 November 2014.)

Malware can also be stopped without a program. This can be done by not letting a computer connect to the Internet or other computers, called creating an air gap. (Note: "Air Gap". Jantalla Interactive Incorporated. Retrieved 6 November 2014.) However, these computers can still get malware if someone puts it there another way. One example is when someone plugs in a USB drive that was already plugged into a computer with a virus. (Note: Mills, Elinor.)

HTTP cookie

An HTTP cookie (usually just called a cookie) is a simple computer file made of text. The information stored in cookies can be used to personalise the experience when using a website. A website can use cookies to find out if someone has visited a website before and record information (data) about what they did.

When someone is using a computer to browse a website, a personalised cookie file can be sent from the website’s server to the person’s computer. The cookie is stored in the web browser on the person’s computer. At some time in the future, the person may browse that website again. The website can send a message to the person’s browser, asking if a cookie from the website is already stored in the browser. If a cookie is found, then the data that was stored in the cookie before can be used by the website to tell the website about the person’s previous activity. Some examples where cookies are used include shopping carts, automatic login and remembering which advertisements have already been shown.

Cookies have been a problem for Internet privacy. This is because they can be used to track browsing behavior. Because of this, laws have been made in some countries to protect people’s privacy. There are many other options than cookies, but each option has its own problems.

Cookies have often been mistaken for computer programs. But cookies cannot do much on their own. They are simply a piece of data. They are often called spyware or viruses, but they are not either of these.

Most web browsers allow users to choose whether to accept cookies. If the user does not allow cookies, some websites will become unusable. For example, shopping baskets which use cookies do not work if the user does not allow cookies.
Protocols

Hypertext Transfer Protocol

Hypertext Transfer Protocol (often abbreviated to HTTP) is a communications protocol. It is used to send and receive webpages and files on the internet. It was developed by Tim Berners-Lee and is now coordinated by the W3C. HTTP version 1.1 is the most common used version today. It is defined in RFC 2616.

HTTP works by using a user agent to connect to a server. The user agent could be a web browser or spider. The server must be located using a URL or URI. This always contains http:// at the start. It normally connects to port 80 on a computer.

A more secure version of HTTP is called HTTPS. This contains https:// at the beginning of the URL. It encrypts all the information that is sent and received. This can stop malicious users such as hackers from stealing the information. HTTPS is often used on payment websites.

Request Message

The request message contains the following:

- Request line, such as GET /images/logo.gif HTTP/1.1, which requests the file logo.gif from the /images directory
- Headers, such as Accept-Language: en
- An empty line
- An optional message body

The request line and headers must all end with two characters: a carriage return followed by a line feed, often written <CR><LF>. The empty line must consist of only <CR><LF> and no other whitespace. In the HTTP/1.1 protocol, all headers except Host are optional.

A request line containing only the path name is accepted by servers to maintain compatibility with HTTP clients before the HTTP/1.0 standard. Even this site has a HTTP at its beginning.

Wired Equivalent Privacy

Wired Equivalent Privacy (also known as WEP) is a standard to use encryption in Wireless LANs. It was introduced in 1999.

In 2001, mathematicians showed that WEP is not very strong. A WEP connection could be decoded, with software that can be easily found, within minutes. (Note: Nikita Borisov, Ian Goldberg, David Wagner. "Intercepting Mobile Communications: The Insecurity of 802.11". Retrieved on 12 September 2006.) Because of this finding, IEEE created a new 802.11i group to fix the problems. By 2003, the Wi-Fi Alliance announced that Wi-Fi Protected Access (WPA) would replace WEP, which was a subset of then upcoming 802.11i amendment. Finally in 2004, they made it official and said that it would go ahead. It was part of the full 802.11i standard (also known as WPA2), the IEEE declared that both WEP-40 and WEP-104 are not recommended because they are not secure enough. (Note: "What is a WEP key?". liren.net. Retrieved on 11 March 2008.)

Even though it only offers low security, WEP is still widely in use. (Note: "Wireless Adoption Leaps Ahead, Advanced Encryption Gains Ground in the Post-WEP Era". RSA.com. Retrieved on 11 March 2008.) WEP is often the first security choice presented to users by router configuration tools even. Today, WEP provides a level of security that deters only accidental use. As a result, people can invade and enter the network. (Note: Andrea Bittau, Mark Handley, Joshua Lackey. "The Final Nail in WEP's Coffin". Retrieved on 16 March 2008.)

People sometimes call it Wireless Encryption Protocol, which is wrong.
Wi-Fi Protected Access

Wi-Fi Protected Access (also known as WPA and WPA2) is the name for a number of standards to use encryption on a Wireless LAN. The standards were created because researchers had found several weaknesses in Wired Equivalent Privacy. Wired Equivalent Privacy, or WEP was the standard that came before it. The protocol WPA2 implements most of the standard IEEE 802.11i.

Products that have the label WPA were designed to work with most cards, even those that came out before there was WPA. This is not true for access points though.

Products with the WPA2 implement all of the standard. This is more secure, but it may not work with some older cards.

Protection

Encryption

Encryption is a method which allows information (for example, a secret message) to be hidden so that it cannot be read without special knowledge (such as a password). Once this is done, using a secret code or cypher, the information is encrypted. Decryption is a way to change an encrypted piece of information back into unencrypted form. This is called the decrypted form. The study of encryption is called cryptography.

Examples

A simple kind of encryption for words is ROT13. In ROT13, letters of the alphabet are changed with each other using a simple pattern. For example, A changes to N, B changes to O, C changes to P, and so on. Each letter is “rotated” by 13 spaces. Using the ROT13 cipher, the words Simple English Wikipedia becomes Fvzcyr Ratyvfu Jvxvcrqvn. The ROT13 cipher is very easy to decrypt. Because there are 26 letters in the English alphabet, if a letter is rotated two times by 13 letters each time, the original letter will be obtained. So applying the ROT13 cipher a second time brings back the original text. When he communicated with his army, Julius Caesar sometimes used what is known as Caesar cipher today. This cipher works by shifting the position of letters: each letter is rotated by 3 positions.

Most kinds of encryption are more complex. Some are made only for text. Others are made for binary computer files like pictures and music. Today, the asymmetric encryption system used the most is RSA. Any computer file can be encrypted with RSA. AES is a common symmetric algorithm.

One-Time Pad

Most types of encryption can theoretically be cracked: an enemy might be able to decrypt a message without knowing the password, if he has clever mathematicians, powerful computers and lots of time. The one-time pad is special because, if it is used correctly, it is impossible to crack. There are three rules that must be followed:

- The secret key (password) must be longer than the secret message: if the message has 20 letters then the key must also have at least 20 letters.
- The secret key must be a random list of letters (e.g. KQBWLDA…)
- The secret key must only be used once. To send more than one message, a different key must be used for each one.

If these three rules are obeyed, then it is impossible to read the secret message without knowing the secret key. For this reason, during the Cold War, embassies and large military units often used one-time pads to communicate secretly with their governments. They had little books (“pads”) filled with random letters or random numbers. Each page from the pad could only be used once: this is why it is called a “one-time pad”.

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Encryption on the Internet

Encryption is often used on the Internet, as many web sites use it to protect private information. On the Internet, several encryption protocols are used, such as Secure Sockets Layer (SSL), IPsec, and SSH. They use the RSA encryption system and others. The protocol for protected web browsing is called HTTPS. Mostly URL encryption contain MD5 Algorithm. Various algorithms are used in the internet market depending upon the need.

Antivirus Software

Antivirus software, if properly installed on a computer system, can prevent access to computer systems by unwanted computer programs. Viruses, worms or Trojan Horses can be used by criminals or mischievous people (called Crackers). They can be used to steal information or damage computer systems. If no antivirus software is installed, hackers may be able to access the information in the computer.

Most tests and experts claim that antivirus software is unable to prevent all attacks. (Note: Shaw, Gordon. "AV-Test release latest results." Virus Bulletin. Retrieved 8 March 2009.) There are many different types of antivirus software. Many Antivirus programs can be downloaded for free. These versions usually have some features missing. The missing features are only available to those who buy the “full” version.

Antivirus software uses many ways to protect the computer. They often search for signs of viruses in every website that is visited. Most also do a regular scan of all the data and files on the computer’s hard disk.

Installing more than one antivirus is not a good idea. The 2 different antivirus software can interfere with each other.

Problems with Antivirus Software

Antivirus software can not always detect all viruses on a computer.

Sometimes antivirus software sees viruses in files that do not really have viruses. This is called a false positive. (Note: http://www.offlinetalk.com/index.php/topic,106.msg169.html) The antivirus software will sometimes remove files from the computer that should not be removed. This may cause other programs to not work properly.

Firewall (Networking)

Originally, a firewall was a wall that was built to stop (or slow down) the spread of a fire. In terms of computer security, a firewall is a piece of software. This software monitors the network traffic. A firewall has a set of rules which are applied to each packet. The rules decide if a packet can pass, or whether it is discarded. Usually a firewall is placed between a network that is trusted, and one that is less trusted. When a large network needs to be protected, the firewall software often runs on a dedicated hardware, which does nothing else.

A firewall protects one part of the network against unauthorized access.

Different Kinds of Firewalls

• Packet filtering. Data travels on the internet in small pieces; these are called packets. Each packet has certain metadata attached, like where it is coming from, and where it should be sent to. The easiest thing to do is to look at the metadata. Based on rules, certain packets are then dropped or rejected. All firewalls can do this.it is known as network layer
• **Stateful packet inspection.** In addition to the simple packet filtering (above) this kind of firewall also keeps track of connections. A packet can be the start of a new connection, or it can be part of an existing connection. If it is neither of the two, it is probably useless and can be dropped.

• **Application-layer firewalls.** Application-layer firewalls do not just look at the metadata; they also look at the actual data transported. They know how certain protocols work, for example FTP or HTTP. They can then look if the data that is in the packet is valid (for that protocol). If it is not, it can be dropped.

**Other Things Firewalls Are Used For**

Firewalls can provide a secure connection between two networks. This is called *tunnelling*. The data may be encrypted. It is unencrypted at the other end. Since the firewalls are doing this, the rest of the network is unaware of it. An alternative is to provide a secure access (to the corporate network).

**Network Address Translation**

Very often, firewalls can translate IP addresses. That way, many computers can share a few public IP addresses. The firewall translates between the public and the private IP addresses.

**Types of Firewalls**

In general, there are two types of firewalls:

• **Software-based firewalls:** these are often run as additional programs on computers that are used for other things. They are often known as *personal firewalls* which can be updates on personal computers.

• **Hardware-based firewalls:** Hardware based firewalls run on a dedicated computer (or appliance). Often, these offer a better performance than software firewalls, but they are also more expensive.

**What Firewalls Cannot Protect Against**

Firewalls can protect against some problems (viruses and attacks) that come from the internet. They cannot protect against viruses, that come from infected media (like an infected office document on an USB flash drive).

**Backup**

A **backup** is a copy of some data. This copy can be used when the original data is changed, or lost. Losing data is common: A 2008 survey found that two thirds of respondents had lost files on their home PC. (Note: Global Backup Survey. Retrieved on 15 February 2009) Another purpose of backing up data is to have a copy that represents an earlier state of the data, before it was changed. Organisations may have rules which state how long data should be kept, and what kinds of data these rules apply to. In many countries there are rules that specify that certain kinds of data need to be kept for a given time. An example of this is the data used for accounting.

Backups are a simple form of disaster recovery. Even though they are commonly seen as disaster recovery, they should be part of a disaster recovery plan. A disaster recovery plan is a documented set of procedures and tasks to perform to protect the consistency and integrity of a corporate IT system.
Different Backup Media

There are different types of backup systems that use different kinds of media. Common backup media includes:

- Different kinds of tapes, for example Digital Audio Tape, or LTO
- Hard disks
- Optical disks like CDs and DVDs
- Magneto-Optical Discs
- Emails

Some of the backup media are portable, and can easily be stored in a safe location. The problem with storing tapes in a bank safe, for example is that they are only available during the opening hours of the bank.

Another issue has commonly been the speed of the backup. Media such as digital tapes can store a lot of data, but accessing them is relatively slow. Tapes can only be read or written in sequence, while media such as hard disks or optical drives are basically random access. When data is backed up, its encoding is often changed. This makes it possible to use codes such as Cyclic redundancy checks, which can detect, and sometimes repair an error.

Reasons for Doing a Backup

Backups are usually done for one of the following reasons:

- Prevent data loss if there is a disaster (like a fire or hardware failure, or an intentional or unintentional deletion)
- Computer viruses or other programs make data unusable
- There is a logical error in the data
- Sudden computer shutdown which can be caused by power shortage.

Different Types of Backup

- A full backup copies all of the data. This means that if the main copy of the data is lost, we can bring it all back simply by copying the data back from the backup.
- A differential backup only copies the data that has changed since the last full backup. The reason we do this is that sometimes only a small amount of data has changed since the last full backup; this means we can do a differential backup much more quickly. If someone loses their data, and needs to get it back from a differential backup, they need to use the last full backup, to bring back all of their data. They then need to use the last differential backup to bring back everything that was changed between the full backup and the differential backup.
- An incremental backup only copies the data that has changed since the last incremental backup. This makes each backup quicker, because we are only copying what has changed since the last backup. To bring the data back, if the main copy of the data is lost, we need the last full backup, as well as all of the incremental backups that have been done since then. This means that bringing data back from an incremental backup is slower and more risky than differential or full backups.

How Long to Keep a Backup

The Grandfather-father-son system means that we keep different types of backup for different amounts of time. For example, we might do a backup every day, and keep a week’s worth of backups. We might then keep one backup for each week for a month, and one backup from each month for a year. This means that we have a backup of our data from a year ago, so that if we realise we need some data from a long time ago, we have that data available. We also have several copies of our recent data, in case one of them doesn’t work.
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