

Intellectual Property

Friends share all things.

—PYTHAGORAS

Today's pirates operate not on the high seas but on the Internet.

—RECORDING INDUSTRY ASSOCIATION OF AMERICA

4.1 Introduction

At a Bowling for Soup concert, the band made up a song onstage. Singer Jaret Reddick says, "That thing was on YouTube before I even got back home from the show" [1]. Do entertainers have the right to control who sees and hears a performance of their music?

About 40% of software installed on personal computers worldwide and about 80% of software in China was obtained illegally [2]. Is it fair for some people to pay full price for software when so many others are getting the same programs for little or no money?

Half of teenage Internet users in America admit to downloading music files [3]. The Recording Industry Association of America (RIAA) responds by identifying file-sharers and sending each of them a letter warning of an impending lawsuit, but giving the file-sharer the opportunity to settle out of court, usually by paying between \$3,000 and \$5,000 [4]. Boston University graduate student Joel Tenenbaum refused to settle out of court, was found guilty of violating copyright law by downloading and sharing 30 songs, and ordered by the jury to pay record companies \$675,000 [5]. Meanwhile, the

Tired of being treated like a criminal for sharing music online?

You're in good company. Over 60 million other music fans use peer-to-peer programs like Kazaa and Morpheus to share their favorite tunes. Yet the record labels are bullying ISPs and hunting down college kids in an effort to shut down file sharing.

Isn't it time for a new approach? The Electronic Frontier Foundation thinks so. We believe the answer lies in a model that fairly compensates artists while supporting music lovers. Join EFF today so the music can play on.

**File-Sharing:
It's Music to our Ears**

**Stand up for your right to share the music you love!
Join EFF today at www.eff.org/share.**

FIGURE 4.1 The Electronic Frontier Foundation is advocating a reform of the copyright laws in the United States. (Advertisement from the Electronic Frontier Foundation. Copyright © 2011 by Electric Frontier Foundation (Creative Commons). Reprinted with permission.)

Electronic Frontier Foundation runs a “Let the Music Play” campaign (Figure 4.1) to convince Americans they should put pressure on Congress to change copyright laws [6].

As a society we benefit from access to high-quality music, movies, computer programs, and other products of the human intellect. The value of these intellectual properties is much higher than the cost of the media on which they are distributed, tempting people to make unauthorized copies. When this happens, producers of intellectual property do not receive all of the payments the law says they are entitled to. The legal system has responded by giving more rights to the creators of intellectual property. Are these changes in the best interests of our society, or are our politicians catering to special interest groups?

In this chapter, we discuss how information technology is affecting our notions of intellectual property. We consider what makes intellectual property different from tan-

gible property and how governments have created a variety of mechanisms to guarantee intellectual property rights. We examine what has been considered “fair use” of intellectual property created by others, and how new copy-protection technologies are eroding the notions of fair use. Meanwhile, peer-to-peer networks are making it easier than ever for consumers to get access to music and movies without purchasing them. We look at what the entertainment industry is doing to fight free access to copyrighted material. We also explore the evolution of intellectual property protection for computer software and the rise of the open-source movement, which advocates the distribution of source code to programs. Finally, we take a look at one organization’s efforts to make it easier for artists, musicians, and writers to use the Internet as a vehicle for stimulating creativity and enhancing collaboration.

4.2 Intellectual Property Rights

4.2.1 What Is Intellectual Property?

Intellectual property is any unique product of the human intellect that has commercial value [7]. Examples of intellectual property are books, songs, movies, paintings, inventions, chemical formulas, and computer programs.

It is important to distinguish between intellectual property and its physical manifestation in some medium. If a poet composes a new poem, for example, the poem itself is the intellectual property, not the piece of paper on which the poem is printed.

In most of the world there is a widely accepted notion that people have the right to own property. Does this right extend to intellectual property as well? To answer this question, we need to examine the philosophical justification for a natural right to property.

4.2.2 Property Rights

The English philosopher John Locke (1632–1704) developed an influential theory of property rights. In *The Second Treatise of Government*, Locke makes the following case for a natural right to property. First, people have a right to property in their own person. Nobody has a right to the person of anybody else. Second, people have a right to their own labor. The work that people perform should be to their own benefit. Third, people have a right to those things that they have removed from nature through their own labor [8].

For example, suppose you are living in a village, in the middle of woods that are held in common. One day you walk into the woods, chop down a tree, saw it into logs, and split the logs into firewood (Figure 4.2). Before you cut down the tree, everyone had a common right to it. By the time you have finished splitting the logs, you have mixed your labor with the wood, and at that point, it has become your property. Whether you burn the wood in your stove, sell it to someone else, pile it up for the winter, or give it away, the choice of what to do with the wood is yours.



FIGURE 4.2 According to John Locke, people have a natural right to the things they have removed from nature through their own labor.

Locke uses the same reasoning to explain how a person can gain the right to a piece of land. Taking a parcel out of the state of nature by clearing the trees, tilling the soil, and planting and harvesting crops gives people who performed these labors the right to call the land their property.

To Locke, this definition of property makes sense as long as two conditions hold. First, no person claims more property than he or she can use. In the case of harvesting a natural resource, it is wrong for someone to take so much that some of it is wasted. For example, people should not appropriate more land than they can tend. Second, when people remove something from the common state in order to make it their own property, there is still plenty left over for others to claim through their labor. If the woods are full of trees, I can chop a tree into firewood without denying you or anyone else the opportunity to do the same thing.

Locke's description of a natural right to property is most useful at explaining how virtually unlimited resources are initially appropriated. It is not as useful in situations where there are few or no resources left for appropriation.

4.2.3 Extending the Argument to Intellectual Property

Is there a natural right to intellectual property?

We can try to demonstrate such a right exists by extending Locke's theory of property rights to intellectual property. However, since Locke was talking about the ownership of physical objects and we are talking about the ownership of ideas, we must resort to an analogy. We'll compare creating a piece of intellectual property to making a belt buckle [9]. In order to make a belt buckle, a person must mine ore, smelt it down, and cast it. To write a play, a playwright "mines" words from the English language, "smelts" them into stirring prose, and "casts" them into a finished play.

Attempting to treat intellectual property the same as ordinary property leads to certain paradoxes, as Michael Scanlan has observed [9]. We will consider two of Scanlan's scenarios illustrating problems that arise when we extend Locke's natural rights argument to intellectual property.

≈ SCENARIO A, ACT 1

After a day of rehearsals at the Globe Theatre, William Shakespeare decides to have supper at a pub across the street. The pub is full of gossip about royal intrigue in Denmark. After his second pint of beer, Shakespeare is visited by the muse, and in an astonishing burst of energy, he writes *Hamlet* in one fell swoop.

If we apply Locke's theory of property to this situation, clearly Shakespeare has the right to own *Hamlet*. He mixed his labor with the raw resources of the English language and produced a play. Remember, we're not talking about the piece of paper upon which the words of the play are written. We're talking about the sequence of words comprising the play. The paper is simply a way of conveying them.

What should Shakespeare get from his ownership of *Hamlet*? Here are two ideas (you can probably think of more): He should have the right to decide who will perform the play. He should have the right to require others who are performing the play to pay him a fee.

So far, so good. But let's hear the end of the story.

≈ SCENARIO A, ACT 2

On the very same night, Ben Jonson, at a pub on the opposite side of London, hears the same gossip, is struck by the same muse, and writes *Hamlet*—exactly the same play!

Ben Jonson has mixed his intellectual labor with the English language to produce a play. According to Locke's theory of natural rights to property, he ought to own it. Is it possible for both Ben Jonson and William Shakespeare to own the same play (Figure 4.3)? No, not as we have defined ownership rights. It is impossible for both of them to have the exclusive right to decide who will perform the play. Both of them cannot have an exclusive claim to royalties collected when *Hamlet* is performed. We've uncovered a paradox: two people labored independently and produced only a single artifact.

We ended up with this paradox because our analogy is imperfect. If two people go to the same iron mine, dig ore, smelt it, and cast it into belt buckles, there are two belt buckles, one for each person. Even if the belt buckles look identical, they are distinct, and we can give each person ownership of one of them. This is not the case with *Hamlet*. Even though Jonson and Shakespeare worked independently, there is only one *Hamlet*: the sequence of words that constitute the play. Whether we give one person complete ownership or divide the ownership among the two men, both cannot get full ownership of the play, which is what they ought to have if the analogy were perfect. Therefore, the

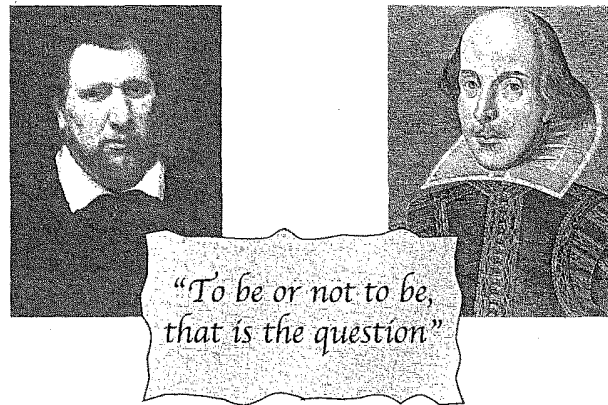


FIGURE 4.3 Suppose both Ben Jonson and William Shakespeare simultaneously write down *Hamlet*. Who owns it?

uniqueness of intellectual properties is the first way in which they differ from physical objects.

A second paradox has to do with the copying of intellectual property. Consider a slightly different version of our story.

≈ SCENARIO B

One evening William Shakespeare stays up all night in a pub writing *Hamlet* while Ben Jonson goes to a party. The next morning Shakespeare returns to the Globe Theatre, but he carelessly leaves a copy of *Hamlet* in the pub. Jonson stops by for a pint, sees the manuscript, transcribes it, and walks out the door with a copy of the play in his possession, leaving the original copy where it was. ≈

Did Jonson steal *Hamlet*? Shakespeare still has his physical copy of the play, but he has lost exclusive control over who will read, perform, or hear the play. If you want to call this stealing, then stealing in the sense of intellectual property is quite different from stealing a physical object. When you steal someone's car, they can't drive it any more. When you steal someone's joke, both of you can tell it.

Certainly any creator of a piece of intellectual property has the right to keep his ideas a secret. After Shakespeare wrote *Hamlet*, he could have locked it in a trunk to prevent others from seeing it. Ben Jonson would not have the right to break into Shakespeare's trunk to get access to the play. Hence we can argue that there is a natural right to keep an idea confidential. Unfortunately, this is a weak right, because Shakespeare cannot perform the play while he is keeping it confidential. He must give up the confidentiality in order to put his creation to good use.

We began this section with the following question: Is there a natural right to intellectual property? We have found no right other than the weak right to keep an idea confidential. In our quest for stronger rights, we have uncovered two important differences between tangible property and intellectual property. First, every intellectual

property is one-of-a-kind. Second, copying a piece of intellectual property is different from stealing a physical object.

4.2.4 Benefits of Intellectual Property Protection

New ideas in the form of inventions and artistic works can improve the quality of life for the members of a society. Some people are altruistic and will gladly share their creative energies. For example, Benjamin Franklin (1706–1790) invented many useful items, including an improved wood stove, the lightning rod, the odometer, and bifocals. He did not patent any of them. Franklin said, "As we enjoy great advantages from the invention of others, we should be glad of an opportunity to serve others by any invention of ours; and this we should do freely and generously" [10]. However, most people find the allure of wealth to be a strong inducement for laboring long hours in the hope of creating something useful. So even if there are no natural rights to intellectual property, a society may choose to grant intellectual property rights to people because of the beneficial consequences.

The authors of the Constitution of the United States recognized the benefits society reaps by encouraging creativity. Article I, Section 8, of the U.S. Constitution gives Congress the power to "promote the Progress of Science and useful Arts by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."

If a person has the right to control the distribution and use of a piece of intellectual property, there are many opportunities for that person to make money. For example, suppose you build a better mousetrap and the government gives you ownership of this design. You may choose to manufacture the mousetrap yourself. Anyone who wants the better mousetrap must buy it from you, because no other mousetrap manufacturer has the right to copy your design. Alternatively, you may choose to license your design to other manufacturers, who will pay you for the right to build mousetraps according to your design.

On the other hand, it is possible for you to be rewarded for your creativity without the new device ever reaching the public. Suppose you sell an exclusive license for your better mousetrap to the company that dominates the mousetrap market. The company chooses not to manufacture the new mousetrap because—for whatever reason—it can make more money selling the existing technology. In this situation you and the company benefit, but society is deprived access to the new, improved technology.

4.2.5 Limits to Intellectual Property Protection

Society benefits the most when inventions are in the public domain and anyone can take advantage of them. Going back to the mousetrap example, we would like everyone in society who needs a mousetrap to get the best possible trap. If someone invents a superior mousetrap, the maximum benefit would result if all mousetrap manufacturers were able to use the better design. On the other hand, if the inventor of the superior mousetrap did not have any expectation of profiting from her new design, she may not have bothered to invent it. Hence there is a tension between the need to reward the

creators of intellectual property by giving them exclusive rights to their ideas and the need to disseminate these ideas as widely as possible.

The way the Congress has traditionally addressed this tension is through a compromise. It has granted authors and inventors exclusive rights to their writings and discoveries, but only for a limited period of time. (Note: Rights to a piece of intellectual property produced by an employee in the normal course of his or her duties belong to the employer.) At the end of that time period, the intellectual property enters the public domain. While creators have control over the distribution of their properties, use of the properties is more expensive, and the creators are rewarded. After properties enter the public domain, using them becomes less expensive, and everyone has the opportunity to produce derivative works from them.

Consider a community orchestra that wishes to perform a piece of classical music. It may purchase a piece of music from the public domain for far less money than it cost simply to rent the same piece of music while it was still protected by copyright (Table 4.1).

The question is: What is a reasonable length of time to grant authors and inventors exclusive rights to their creative works? Supreme Court Justice Stephen Breyer [12], Kembrew McLeod [13], and Lawrence Lessig [14] have used "Happy Birthday to You" as evidence that copyright protections are excessive.

"Happy Birthday to You" is the most popular song in the world. Have you ever wondered why you almost never hear it sung on television? The reason is that the music

TABLE 4.1 Once a piece of classical music enters the public domain, it may be purchased for much less than it cost simply to rent the same piece of music for two performances when it was still under copyright protection. These prices assume the orchestra has an annual budget of \$150,000 or less [11]. (Table from "Letter to The Honorable Senator Spencer Abraham," by Randolph P. Luck from LUCK'S MUSIC LIBRARY. Copyright © 1996 by Randolph P. Luck. Reprinted with permission.)

Artist	Work	Previous Rental Fee	Year Became Public Domain	Purchase Price
Ravel	Daphnis et Chloe Suite no. 1	\$450.00	1987	\$155.00
Ravel	Mother Goose Suite	540.00	1988	70.00
Ravel	Daphnis et Chloe Suite no. 2	540.00	1989	265.00
Griffes	The White Peacock	335.00	1993	42.00
Puccini	O Mio Babbino Caro	252.00	1994	26.00
Respighi	Fountains of Rome	441.00	1994	140.00
Ravel	Le Tombeau de Couperin	510.00	1995	86.00
Respighi	Ancient Aires and Dances Suite no. 1	441.00	1996	85.00
Elgar	Cello Concerto	550.00	1997	140.00
Holst	The Planets	815.00	1997	300.00
Ravel	Alborada Del Gracioso	360.00	1999	105.00

publisher Clayton F. Summy Company (now a subsidiary of TimeWarner) copyrighted the song in 1935, and television networks must pay TimeWarner to air it. TimeWarner collects about \$2 million in royalties each year for public performances of "Happy Birthday to You" [15]. Under the Copyright Term Extension Act of 1998, the song will remain copyrighted until at least 2030!

More recently, George Washington University law professor Robert Brauneis has objected that "Happy Birthday to You" should not be used as an example of the "overly generous protection of copyright law." In a meticulously researched article, he concludes that the song "is almost certainly no longer under copyright, due to a lack of evidence about who wrote the words; defective copyright notice; and a failure to file a proper renewal application" [16]. However, to this date no one has challenged TimeWarner's copyright in court.

4.3 Protecting Intellectual Property

While the U.S. Constitution gives Congress the right to grant authors and inventors exclusive rights to their creations, it does not elaborate on how these rights will be protected. Today, there are four different ways in which individuals and organizations protect their intellectual property: trade secrets, patents, copyrights, and trademarks/service marks.

4.3.1 Trade Secrets

A trade secret is a confidential piece of intellectual property that provides a company with a competitive advantage. Examples of trade secrets include formulas, processes, proprietary designs, strategic plans, customer lists, and other collections of information. The right of a company to protect its trade secrets is widely recognized by governments around the world. In order to maintain its rights to a trade secret, a company must take active measures to keep it from being discovered. For example, companies typically require employees with access to a trade secret to execute a confidentiality agreement.

A famous trade secret is the formula for Coca-Cola syrup. The formula, known inside the company as "Merchandise 7X," is locked in a bank vault in Atlanta, Georgia. Only a few people within the company know the entire formula, and they have signed nondisclosure agreements. The task of making the syrup is divided among different groups of employees. Each group makes only one part of the final mixture, so that nobody in these groups learns the complete recipe.

An advantage of trade secrets is that they do not expire. A company never has to disclose a trade secret. Coca-Cola has kept its formula secret for more than 100 years.

The value of trade secrets is in their confidentiality. Hence trade secrets are not an appropriate way to protect many forms of intellectual property. For example, it would make no sense for a company to make a movie a trade secret, because a company can only profit from a movie by allowing it to be viewed, which would make it no longer confidential. On the other hand, it would be appropriate for a company to make the *idea*

for a movie a trade secret. Art Buchwald pitched Paramount Pictures a story called *King for a Day*, about an African prince who visits the United States. After the studio produced the movie *Coming to America*, starring Eddie Murphy, Buchwald successfully sued the studio for breach of contract, because he had made the studio sign a confidentiality agreement before he gave them the plot [17].

While it is illegal to steal a trade secret, there are other ways in which the confidentiality may be broken. “Reverse engineering” is one way in which a competing firm can legally gain access to information contained in a trade secret. If another company can purchase a can of Coca-Cola and figure out the formula, it is free to manufacture a soft drink that looks and tastes just like Coke.

Another way in which a competing firm can gain access to information contained in another company’s trade secret is by hiring its employees. While a firm can require its employees to sign confidentiality agreements, it cannot erase the memories of an employee who starts working for a competing firm. Hence some “leakage” of confidential information may be inevitable when employees move from one company to another.

4.3.2 Trademarks and Service Marks

A trademark is a word, symbol, picture, sound, or color used by a business to identify goods. A service mark is a mark identifying a service [18].

By granting a trademark or service mark, a government gives a company the right to use it and the right to prevent other companies from using it. Through the use of a trademark, a company can establish a “brand name.” Society benefits from branding because branding allows consumers to have more confidence in the quality of the products they purchase.

When a company is the first to market a distinctive product, it runs the risk that its brand name will become a common noun used to describe any similar product. When this happens, the company may lose its right to exclusive use of the brand name. Some trademarks that have become generic are “yo yo,” “aspirin,” “escalator,” “thermos,” and “brassiere.”

Companies strive to ensure their marks are used as adjectives rather than nouns or verbs. One way they do this is through advertising (Figure 4.4). Kimberly-Clark’s advertisements refer to “Kleenex *brand* facial tissue.” Remember Johnson & Johnson’s jingle, “I am stuck on Band-Aid *brand* ’cause Band-Aid’s stuck on me”?

Another way companies protect their trademarks is by contacting those who are misusing them. For example, Adobe has responded to Web posts about “photoshopping images” by posting this follow-up message: “The Photoshop trademark must never be used as a common verb or as a noun. The Photoshop trademark should always be capitalized and should never be used in possessive form, or as a slang term” [19].

4.3.3 Patents

A patent is a way the U.S. government provides an inventor with an exclusive right to a piece of intellectual property. A patent is quite different from a trade secret because a

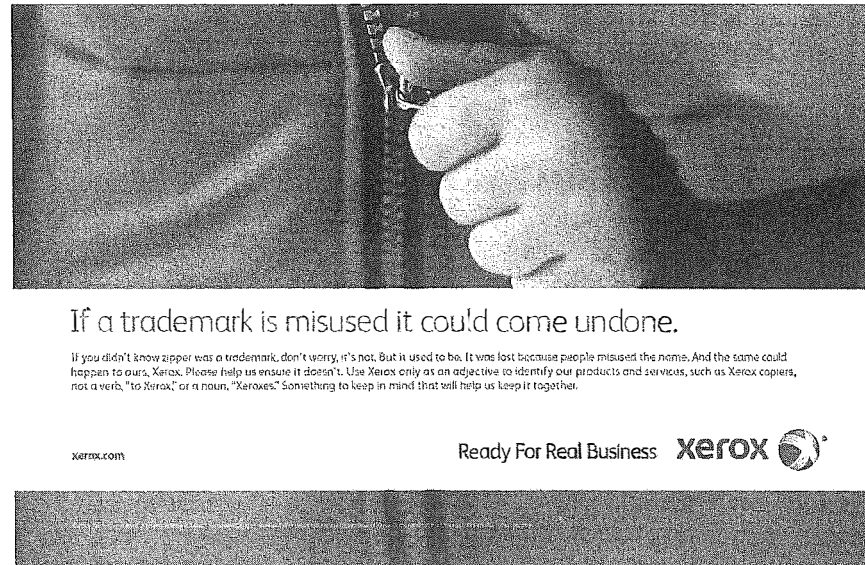


FIGURE 4.4 Xerox Corporation ran this advertisement as part of its campaign to protect its trademark. (Screenshot by Xerox. Copyright © 2012 by Xerox Corporation. All rights reserved. Reprinted with permission.)

patent is a public document that provides a detailed description of the invention. The owner of the patent can prevent others from making, using, or selling the invention for the lifetime of the patent, which is currently 20 years. After the patent expires, anyone has the right to make use of its ideas.

POLAROID V. KODAK

Dr. Edwin Land invented “instant” photography. The company he founded, Polaroid Corporation, had ten patents protecting the invention of film that developed in 60 seconds. Polaroid did not license these patents to other firms, and for many years it was the only company to sell cameras and film allowing photographs to be developed in a minute.

When Kodak introduced its first instant camera in 1976, Polaroid sued Kodak [20]. In 1985 a court ruled that Kodak had infringed on seven of Polaroid’s original ten patents; six years later Kodak paid Polaroid a \$925 million settlement [21, 22].

SPARC INTERNATIONAL

Sometimes companies see an advantage in licensing their inventions. After Sun Microsystems invented the SPARC architecture, it wanted to maximize the number of SPARC-compliant computers being manufactured. For this reason, Sun transferred ownership of the SPARC specifications to an independent, nonprofit organization called SPARC International. SPARC International has licensed SPARC technology to a variety of other firms. In 2008, the list of companies manufacturing SPARC-based systems included Epoka Group A/S, Fujitsu, Itronix, Nature Worldwide Technology Corporation

(NatureTech), Rave Computer Association, Inc., Sun Microsystems, Inc., Themis Computer, and Toshiba Corporation.

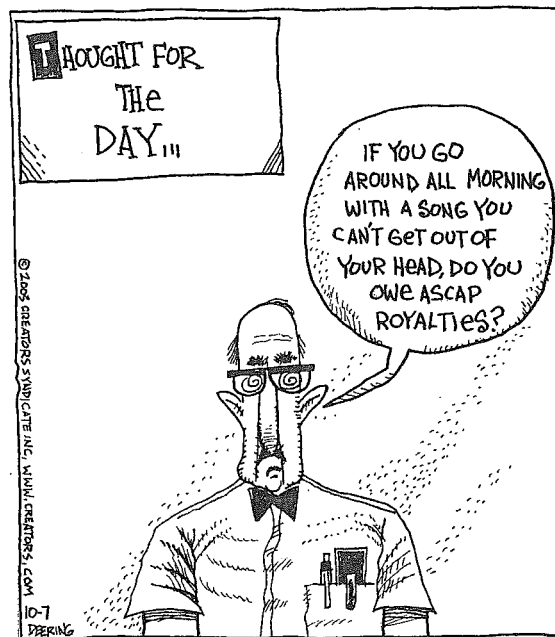
4.3.4 Copyrights

A **copyright** is how the U.S. government provides authors with certain rights to original works that they have written. The owner of a copyright has five principal rights:

1. The right to reproduce the copyrighted work
2. The right to distribute copies of the work to the public
3. The right to display copies of the work in public
4. The right to perform the work in public
5. The right to produce new works derived from the copyrighted work

Copyright owners have the right to authorize others to exercise these five rights with respect to their works. The owner of a copyright to a play may sell a license to a high school drama club that wishes to perform it. After a radio station broadcasts a song, it must pay the songwriter(s) and the composer(s) through a performance rights organization such as ASCAP, BMI, or SESAC.

Copyright owners have the right to prevent others from infringing on their rights to control the reproduction, distribution, display, performance, and production of works derived from their copyrighted work.



By permission of John Deering and Creators Syndicate, Inc.

Several important industries in the United States, including the movie industry, music industry, software industry, and book publishing, rely upon copyright law for

protection. “Copyright industries” account for over 6 percent of the United States gross domestic product, with about \$900 billion in sales. About 5.5 million U.S. citizens work in these industries, which are growing at a much faster rate than the rest of the U.S. economy. With foreign sales and exports of \$126 billion, copyright industries were the leading export sector in the United States in 2007 [23].

In this section, we examine court cases and legislation that have helped define the limits of copyright in the United States.

GERSHWIN PUBLISHING CORPORATION V. COLUMBIA ARTISTS MANAGEMENT, INC.

Columbia Artists Management, Inc. (CAMI) managed concert artists, and it sponsored hundreds of local, nonprofit community concert associations that arranged concert series featuring CAMI artists. CAMI helped the associations prepare budgets, select artists, and sell tickets. CAMI printed the programs and sold them to the community concert associations. In addition, all musicians performing at these concerts paid CAMI a portion of their fees.

On January 9, 1965, the CAMI-sponsored Port Washington (NY) Community Concert Association put on a concert that included Gershwin’s “Bess, You Is My Woman Now” without obtaining copyright clearance from Gerwshwin Publishing Corporation. The American Society of Composers, Authors, and Publishers (ASCAP) sued CAMI for the copyright infringement.

CAMI argued that it was not responsible for the copyright infringement, since the concert was put on by the Port Washington Community Concert Association. However, the U.S. District Court for the Southern District of New York ruled that CAMI could be held liable because it was aware that the community concert associations it supported were not obtaining proper copyright clearances. In 1971, the U.S. Court of Appeals for the Second Circuit upheld the ruling of the district court [24].

BASIC BOOKS V. KINKO’S GRAPHICS CORPORATION

In the 1980s, Kinko’s Graphics Corporation engaged in what it called the “Professor Publishing” business. It distributed brochures to university professors asking them to provide lists of readings they planned to use in their courses. Kinko’s used these lists to produce packets of reading materials for students taking these classes. The packets typically contained chapters from books. In 1991, the U.S. District Court for the Southern District of New York ruled that when Kinko’s produced these packets it infringed upon the copyrights held by the publishers. The judge ordered Kinko’s to pay statutory damages of \$510,000 to the plaintiffs, a group of eight book publishers [25]. Kinko’s subsequently got out of the Professor Publishing business.

DAVEY JONES LOCKER

Richard Kenadek ran a computer bulletin board system (BBS) called Davey Jones Locker. Subscribers paid \$99 a year for access to the BBS, which contained copies of more than 200 commercial programs. In 1994, Kenadek was indicted for infringing on the

copyrights of the owners of the software. He pleaded guilty and was sentenced to six months' home confinement and two years' probation [26].

NO ELECTRONIC THEFT ACT

Another incident in 1994 led to further legislation protecting copyrights. David LaMaccia, an MIT student, posted copyrighted software on a public bulletin board he created on a university computer. According to prosecutors, bulletin board users downloaded more than a million dollars' worth of software in less than two months. However, the prosecutors were forced to drop charges against LaMaccia because he had made the programs available for free. Since he had not profited from his actions, he had not violated copyright law. To close this legal loophole, Congress passed the No Electronic Theft Act of 1997, which made it a criminal offense *simply to reproduce or distribute* more than \$1,000 worth of copyrighted material in a six-month period.

COPYRIGHT CREEP

As a result of the Sonny Bono Copyright Term Extension Act of 1998, works created and published before January 1, 1978, are protected for 95 years. Works created on or after January 1, 1978, are protected for the author's lifetime plus 70 years after the author's death. If the work is a work made for hire, the length of protection is 95 years from the date of publication or 120 years from the date of creation, whichever is less.

According to Siva Vaidhyanathan, "in the early republic and the first century of American legal history, copyright was a Madisonian compromise, a necessary evil, a limited, artificial monopoly, not to be granted or expanded lightly" [27]. Over time, however, Congress has gradually increased both the term of copyright protection and the kind of intellectual properties that are protected by copyright (Figure 4.5). One reason

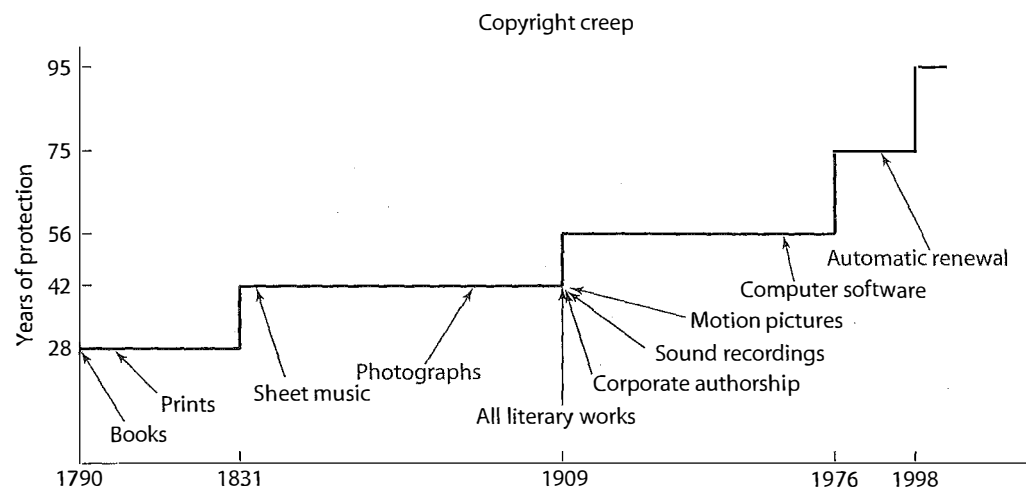


FIGURE 4.5 Since the first Copyright Act was passed in 1790, both the length of copyright protection and the kinds of intellectual property that can be copyrighted have grown dramatically.

has been the desire to have international copyright agreements. In order to complete these agreements, Congress has had to reconcile American copyright law with European law, which in general has had much stronger protections for the producers of intellectual property [27]. Another reason for “copyright creep” has been the introduction of new technologies such as photography, audio recording, and video recording.

For example, since 1831, music publishers have been able to copyright sheet music and collect royalties from musicians performing this music in public. In 1899, Melville Clark introduced the Apollo player piano, which played songs recorded on rolls of heavy paper. Apollo manufactured and sold piano rolls of copyrighted songs. White-Smith Music Company sued Apollo for infringing on its copyrights. In 1908, the Supreme Court ruled that Apollo had not infringed on White-Smith Music’s copyrights. The court suggested that Congress ought to change copyright law if it wanted owners of copyrights to have control over recordings such as piano rolls and phonograph records. Congress responded by revising the Copyright Act in 1909. The new copyright law recognized that player piano rolls and phonograph records could be copyrighted.

Some people believe the expansion of the scope of copyright protection has shifted the balance of private versus public rights too far toward the copyright holders. They say it is no coincidence that copyright terms were extended just before Mickey Mouse was to enter the public domain. The Walt Disney Corporation lobbied Congress to pass the Sonny Bono Copyright Term Extension Act (CTEA) of 1998, protecting its profits derived from Mickey Mouse, Donald Duck, and its other famous characters [28]. Some critics suggest that since Walt Disney made a great deal of money on *Snow White and the Seven Dwarfs*, *Cinderella*, *Pinocchio*, *The Hunchback of Notre Dame*, *Alice in Wonderland*, and *The Jungle Book*, all based on stories taken from the public domain, it’s only fair that at some point Walt Disney characters become part of the public domain, available for others to use in new creative works [29].

Eric Eldred, who digitizes old books and makes them freely available over the Web, led a group of petitioners who challenged the CTEA. They argued that the U.S. Constitution gives Congress the power to grant exclusive rights to authors for “limited times,” and that the writers of the Constitution expected copyright durations to be short. By extending the terms of existing copyrights 11 times in 40 years, they said, Congress had exceeded its Constitutional power [30].

The government and groups representing the entertainment industry, including The Walt Disney Co., the Motion Picture Association of America, and the Recording Industry Association of America, argued that Congress does have the Constitutional authority to extend the terms of existing copyrights [31].

In a 7–2 decision the U.S. Supreme Court ruled in favor of the government and the entertainment industry, stating that the petitioners did not demonstrate how the CTEA had crossed “a constitutionally significant threshold.” In the opinion of the Court, “Those earlier Acts did not create perpetual copyrights, and neither does the CTEA” [32].

In 2004, the Royal Society of Arts in London commissioned an international group of artists, scientists, and lawyers to create a statement regarding intellectual property

laws. The group wrote the Adelphi Charter on Creativity Innovation and Intellectual Property. Within the Charter is the following statement: “The expansion in the law’s breadth, scope, and term over the last 30 years has resulted in an intellectual property regime which is radically out of line with modern technological, economic and social trends. This threatens the chain of creativity and innovation on which we and future generations depend” [33]. The Charter proposes a set of public-interest tests that governments should apply before approving further changes to intellectual property laws. It remains to be seen whether the Adelphi Charter will influence the global debate on intellectual property.

4.4 Fair Use

The right given to a copyright owner to reproduce a work is a limited right. Under some circumstances, called fair use, it is legal to reproduce a copyrighted work without the permission of the copyright holder. Examples of fair use include citing short excerpts from copyrighted works for the purpose of teaching, scholarship, research, criticism, commentary, and news reporting.

The United States Copyright Act does not precisely list the kinds of copying that are fair use. Instead, what is considered to be fair use has been determined by the judicial system. The courts have relied upon Section 107 of the Copyright Act, which lists four factors that need to be considered [34]:

1. *What is the purpose and character of the use?*

An educational use is more likely to be permissible than a commercial use.

2. *What is the nature of the work being copied?*

Use of nonfiction is more likely to be permissible than use of fiction. Published works are preferred over unpublished works.

3. *How much of the copyrighted work is being used?*

Brief excerpts are more likely to be permissible than entire chapters.

4. *How will this use affect the market for the copyrighted work?*

Use of out-of-print material is more likely to be permissible than use of a readily available work. A spontaneously chosen selection is better than an assigned reading in the course syllabus.

In the previous section on copyright we discussed the case against Kinko’s. A number of factors led the judge to conclude that the reproductions made by Kinko’s Professor Publishing business were not fair use. Kinko’s is a commercial enterprise; it started the Professor Publishing business to make a profit. It copied significant portions of books to create the course reading packets. Some of the books were still in print; hence, Kinko’s negatively affected the market for the copyrighted work. Finally, the readings were not spontaneously chosen. Kinko’s had time to contact publishers and gain permission to reproduce the materials, perhaps by paying a licensing fee.

Let's consider two scenarios in which copyrighted works are duplicated and determine if they made fair use of the material. These scenarios are closely modeled after situations presented on the Web site of CETUS, the Consortium for Educational Technology in University Systems (www.cetus.org).

≈ FAIR USE EXAMPLE #1

A professor puts a few journal articles on reserve in the library and makes them assigned reading for the class. Some students in the class complain that they cannot get access to the articles because other students always seem to have them checked out. The professor scans them and posts them on his Web site. The professor gives the students in the class the password they need to access the articles. ≈

The first factor to consider is the purpose of the use. In this case the purpose is strictly educational. This factor weighs in favor of fair use.

The second factor is the nature of the work being copied. The journal articles are nonfiction. Again this weighs in favor of fair use.

The third factor is the amount of material being copied. The fact that the professor is copying entire articles rather than brief excerpts weighs against a ruling of fair use.

The fourth factor is the effect the copying will have on the market for journal sales. If the journal issues containing these articles are no longer for sale, then the professor's actions cannot affect the market. The professor took care to prevent people outside the class from accessing the articles. Overall, this factor appears to weigh in favor of fair use.

Three of the four factors weigh in favor of fair use. The professor's actions probably constitute fair use of the copyrighted material.

≈ FAIR USE EXAMPLE #2

An art professor takes slide photographs of a number of paintings reproduced in a book about Renaissance artists. She uses the slides in her class lectures. ≈

The first factor to consider is the purpose of the copying. The professor's purpose is strictly educational. Hence, the first factor weighs in favor of fair use.

The second factor is the type of material being copied. The material is art. Hence, this factor weighs against a ruling of fair use.

The third factor is the amount of material copied. In this case, the professor is displaying copies of the paintings in their entirety. Fair use almost never allows a work to be copied in its entirety. Note that even if the original painting is in the public domain, the photograph of the painting appearing in the art book is probably copyrighted.

The final factor is the effect the copying will have on the market. The determination of this factor would depend on how many images the professor took from any one book and whether the publisher is in the business of selling slides of individual images appearing in its book.

Overall, this professor's actions are less likely to be considered fair use than the actions of the professor in the first scenario.

4.4.1 *Sony v. Universal City Studios*

In 1975, Sony introduced its Betamax system, the first consumer VCR. People used these systems to record television shows for viewing later, a practice called **time shifting**. Some customers recorded entire movies onto videotape.

A year later, Universal City Studios and Walt Disney Productions sued Sony, saying it was responsible for copyright infringements performed by those who had purchased VCRs. The movie studios sought monetary damages from Sony and an injunction against the manufacturing and marketing of VCRs. The legal battle went all the way to the U.S. Supreme Court. The Supreme Court evaluated the case in light of the four fair use factors.

The first factor is the intended purpose of the copying. Since the purpose is private, not commercial, time shifting should be seen as fair use with respect to the first factor.

The second factor is the nature of the copied work. Consumers who are time shifting are copying creative work. This would tend to weigh against a ruling of fair use.

The third factor is the amount of material copied. Since a consumer copies the entire work, this weighs against a ruling of fair use.

The final factor is the effect time shifting will have on the market for the work. The Court determined that the studios were unable to demonstrate that time shifting had eroded the commercial value of their copyrights. The movie studios receive large fees from television stations in return for allowing their movies to be broadcast. Television stations can pay these large fees to the studios because they receive income from advertisers. Advertising rates depend upon the size of the audience; the larger the audience, the more a television station can charge an advertiser to broadcast a commercial. Time shifting allows people who would not ordinarily be able to watch a show to view it later. Hence, it can be argued that VCRs actually increase the size of the audience, and since audience size determines the fees studios receive to have their movies broadcast on television, it is not at all clear whether the copying of these programs harms the studios.

The Supreme Court ruled, in a 5–4 decision, that time shifting television programs is a fair use of the copyrighted materials [35]. It said that the private, noncommercial use of copyrighted materials ought to be presumed fair use unless it could be shown that the copyright holder would be likely to suffer economic harm from the consumer's actions (Figure 4.6). Importantly, the Court also noted that the Sony Betamax VCR could be used to copy both copyrighted and noncopyrighted material, and that Sony should not be held accountable if some of the people who buy a VCR choose to use it to infringe on copyrights.

4.4.2 Digital Recording Technology

In the not-so-distant past, music publishers distributed content on vinyl records, and some purchasers made backup copies on cassette tapes. The copying process introduced

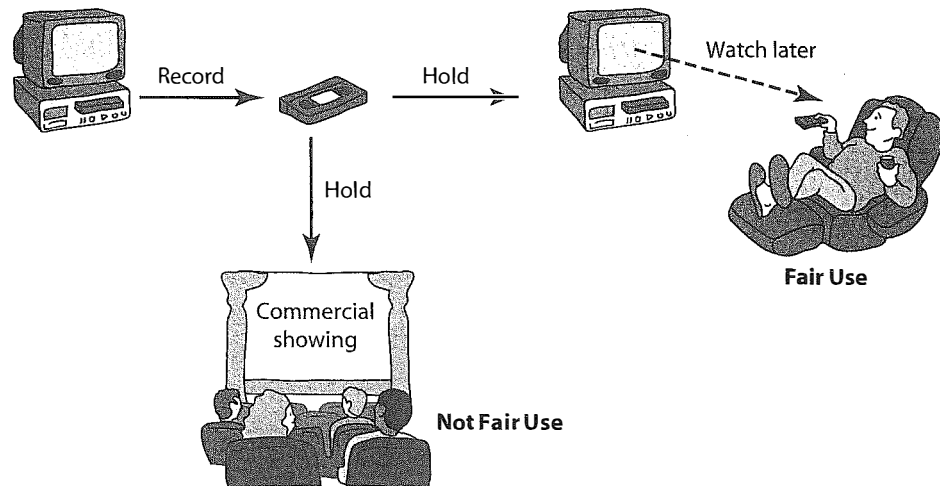


FIGURE 4.6 The Supreme Court ruled that videotaping television broadcasts for private viewing at a later time is fair use of the copyrighted material. This practice is called time shifting. Using videotaped material for a commercial purpose is not considered fair use.

hiss and distortions that significantly degraded the quality of the music. Trying to make a copy from a copy resulted in a nearly worthless tape. Music publishers focused on suing major violators of copyright law (those producing thousands of tapes) and ignored people who made a few copies of albums for their friends [36].

Digital technologies disrupted the status quo. The first of these technologies was the compact disc (CD). Initially, the introduction of CDs was a huge boon for the music publishing industry. The per-unit production cost of CDs was lower than vinyl albums or tapes, but their sound quality was higher, meaning companies could charge more for them. As a result, their profits swelled.

Someone with a digital recording device can copy a CD perfectly because it encodes music digitally—as a stream of ones and zeroes. When consumers didn't have access to digital recording devices, that wasn't a problem, but in the mid-1980s, Sony began selling digital audio tape (DAT) recorders in Japan and Europe. The Recording Industry Association of America opposed the introduction of DAT recorders in the United States on the grounds that giving consumers the ability to make unlimited numbers of perfect copies would destroy the recording industry. On the other side were Sony, Phillips, and other electronics companies that wanted to sell these devices to consumers.

4.4.3 Audio Home Recording Act of 1992

The Audio Home Recording Act represents a compromise between the desires of the recording industry, the electronics industry, and consumers. The Act protects the right of consumers to make copies of analog or digital recordings for personal, noncommercial use. For example, a consumer may copy a recording to put in another music player, to give to another family member, or to use as a backup.

To reduce the problem of unauthorized copying, the Audio Home Recording Act requires manufacturers of digital audio recorders to incorporate the Serial Copyright Management System (SCMS). The SCMS allows a consumer to make a digital copy from the original recording, but it prevents someone from making a copy of the copy.

To compensate artists and recording companies from the loss of sales due to copying, the Audio Home Recording Act requires a royalty to be paid on the sale of all digital audio recording devices and blank digital audio recording media. The royalties are divided among songwriters, music publishers, musicians, and recording companies, based on the popularity of their music. As it turns out, these royalty payments have never been a significant source of income for any of these groups.

4.4.4 *RIAA v. Diamond Multimedia Systems Inc.*

A compression algorithm reduces the number of bits needed to store a picture or sound. The most popular compression algorithm for music is MP3, which was developed by a team of European scientists. An MP3 music file is typically less than 10 percent the size of the original file, but it is difficult to hear the difference between the original and the compressed versions. The availability of MP3 encoders and decoders in the mid-1990s helped speed the development of portable music players.

Diamond Multimedia Systems introduced the Rio MP3 portable music player in 1998. About the size of an audio cassette, the Rio stored an hour of digitized music. The Recording Industry Association of America (RIAA) asked for an injunction preventing Diamond Multimedia Systems from manufacturing and distributing the Rio. The RIAA alleged that the Rio did not meet the requirements for the Audio Home Recording Act of 1992 because it did not employ the Serial Copyright Management System to prevent unauthorized copying of copyrighted material.

The U.S. Court of Appeals, Ninth Circuit, upheld the ruling of a lower court that the Rio was not a digital audio recording device as defined by the Audio Home Recording Act. It denied the injunction on these technical grounds. In addition, the Court affirmed that *space shifting*, or copying a recording in order to make it portable, is fair use and entirely consistent with copyright law (Figure 4.7).

4.4.5 *Kelly v. Arriba Soft Corporation*

Leslie Kelly was a photographer who maintained a Web site containing many of his copyrighted photos. Arriba Soft Corporation created an Internet-based search engine that responded to user queries by displaying thumbnail images. Arriba Soft created the thumbnail images by copying images from other Web sites. When Kelly discovered that the Arriba Soft search engine was displaying thumbnail images of his photographs, he sued Arriba Software for copyright infringement.

The U.S. Court of Appeals, Ninth Circuit, upheld the ruling of a lower court that Arriba Soft's use of the images was a fair use of the work [37]. Two factors heavily favored Arriba Soft's claim of fair use. First, the character and purpose of Arriba Soft's use of the images was "significantly transformative" [37]. Kelly's original images were

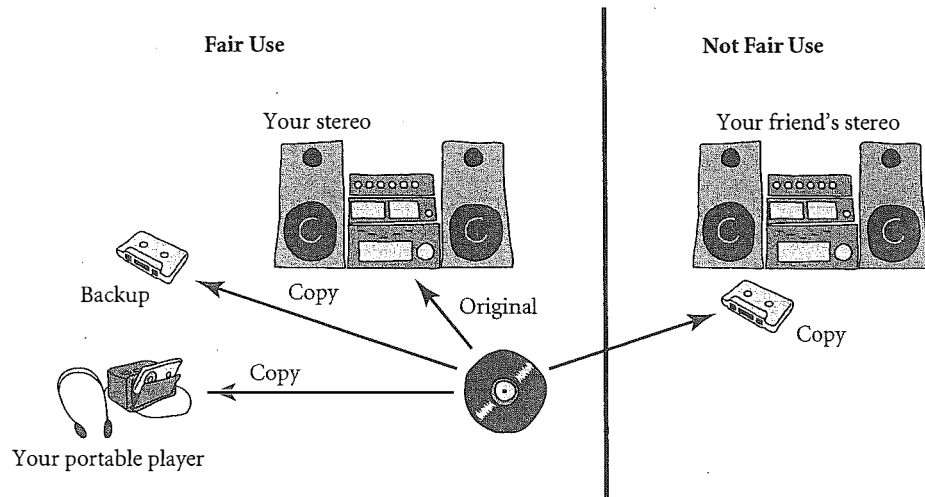


FIGURE 4.7 Space shifting is the creation of a copy for backup purposes or for use in a portable device, and it is considered fair use. Making a copy for a friend is not considered fair use.

artistic creations designed to provide the viewer with an aesthetic experience. Arriba Soft's use of the thumbnails was to create a searchable index that would make it easier for people to find images on the Internet. The thumbnail images had such low resolution that enlarging them resulted in a blurry image with little aesthetic appeal. Second, Arriba Soft's use of Kelly's images did not harm the value of the original images or the market for these images. If anything, the search engine's display of Kelly's images "would guide users to Kelly's web site rather than away from it," increasing the demand for his photographs [37].

4.4.6 Google Books

In December 2004, Google announced a plan to scan millions of books held by Harvard University, the University of Michigan, the New York Public Library, Oxford University, and Stanford University, creating a database containing the words contained in all of these books [38]. This database is much more powerful than traditional library card catalogs because it allows users to search for words or phrases appearing anywhere in the cataloged books. The system responds to a user query by returning the books that match the query most closely. If the book is in the public domain, the user can view and download a PDF file containing the scanned images of the book's pages. If the book is still under copyright, the user can see a few sentences from the book that show the search term in context, and the search engine provides links to libraries holding the book and online bookstores selling the book.

In September 2005, the Authors Guild filed a lawsuit in the U.S. District Court for the Southern District of New York, claiming that "by reproducing for itself a copy of those works that are not in the public domain, Google is engaging in massive copyright

infringement” [39]. A month later, a group of five major publishers sued Google for copyright infringement. The publishers claimed that Google was infringing their rights under the Copyright Act because Google’s intent was “purely commercial” and in order to create its database, Google was systematically copying entire books still protected by copyright [40].

Three years later, Google reached an out-of-court settlement with the Authors Guild and the Association of American Publishers. A joint public FAQ from the Authors Guild, the Association of American Publishers, and Google stated that the agreement would enable them “to do more together than copyright owners or Google could have done alone or through a court ruling” [41]. According to the three parties, the settlement would result in five important benefits:

1. Readers in the United States would have much easier access to millions of copyrighted books, including millions of books that are out-of-print, by allowing readers to search through them and preview them online.
2. The market for copyrighted books in the United States would grow by offering Google Books users the opportunity to purchase online access to them.
3. People would gain online access to out-of-print books at designated computers in U.S. public libraries and university libraries.
4. U.S. colleges and universities would have the opportunity to purchase subscriptions that would enable their students to gain online access to the collections of some of the world’s greatest libraries.
5. Authors and publishers would receive payments earned from the online access of their books, fees paid when people printed pages from their books, and advertising revenues.

As part of the settlement, Google agreed to pay \$125 million to resolve legal claims made by authors and publishers, cover their legal fees, and establish the Book Rights Registry. By registering their works with the Book Rights Registry, copyright holders would be able to receive payments received from institutional subscriptions, book sales, and advertising revenues.

The out-of-court settlement was controversial [42]. According to some, Google should not have made a deal with the plaintiffs. They felt Google’s use of the copyrighted material was a fair use, based on the precedent of *Kelly v. Arriba Soft Corporation*, and if Google had gone to trial and been found not guilty, the public would have been able to access these books at lower rates. Others criticized the settlement because they thought it gave Google a virtual monopoly over orphaned works: copyrighted books for which the copyright owner cannot be located. The Electronic Frontier Foundation expressed concerns about the potential chilling effect of Google tracking the pages that people are viewing.

In March 2011, the U.S. District Court for the Southern District of New York rejected the proposed settlement. The judge ruled that the agreement “would give Google a significant advantage over competitors, rewarding it for engaging in wholesale copying of copyrighted works without permission” [43]. In particular, the judge objected to the

part of the agreement that would have given Google liberal rights over orphaned works; according to the judge, a process for making use of orphaned books should be established by Congress, not a federal judge. Meanwhile, Google now has scanned more than 15 million books, even though most of them are still under copyright [44].

4.5 New Restrictions on Use

CDs and DVDs store sounds and images in digital form. When information is stored digitally, anyone with the right equipment can make perfect copies. China is the principal source of counterfeit CDs and DVDs (Figure 4.8) [45].

The increase in the number of people with broadband Internet connections has stimulated digital copying. Although a patient person with an ordinary dial-up connection to the Internet can download large files, connections that are dozens of times faster make file sharing much more practical. As more people got DSL or cable access to the Internet, the number of downloads soared [46]. Broadband connections have also made video sharing much more popular. As a result, the music industry is in real trouble. Total revenue from music sales and licensing in the United States dropped from \$14.6 billion in 1999 to \$6.3 billion in 2009 [47].

Governments and recording companies have responded to the threat of illegal copying of copyrighted materials by introducing new legal and technological restrictions on copying. Sometimes that makes it impossible for consumers to make copies even for purposes that are considered fair use, such as making a backup. Larry Kenswil of



FIGURE 4.8 Counterfeit CDs are destroyed in Thailand. (© Reuters/CORBIS)

Universal Music Group says, “What we really want to do is not to stop copying, simply to stop redistributing. But the technology available doesn’t distinguish between the two” [36].

4.5.1 Digital Millennium Copyright Act

The Digital Millennium Copyright Act (DMCA), passed by Congress in 1998, was the first major revision of United States copyright law since 1976. The primary purpose of the DMCA was to bring the United States into compliance with international copyright agreements it had signed [34]. Provisions in the DMCA significantly curtail fair use of copyrighted material. The DMCA makes it illegal for consumers to circumvent encryption schemes placed on digital media, and it is illegal to sell (or even discuss online) a software program designed to circumvent copy controls [48].

Online service providers that misuse copyrighted materials face severe penalties [48]. That means, for example, a university that knows students are exchanging MP3 files on the campus network and does nothing to stop them can be sued [49].

The DMCA extends the copyright protection to music broadcast over the Internet. It requires royalty payments to be made to copyright holders of music played over the Internet since October 1998. For example, a college Internet radio station would pay the larger of an annual fee of \$500 or \$0.0002 per listener per song for every song that it plays. Radio stations are having a hard time determining how much they owe, because most of them have not kept track of how many online listeners they have or the number of songs they have played [50].

4.5.2 Digital Rights Management

Digital rights management (DRM) can refer to any of a variety of actions owners of intellectual property may take to protect their rights. As Christopher May puts it, “All DRM technologies are aimed at tracking and controlling the use of content once it has entered the market” [51]. DRM technologies may be incorporated into a computer’s operating system, a program, or a piece of hardware.

One approach to DRM is to encrypt the digital content so that only authorized users can access it. Another approach is to place a digital mark on the content so that a device accessing the content can identify the content as copy-protected.

4.5.3 Secure Digital Music Initiative

The Secure Digital Music Initiative (SDMI) was an effort to create copy-protected CDs and secure digital music downloads that would play only on SDMI-compliant devices. About 200 entertainment and technology companies joined the consortium, which worked for three years to develop “digital watermarks” that would make unauthorized copying of audio files impossible. The SDMI was unsuccessful for three reasons. First, before any copy-protection technologies could be put in place, the number of music files being copied on the Internet mushroomed. Second, some of the sponsors of the

SDMI—consumer electronics companies—started making a lot of money selling devices that became more attractive to customers as access to free MP3 files got easier. Their sales could be hurt by restrictions on copying. Third, the digital watermarking scheme was cracked [52].

In September 2000, SDMI issued a “Hack SDMI” challenge. It released some digitally watermarked audio files and offered a \$10,000 prize to the first person to crack them. Princeton computer science professor Edward Felten and eight colleagues picked up the gauntlet. Three weeks later, the team had successfully read the audio files. The team declined to accept the cash prize. Instead, it wrote a paper describing how it broke the encryption scheme. It prepared to present a paper at the Fourth Annual Information Hiding Workshop at Carnegie-Mellon University in April 2001 [53]. At this point, the Recording Industry Association of America sent Dr. Felten a letter stating, “Any disclosure of information gained from participating in the public challenge would be outside the scope of activities permitted by the agreement and could subject you and your research team to actions under the Digital Millennium Copyright Act” [54]. Fearing litigation, Dr. Felten agreed to withdraw the paper from the conference. However, that did not prevent the information from being leaked. Even before the conference, copies of the research paper and the letter from the RIAA were placed on a freedom-of-speech Web site [54]. Four months later Felten’s group published the paper [55].

4.5.4 Sony BMG Music Entertainment Rootkit

In the summer and fall of 2005, Sony BMG Music Entertainment shipped millions of audio CDs with Extended Copy Protection, a DRM system. Extended Copy Protection prevented users from ripping audio tracks into MP3 format or making more than three backup copies of the CD. It also monitored the user’s listening habits and reported back to Sony via the Internet. Extended Copy Protection did this by secretly installing a “rootkit” on Windows computers when the CD was played for the first time. A **rootkit** is a way of hiding files and processes from users; rootkits are commonly associated with computer hackers. The installation of the rootkit also compromised the security of the user’s computer, making it vulnerable to “Trojan horse” programs (see Chapter 6) [56].

A computer expert discovered the Sony rootkit on his computer and publicized its existence, resulting in a huge public outcry and a class action lawsuit. Without admitting any wrongdoing, Sony BMG agreed to the following:

- Cease production of CDs with Extended Copy Protection
- Provide financial incentives to retailers to return unsold audio CDs with Extended Copy Protection
- Make freely available the software patch needed to uninstall the rootkit
- Allow customers to exchange CDs with Extended Copy Protection for identical CDs with no DRM
- Give consumers \$7.50 or three free album downloads for every CD with Extended Copy Protection they exchange [57]

4.5.5 Encrypting DVDs

A DVD (Digital Versatile Disc) is capable of storing a full-length motion picture. DVDs are smaller than videotapes and have higher video and audio fidelity. People can view DVDs on DVD players attached to home entertainment systems; they can also watch DVDs on Windows and Macintosh computers equipped with DVD players.

To prevent unauthorized viewing of DVD movies, the contents of the discs are encrypted using a scheme called the Content Scramble System (CSS), developed by Matsushita and Toshiba. DVD players and DVD drives inside PCs and Macintoshes have a licensed copy of CSS including the decryption keys [58].

In 1999, 16-year-old Norwegian Jon Johansen wrote a computer program called DeCSS that decoded the CSS encryption scheme. DeCSS enabled him to view DVD movies on a computer running the Linux operating system, which was not supported by CSS. Johansen distributed the program to others via the Internet.

2600 Magazine published the code and provided links to it. Eight major motion picture studios successfully sued the publisher of *2600 Magazine* for violating the Digital Millennium Copyright Act [59]. In November 2001, a federal appeals court upheld the ruling. The appeals court ruled that while a computer code is “speech,” the code enjoys only limited First Amendment protection because its purpose is more “functional” than “expressive.” The court held that the publisher’s right to post the code on the Internet was outweighed by the potential harm the program could do in the form of increasing the illegal copying of digitally encoded motion pictures [60].

Jon Johansen was also brought to trial in Norway for creating and distributing DeCSS, but in January 2003, an Oslo City Court acquitted Johansen. The court ruled he had the right to access information on a DVD that he had purchased. It noted the program Johansen developed to decrypt DVDs could be used for both legal and illegal purposes [59].

4.5.6 Foiling HD-DVD Encryption

IBM, Intel, Microsoft, Panasonic, Sony, Toshiba, The Walt Disney Company, and Warner Brothers cofounded an organization that created the Advanced Access Content System (AACS) for encrypting high-definition DVDs (HD-DVDs). The purpose of the AACS is to prevent the unauthorized copying and viewing of HD-DVDs.

In January 2007, this 32-character AACS encryption key was posted on Digg.com, a social news Web site:

```
09 F9 11 02 9D 74 E3 5B D8 41 56 C5 63 56 88 C0
```

In theory, consumers could use this key to play HD-DVDs on their Linux computers or rip movies to their computer hard drives, but the post did not link to a program that could actually do either of these things. The AACS parent organization immediately contacted Digg, claiming the post violated its intellectual property rights and ordering Digg to purge the key from its site. Tiny Digg, with only a few employees, deleted the offending story and closed the account of the person who submitted it. Some other

Digg users had reproduced the story or mentioned the key in comments. Digg closed the accounts of these users and deleted their posts, too. Digg CEO Jay Adelson explained the company's decision this way: "Whether you agree or disagree with the policies of the intellectual property holders and consortiums, in order for Digg to survive, it must abide by the law" [61].

The reaction of "diggers"—regular Digg users—to these actions was swift and unambiguous. In the words of some bloggers, "an Internet riot" ensued. Thousands of diggers reposted the key in a variety of imaginative ways and "dugg" each other's stories. Soon every front-page story had the encryption key in its headline. At the end of the day, the Digg administrators backed down. Digg's founder and chief architect said, "You've made it clear. You'd rather see Digg go down fighting than bow down to a bigger company. If we lose, then what the hell, at least we died trying" [61].

In response to the release on the Web of this key, the AACIS organization expired the compromised key, requiring owners of HD DVD and Blu-ray players to go online and fetch a replacement key [62]. A month later, a story revealing the new "secret" processing key was posted on Digg [63].

4.5.7 Criticisms of Digital Rights Management

The introduction of DRM technologies has been controversial. Here are some criticisms that have been raised against DRM.

Many experts suggest that any technological "fix" to the problem of copyright abuse is bound to fail. As we have seen in the previous examples, all prior attempts to create encryption or anti-copying schemes have been abandoned or circumvented.

Others argue that DRM undermines the well-established principle of fair use. Under DRM, a consumer may not be able to make a private copy of a DRM-protected work without making an extra payment, even if he has the right to do so under traditional fair use standards. Selena Kim writes:

In the analogue world, people go ahead and use the work if they believe themselves entitled to do so. It is only if users are sued for infringement that they invoke the relevant copyright exceptions as defence. In a digital world encapsulated by access control and embedded with copy control, a potential user of a work may have to ask for permission twice: once to access a work, and again to copy an excerpt. The exception to copyright is not being put forward as a defence; it is put forward to show entitlement to use the work. [64]

DRM restrictions sometimes prevent libraries from reformatting materials to make them more accessible to persons with disabilities. In addition, DRM protections, unlike copyrights, never expire [65].

Finally, some DRM schemes prevent people from anonymously accessing content. Microsoft's Windows Media Player has an embedded globally unique identifier (GUID). The Media Player keeps track of all the content the user views. When the Media Player contacts Microsoft's central server to obtain titles, it can upload information about the user's viewing habits.

4.5.8 Online Music Stores Drop Digital Rights Management

When Apple began selling music through the iTunes Music Store in 2003, all of the songs were protected with a DRM scheme called FairPlay. FairPlay blocked users from freely exchanging music they had purchased by preventing songs from being played on more than five computers or being copied onto CDs more than seven times. FairPlay had two other “features” that were strong incentives for consumers to stick with the Apple brand: music purchased from the iTunes store couldn’t be played on portable devices other than the Apple iPod, and DRM-protected music purchased from other online retailers couldn’t be played on the iPod [66].

Consumers complained about the restrictions associated with DRM, and eventually music retailers responded. In 2007, EMI announced it would begin offering all of its songs without DRM through the iTunes Store for \$1.29, 30 cents more than the previous price [67]. A year later, Amazon became the first online music store to reach an agreement with all four major labels to sell music free of DRM restrictions [68]. Apple followed suit in 2009 with an announcement that it, too, had reached an agreement with all the major music labels to sell music without DRM restrictions [69].

4.6 Peer-to-Peer Networks

On the Internet, the adjective *peer-to-peer* refers to a transient network allowing computers running the same networking program to connect with each other and access files stored on each other’s hard drives (Figure 4.9). Peer-to-peer networks stimulate the

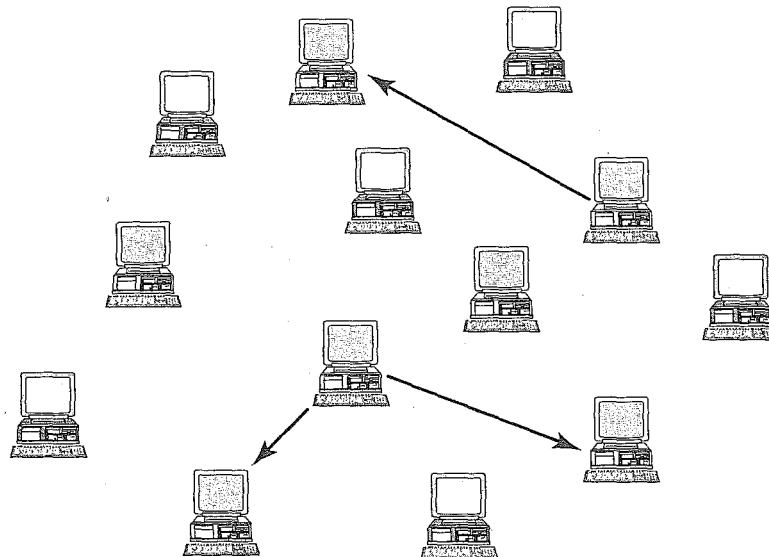


FIGURE 4.9 Some of the computers on the Internet run the same networking program to form a peer-to-peer network. The network supports multiple simultaneous file transfers. The files may contain digitized music, images, computer software, or other content.

exchange of data in three ways. First, they give each user access to data stored in many other computers. Second, they support simultaneous file transfers among arbitrary pairs of computers. Third, they allow users to identify those systems that will be able to deliver the desired data more rapidly, perhaps because they have a faster Internet connection or are fewer routing hops away.

4.6.1 Napster

Napster, which began operation in 1999, was a peer-to-peer network that facilitated the exchange of music files. In December 1999, the RIAA sued Napster for copyright infringement, asking for damages of \$100,000 each time a Napster user copied a copyrighted song. In June 2000, the RIAA asked for a preliminary injunction to block Napster from trading any copyrighted content from major record labels. In February 2001, a federal appeals court ruled that Napster must stop its users from trading copyrighted material. Napster put in place file-filtering software that was 99 percent effective in blocking the transfer of copyrighted material. In June 2001, a district court judge ruled that unless Napster could block 100 percent of attempted transfers of copyrighted material, it must disable file transfers. This court order effectively killed Napster, which went offline in July 2001 and officially shut down in September 2002 [70, 71, 72]. The following year, Napster reemerged as an online subscription music service and music store.

4.6.2 FastTrack

FastTrack is a second-generation peer-to-peer network technology developed by Scandinavians Niklas Zenniström and Janus Friis. Because of its decentralized design, a FastTrack network may be more difficult to shut down than Napster [73, 74].

Figure 4.10 illustrates the differences between the Napster and FastTrack implementations of peer-to-peer file sharing. Napster relied upon a central computer to maintain a global index of all files available for sharing. The existence of this central index made it easy to eliminate the distribution of copyrighted files via Napster.

In contrast, FastTrack distributes the index of available files among a large number of “supernodes.” Any computer with a high-speed Internet connection running FastTrack has the potential to become a supernode. The use of multiple supernodes makes searching for content slower, but it also makes it much more difficult for legal authorities to shut down the file-sharing network.

Popular peer-to-peer networks Kazaa and Grokster use the FastTrack technology. Morpheus, operated by StreamCast, is based on a different file-sharing technology called Neonet [75].

4.6.3 BitTorrent

For a computer with a broadband connection to the Internet, downloading a file from the network is about ten times faster than uploading a file to the network. A problem with FastTrack and other peer-to-peer networking protocols is that when one peer computer shares a file with another peer computer, the file is transferred at the slower, upload

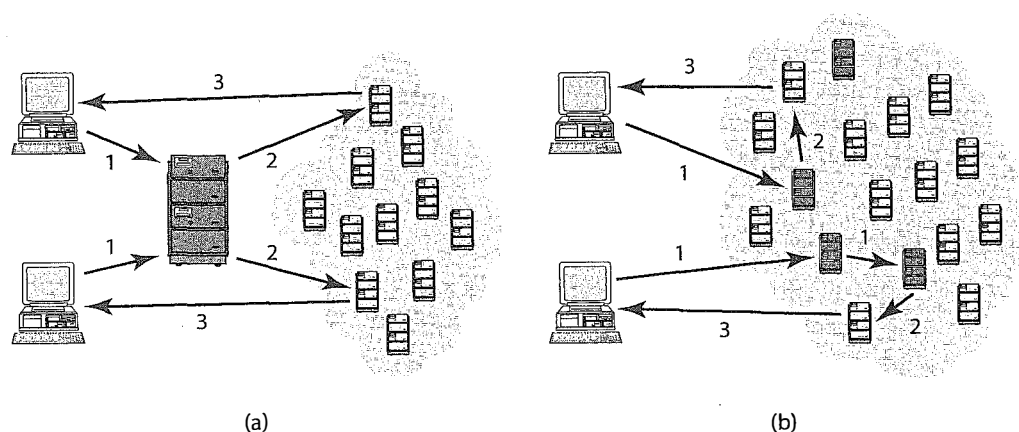


FIGURE 4.10 Comparison of the Napster and FastTrack implementations of peer-to-peer file sharing. (a) In Napster, a central server maintains the index of all files available for sharing. Retrieving a file is a three-step process: (1) making the request to the central server, (2) establishing a peer-to-peer connection between the sending and receiving computers, and (3) transferring the file. (b) In FastTrack, the index of available files is distributed among many “supernodes.” Each supernode has information about files available for sharing on “nearby” computers. Different users connect with different supernodes.

speed rather than the faster, download speed. To solve this problem, Bram Cohen developed BitTorrent [76].

BitTorrent divides a file into pieces about a quarter megabyte in length. Different pieces of a file can be downloaded simultaneously from different computers, avoiding the uploading bottleneck (Figure 4.11). As soon as a user has a piece of a file, the user can share this piece with other users. Since BitTorrent gives a priority for downloads to those users who allow uploading from their machines, users tend to be generous. As a result, downloading speeds increase as more peers get a copy of the file. Put another way, downloading speeds increase with the popularity of a title.

With its markedly higher downloading rates, BitTorrent has made practical the exchange of files hundreds of megabytes long. People are using BitTorrent to download copies of computer programs, television shows, and movies. Linspire, a Linux operating system developer, reduces demand on its servers (and saves money) by using BitTorrent to distribute its software [77]. BitTorrent was also the vehicle by which *Revenge of the Sith* became available on the Internet before it appeared in movie theaters [78].

4.6.4 RIAA Lawsuits

In April 2003, the RIAA warned Grokster and Kazaa users that they could face legal penalties for swapping files containing copyrighted music. The message read, in part:

It appears that you are offering copyrighted music to others from your computer. . . . When you break the law, you risk legal penalties. There is a simple way to avoid that risk: DON'T STEAL MUSIC, either by offering it to others to copy or

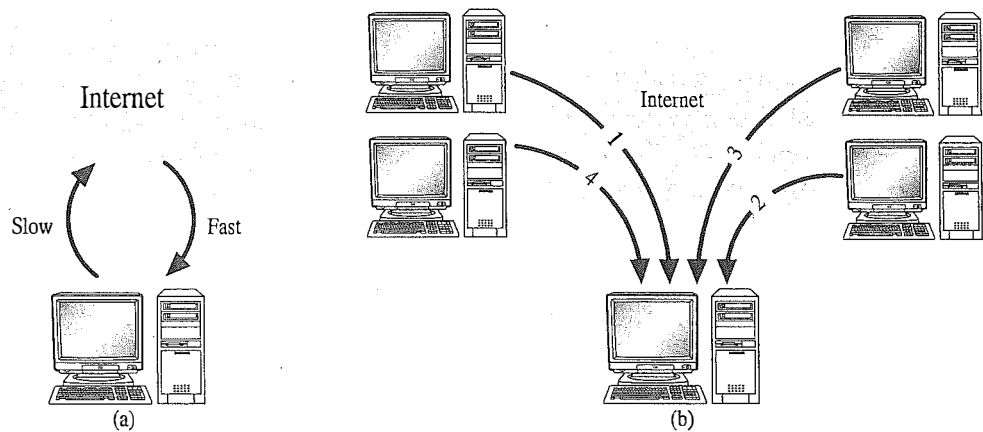


FIGURE 4.11 (a) Broadband Internet connections provide higher speeds for downloading than for uploading. (b) BitTorrent reduces downloading times by enabling a computer to download different pieces of a file simultaneously from many different peers.

downloading it on a 'file-sharing' system like this. When you offer music on these systems, you are not anonymous and you can easily be identified [79].

The RIAA identified the IP addresses of the most active Kazaa supernodes, leading it to the ISPs of users who have stored large numbers of copyrighted files on their computers. Under the terms of the Digital Millennium Copyright Act, the RIAA subpoenaed Verizon, asking it to identify the names of customers suspected of running these Kazaa supernodes. Verizon resisted responding to the subpoenas, claiming that responding to the subpoenas would violate the privacy of its customers. In June 2003, a judge in Washington, D.C., ruled that Verizon had to release the names of these customers [80].

In September 2003, the RIAA sued 261 individuals for distributing copyrighted music over the Internet [81]. A month later, the RIAA sent letters to 204 people who had downloaded at least 1,000 music files, giving them an opportunity to settle before being sued by the RIAA [82].

In December 2003, the RIAA suffered a setback when the U.S. Court of Appeals for the District of Columbia Circuit ruled that Verizon did not have to respond to the subpoenas of the RIAA and identify its customers [83]. Still, there is some evidence the RIAA lawsuits have reduced illegal file-swapping across the Internet. A survey from ComScore reported activity on Kazaa declined by 15 percent between November 2002 and November 2003 [84]. The Pew Internet & American Life Project reported that the percentage of Internet users who say they download music dropped from 32% in October 2002 to 22% in January 2005, and more than half of the January 2005 downloaders said that they purchased their music from an online service, such as iTunes. However, the report cautioned that because of the stigma associated with illegal downloading, fewer people may be willing to admit they do it. Interestingly, about half of music downloaders said they have gotten music from email, instant messages, or someone else's MP3 player or iPod [85].

The RIAA's campaign to impose severe penalties on file-sharers has been successful in the courtroom, but huge jury judgments against file sharers have been overruled by judges. In June 2009, a federal jury in Minnesota ordered Jammie Thomas-Rassett, a single mother of four, to pay \$1.92 million—\$80,000 a song—for violating the copyrights of 24 songs [86]. (The RIAA accused her of making 1,700 songs available on Kazaa, but they only tried to prove 24 copyright infringements.) In July 2011, Judge Michael Davis reduced the damage award against Thomas-Rassett to \$54,000. Judge Davis called the original award “appalling,” and said it was “so severe and oppressive as to be wholly disproportioned to the offense and obviously unreasonable” [91].

Another verdict went the RIAA's way in July 2009. The RIAA had accused Joel Tenenbaum of copyright infringement for using Kazaa to share 31 music files. The jury awarded the music companies \$675,000, or \$22,500 per song [5]. In July 2010, Judge Nancy Gertner reduced the jury's award to \$67,500. In her ruling, Judge Gertner wrote: “[T]here is substantial evidence indicating that Congress did not contemplate that the Copyright Act's broad statutory damages provision would be applied to college students like Tenenbaum who file-shared without any pecuniary gain. . . . There is no question that this reduced award is still severe, even harsh. It not only adequately compensates the plaintiffs for the relatively minor harm that Tenenbaum caused them; it sends a strong message that those who exploit peer-to-peer networks to unlawfully download and distribute copyrighted works run the risk of incurring substantial damages awards” [90].

During these trials the RIAA did not prove that people had actually downloaded songs from the defendants' computers. Instead, they contended that simply making the music files available to others was a violation of copyright law. In other words, making it possible for someone to download a music file from you means you've violated copyright law, even if no one ever does it. In April 2008, a federal court judge in New York agreed with the position of the RIAA, but judges in Massachusetts and Arizona reached the opposite conclusion, holding that simply making music files available for copying is not copyright infringement [87, 88, 89].

4.6.5 *MGM v. Grokster*

A group of movie studios, recording companies, music publishers, and songwriters sued Grokster and StreamCast for the copyright infringements of their users. The plaintiffs (henceforth referred to as MGM) sought damages and an injunction against the defendants.

During the discovery phase of the litigation, the following facts were revealed:

- The defendants' networks were used to transfer billions of files every month.
- About 90 percent of the files available on Grokster's FastTrack network were copyrighted.
- Grokster and StreamCast promoted their networks to investors and potential customers as replacements for Napster.

- An internal StreamCast document revealed that StreamCast's executives wanted to have more copyrighted songs available on their network than on competing networks.
- Grokster sent its users a newsletter touting its ability to deliver popular copyrighted songs.
- Grokster and StreamCast provided technical support to users who were having difficulty locating or playing copyrighted content.

A U.S. District Court granted Grokster and StreamCast a summary judgment; that is, it made its decision without a trial based on the facts and evidence collected. According to the judge, "[T]he defendants distribute and support software, the users of which can and do choose to employ it for both lawful and unlawful ends. Grokster and StreamCast are not significantly different from companies that sell home video recorders or copy machines, both of which can be and are used to infringe copyrights" [92]. The judge referred to *Sony v. Universal City Studios*, the Supreme Court's 1984 ruling on the legality of Sony's Betamax VCR. MGM appealed to the U.S. Court of Appeals for the Ninth Circuit, which upheld the ruling.

After another appeal, the U.S. Supreme Court *unanimously* reversed the decision of the lower courts in June 2005. Justice Souter wrote: "The question is under what circumstances the distributor of a product capable of both lawful and unlawful use is liable for acts of copyright infringement by third parties using the software. We hold that one who distributes a device with the object of promoting its use to infringe copyright, as shown by clear expression or other affirmative steps taken to foster infringement, is liable for the resulting acts of infringement by third parties" [93].

The Supreme Court made clear it was not reversing the Sony Betamax decision. Instead, it ruled that the "safe harbor" provided to Sony did not apply to Grokster and StreamCast. The Sony Betamax VCR was primarily used for time-shifting television shows, which the Court found to be a fair use. There was no evidence Sony had done anything to increase sales of its VCRs by promoting illegal uses. Therefore, Sony could not be found liable simply for selling VCRs.

The situation for Grokster and StreamCast was quite different. Both companies gave away their software, but made money by streaming advertisements to users. Advertising rates are higher when the number of users is greater. Hence, both companies wanted to increase their user base. They realized the way to do this was to make sure their networks had the content people are interested in downloading. The opinion notes dryly, "Users seeking Top 40 songs, for example, or the latest release by Modest Mouse, are certain to be far more numerous than those seeking a free Decameron, and Grokster and StreamCast translated that demand into dollars . . . [T]he unlawful objective is unmistakable" [93].

According to the Supreme Court, the Ninth Circuit Court of Appeals erred when it cited *Sony v. Universal City Studios*. The more relevant precedent was *Gershwin Publishing Corporation v. Columbia Artists Management, Inc.* The Supreme Court remanded the case to the Court of Appeals, suggesting that a summary judgment in favor of MGM

would be in order. Grokster shut down its peer-to-peer network in November 2005 and paid \$50 million to “movie studios, record labels and music publishers” [94].

4.6.6 Legal Action Against The Pirate Bay

The Pirate Bay, based in Stockholm, Sweden, is one of the biggest file-sharing Web sites in the world, with an estimated 25 million users [95]. People use The Pirate Bay to search for songs, movies, TV shows, or computer programs they can download for free. These items of intellectual property are broken into BitTorrent fragments stored in thousands of different computers scattered across the globe. Established in 2003, The Pirate Bay has been called “the most visible member of a burgeoning international anti-copyright—or pro-piracy—movement” [96].

The movie industry pressured the Swedish government to do something about The Pirate Bay, and in 2006, Swedish police raided its offices and confiscated 186 servers, but the site was offline for only three days [96, 97]. After the site was reactivated, the number of people accessing it increased significantly, perhaps because of the international publicity The Pirate Bay received as a result of the raid [96].

In 2008, the International Federation of the Phonographic Industry sued four individuals connected with The Pirate Bay for making available 33 copyrighted works: 20 songs, nine films, and four computer games [95]. The defendants argued that The Pirate Bay is simply a search engine and does not host any copyrighted content [98]. In April 2009, a District Court in Stockholm found Carl Lundström, Fredrik Neij, Peter Sunde, and Gottfrid Svartholm Warg guilty of aiding and abetting copyright infringement. All four were sentenced to one year in prison, and altogether were fined 30 million Swedish kronor (about \$3.6 million). In November 2010, an appeals court in Sweden upheld the convictions, but shortened the sentences and increased the fine to 46 million kronor (\$6.5 million) [99].

Meanwhile, The Pirate Bay Web site is still operational and enormously popular. On August 15, 2011, Alexa.com ranked thepiratebay.org as the 88th most popular Web site in the world, higher than such well-known sites as NYTimes.com, Myspace.com, and Netflix.com.

4.6.7 Legal Music Services on the Internet

Subscription music-streaming services, such as Napster, Rhapsody, and Spotify, are an alternative to illegal file-swapping. These services charge a monthly fee for legal access to millions of songs. Depending upon the plan, subscribers may or not pay extra to download songs. However, a common feature with subscription services is that they all have a form of digital rights management: subscribers who drop their subscription lose the ability to play the songs they’ve downloaded.

Another model is the online music store, in which you pay to download music without digital rights management. Three leading online music stores are Amazon MP3, eMusic, and Apple’s iTunes Store. The iTunes Store is easily the biggest player in the legal online music business. In 2008, the iTunes Store surpassed Wal-Mart to become

the top music retailer in the United States, with over 50 million customers, a catalog of more than six million songs, and cumulative sales of more than four billion songs [100]. Digital music sales continue to climb, and Forrester Research has predicted that in 2012 revenues from sales of digital music will finally surpass CD sales [101].

Still, illegal downloading remains far more popular than legal music services. According to the International Federation of the Phonographic Industry, 1.4 billion songs were purchased and downloaded worldwide in 2008, compared to about 40 billion songs illegally exchanged through file-sharing services [102].

4.7 Protections for Software

The two primary sources for the information in this section are the BitLaw Web site (www.bitlaw.com), created by Daniel A. Tysver of the law firm Beck & Tysver, and *Legal Protection of Digital Information* by Lee Hollaar [103].

In the early days of the computer industry, there was no strong demand for intellectual property protection for software. Most commercial software was produced by the same companies manufacturing computer hardware. They sold complete systems to customers, and the licensing agreements covered use of the software as well as the hardware. Interest in copyrighting software grew with the emergence of an independent software industry in the 1960s.

4.7.1 Software Copyrights

The first software copyrights were applied for in 1964. The Copyright Office allowed the submitted computer programs to be registered, reasoning that a computer program is like a “how-to” book. The Copyright Act of 1976 explicitly recognizes that software can be copyrighted.

When a piece of software gets copyright protection, what exactly is copyrighted? First, copyright protects the expression of an idea, not the idea itself. For example, suppose you develop a program for a relational database management system. You may be able to copyright your implementation of a relational database management system, but you cannot copyright the concept of using relational databases to store information.

Second, copyright usually protects the object (executable) program, not the source program. Typically, the source code to a program is confidential, in other words, a trade secret of the enterprise that developed it. The company only distributes the object program to its customers. The copyright also protects the screen displays produced by the program as it executes. This is particularly valuable for the developers of video games.

4.7.2 Violations of Software Copyrights

The holder of a copyright has a right to control the distribution of the copyrighted material. Obviously, this includes making copies of the program. The definition of what it means to make a copy of a program is broad. Suppose you purchase a program stored

on a CD. If you transfer a copy of the program from the CD to a hard disk, you are making a copy of it. If you execute the program, it is copied from the hard disk of the computer into its random access memory (RAM). This, too, is considered making a copy of the program. The standard licensing agreement that comes with a piece of commercial software allows the purchaser of the product to do both of the above-mentioned copying operations.

However, doing any of the following actions without authorization of the copyright holder is a violation of copyright law:

1. Copying a program onto a CD to give or sell to someone else
2. Preloading a program onto the hard disk of a computer being sold
3. Distributing a program over the Internet

Another kind of copyright violation can occur when a company attempts to create software that competes with an existing product. Two court cases illustrate a copyright infringement and fair use of another company's product.

APPLE COMPUTER, INC. V. FRANKLIN COMPUTER CORP.

In the early 1980s, Franklin Computer Corp. manufactured the Franklin ACE to compete with the Apple II. The Franklin ACE was Apple II compatible, meaning that programs sold for the Apple II would run on the Franklin ACE without modification. In order to ensure compatibility, the Franklin ACE contained operating systems functions directly copied from a ROM on the Apple II. Apple Computer sued Franklin for infringing on its copyright. The U.S. Court of Appeals for the Third Circuit ruled in favor of Apple Computer, establishing that object programs are copyrightable.

SEGA V. ACCOLADE

Video game-maker Accolade wanted to port some of its games to the Sega Genesis console. Sega did not make available a technical specification for the Genesis console, so Accolade disassembled the object code of a Sega game in order to determine how to interface a video game with the game console. Sega sued Accolade for infringing on its copyright. In 1992, the U.S. Court of Appeals for the Ninth Circuit ruled in favor of Accolade, judging that Accolade's actions constituted fair use of the software. It noted that Accolade had no other way of discerning the hardware interface and that the public would benefit from additional video games being available on the Genesis console.

4.7.3 Software Patents

Until the early 1980s, the U.S. Patent and Trademark Office refused to grant patents for computer software. Its position was that a computer program is a mathematical algorithm, not a process or a machine.

However, a U.S. Supreme Court decision in 1981 forced the Patent and Trademark Office to begin considering software patents. In the case of *Diamond v. Diehr*, the Supreme Court ruled that an invention related to curing rubber could be patented. Even though the company's principal innovation was the use of a computer to control the

heating of the rubber, the invention was a new process for rubber molding, and hence, patentable.

Further court rulings compelled the Patent and Trademark Office to begin issuing patents for a much broader range of software. In 1992, the Court of Appeals for the Federal Circuit considered a patent application from a company that had developed a computerized monitoring device that analyzed signals from an electrocardiograph to determine whether a heart attack victim was at a risk of a dangerous arrhythmia. The court ruled that the software was patentable because the numbers being manipulated by the computer program represented concrete values in the real world. Further court rulings reinforced the idea that computer software and data structures could be patented in the United States [104].

Since then, hundreds of thousands of software patents have been granted [105]. Microsoft alone files about 3,000 patent applications every year [106]. Companies generate revenue by licensing their software patents to other companies. It's also common for several technology companies to hold patents that cover different, but essential components of a commercial product. By signing an agreement to cross-license each other's patents, all of the companies are free to bring their own versions of the product to market.

Given the value of software patents, it's not surprising that a secondary market for them has arisen. For example, when a company holding patents goes bankrupt, its patents are sold to another company [107]. Some companies specialize in holding patents and licensing the rights to use these patents. Patent-holding companies aggressively use the courts to enforce their patent rights; these companies are sometimes referred to as patent trolls. Because defending against a patent infringement lawsuit can easily exceed \$1 million, companies that get sued have a strong motivation to simply settle out of court, putting patent trolls "in a position to negotiate licensing fees that are grossly out of alignment with their contribution to the alleged infringer's product or services" [108].

In 1992, inventor Thomas Campana and lawyer Donald Stout formed New Technologies Products (NTP), a patent-holding company. The purpose of the company was never to make anything, but to protect valuable intellectual property. About half of the company's 50 patents were originally held by Telefind Corporation, which went out of business. In 2000, NTP sent letters to several companies, warning them that they were infringing on NTP wireless email patents, and inviting them to negotiate licensing rights. One of these letters went to Research In Motion (RIM), maker of the BlackBerry, but RIM did not respond to the letter. The next year NTP sued RIM for patent infringement. Instead of settling out of court for a few million dollars, RIM took the case to trial and lost. After more unsuccessful legal maneuvering, RIM in 2006 agreed to pay NTP \$612.5 million to settle the patent infringement dispute [109, 110].

Critics of software patents argue that too many software patents have been granted. A problem faced by patent examiners in the Patent and Trademark Office is knowing what the existing technical knowledge (prior art) in computer programming is. Patent examiners typically look at patents already issued to determine prior art. This works fine for other kinds of inventions, but it doesn't work well for software patents, because a significant amount of software was written before software patents were first granted.

The consequence is that patent examiners issue many “bad patents”—patents that would not have been issued if the examiner knew about all of the prior art. The Patent Office has also been criticized for granting patents for trivial inventions that would be obvious to any skilled computer programmer.

As a consequence of the extremely large number of software patents, the large number of bad patents, and the number of obvious software inventions that are patented, any company releasing a new product that includes software runs a significant risk of being sued for infringing a software patent owned by someone else. Large corporations are resorting to building stockpiles of their own patents, so that if they are sued for infringing another company’s patent, they can retaliate with their own patent infringement counter-suit. The use of software patents as legal weapons is a perversion of their original purpose [111].

Some opponents of the current software patent system maintain that patent protection is inappropriate for software, which is less expensive to produce and has a much shorter useful life than other patentable properties, such as new pharmaceutical drugs. Jeff Bezos, CEO of Amazon.com, has suggested that software patents should have a lifespan of only three to five years [112].

4.7.4 Safe Software Development

An organization must be careful not to violate the copyrights held by its competitors. Even unconscious copying can have serious consequences. Years after hearing the song “He’s So Fine,” George Harrison wrote “My Sweet Lord.” The owner of “He’s So Fine” sued Harrison for copyright infringement and prevailed after a lengthy legal battle. Unconscious copying is a real concern in the software industry because programmers frequently move from one firm to another.

Suppose a company needs to develop a software product that duplicates the functionality of a competitor’s product without violating the competitor’s copyright. For example, in the 1980s, companies developing IBM-compatible computers needed to develop their own implementations of the BIOS (Basic Input/Output System). A “clean room” software development strategy helps ensure a company’s software program does not duplicate any code in another company’s product.

In this strategy, two independent teams work on the project. The first team is responsible for determining how the competitor’s program works. It may access the program’s source code, if it is available. If it cannot get access to the source, it may disassemble the object code of the competitor’s product. It also reads the product’s user manuals and technical documentation. The first team produces a technical specification for the software product. The specification simply states how the product is supposed to function. It says nothing about how to implement the functionality.

The second team is isolated from the first team. Members of this team have never seen any code or documentation from the competitor’s product. It relies solely on the technical specification to develop, code, and debug the software meeting the specification. By isolating the code developers from the competitor’s product, the company

developing the competing product can demonstrate that its employees have not copied code, even unconsciously.

4.8 Open-Source Software

In the early years of commercial computing, there was no independent software industry. Computer manufacturers such as IBM produced both the hardware and the software needed for the system to be usable. Well into the 1960s, software distributions included the source code. Customers who wanted to fix bugs in the programs or add new features could do so by modifying the source code and generating a new executable version of the program.

In the 1970s, the number of computer applications expanded, and organizations recognized the increasing value of software. To protect their investments in software development, most companies decided to make their programs proprietary (owned).

Today, companies developing proprietary software tightly control the distribution of their intellectual property. Typically, they do this by treating source code as a trade secret and distributing only the object code, which is not in human-readable form. In addition, they do not sell the object code. Instead, when people “purchase” the program, what they are actually buying is a license allowing them to run the program. Their rights to do other things with the code, such as make backup copies, are limited.

4.8.1 Consequences of Proprietary Software

Governments have given ownership rights to those who produce computer software because of the perceived beneficial consequences. A key benefit is the ability to profit from the licensing of the software. The assumption is that people will work harder and be more creative if they must compete with others to produce the best product. Those who produce the best products will have the opportunity to make money from them.

While most people point to the benefits of a system encouraging the development of proprietary software, some people have noted the harms caused by such a system. A well-known critic of proprietary software is Richard Stallman. According to Stallman, granting intellectual property rights to creators of computer software has numerous harmful consequences:

- The copyright system was designed for an era in which it was difficult to create copies. Digital technology has made copying trivial. In order to enforce copyrights in the digital age, increasingly harsh measures are being taken. These measures infringe on our liberties.
- The purpose of the copyright system is to promote progress, not to make authors wealthy. Copyrights are not promoting progress in the computer software field.
- It is wrong to allow someone to “own” a piece of intellectual property. Granting someone this ownership forces the users of a piece of intellectual property to choose between respecting ownership rights and helping their friends. When this happens,

the correct action is clear. If a friend asks you for a copy of a proprietary program, you would be wrong to refuse your friend. "Cooperation is more important than copyright" [113].

The open-source movement is the philosophical position that source code to software ought to be freely distributed and that people should be encouraged to examine and improve each other's code. The open-source software movement promotes a cooperative model of software development.

4.8.2 "Open Source" Definition

Open source is an alternative way of distributing software. Licenses for open-source programs have the following key characteristics (there are others) [114]:

1. There are no restrictions preventing others from selling or giving away the software.
2. The source code to the program must be included in the distribution or easily available by other means (such as downloadable from the Internet).
3. There are no restrictions preventing people from modifying the source code, and derived works can be distributed according to the same license terms as the original program.
4. There are no restrictions regarding how people can use the software.
5. These rights apply to everyone receiving redistributions of the software without the need for additional licensing agreements.
6. The license cannot put restrictions on other software that is part of the same distribution. For example, a program's open-source license cannot require all of the other programs on the CD to be open source.

Note that there is nothing in these guidelines that says an open-source program must be given away for free. While people may freely exchange open-source programs, a company has the right to sell an open-source program. However, a company cannot stop others from selling it either. In order for a company to be successful selling open-source software that people can find for free on the Internet, it must add some additional value to the software. Perhaps it packages the software so that it is particularly easy to install. It may provide great manuals, or it may provide support after the sale.

The Open Source Initiative (www.opensource.org) is a nonprofit corporation that promotes a common definition of open source. In July 2005, its Web site listed the names of 58 software licenses that met its definition of open source.

4.8.3 Beneficial Consequences of Open-Source Software

Advocates of open-source software describe five beneficial consequences of open-source licensing.

The first benefit of open source is that it gives everyone using a program the opportunity to improve it. People can fix bugs, add enhancements, or adapt the program for entirely new uses. Software evolves more quickly when more people are working on it.

Rapid evolution of open-source software leads to the second benefit: new versions of open-source programs appear much more frequently than new versions of commercial programs. Users of open-source programs do not have to wait as long for bug fixes and patches [115].

A third benefit of open source is that it eliminates the tension between obeying copyright law and helping others. Suppose you legally purchased a traditional license to use a program, and your friend asks you for a copy. You must choose between helping your friend and conforming to the license agreement. If the program had an open-source license, you would be free to distribute copies of it to anyone who wanted it.

The fourth benefit is that open-source programs are the property of the entire user community, not just a single vendor. If a vendor selling a proprietary program decides not to invest in further improvements to it, the user community is stuck. In contrast, a user community with access to the source code to a program may continue its development indefinitely [115].

The fifth benefit of open source is that it shifts the focus from manufacturing to service, which can result in customers getting better support for their software [115]. If source code were distributed freely, companies would make money by providing support, and the companies that provided the best support would be rewarded in the marketplace [116].

4.8.4 Examples of Open-Source Software

Open-source software is a key part of the Internet's infrastructure, and an increasing number of open-source applications are reaching the desktop. Here are a few examples of highly successful programs distributed under open-source licenses:

- BIND provides DNS (domain name service) for the entire Internet.
- Apache runs about half of the world's Web servers.
- The most widely used program for moving email about the Internet is the open-source program sendmail.
- The Android operating system is the world's best-selling smartphone platform [117].
- Firefox is the most popular Web browser in Europe and the second most popular browser worldwide [118].
- OpenOffice.org is an office application suite supporting word processing, spreadsheets, databases, and presentations (Figure 4.12).
- Perl is the most popular Web programming language.
- Other popular open-source programming languages and tools are Python, Ruby, TCL/TK, PHP, and Zope.
- Programmers have long recognized the high quality of the GNU compilers for C, C++, Objective-C, Fortran, Java, and Ada.

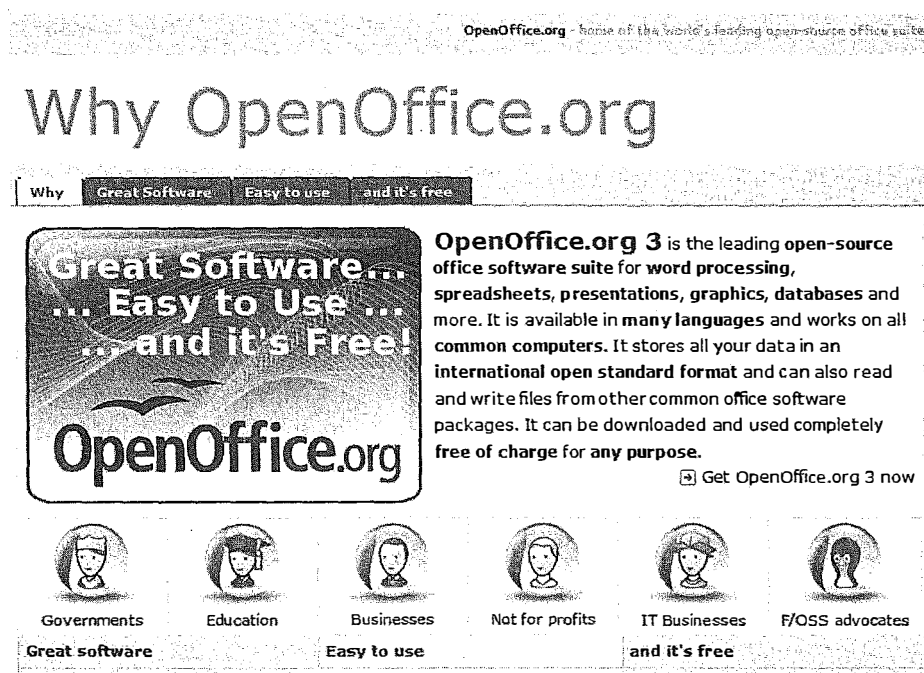


FIGURE 4.12 OpenOffice.org is an open-source office application suite that competes with the commercial product Microsoft Office. (Screenshot from OpenOffice.org, a registered trademark of Apache Software Foundation. Copyright © 2012 by Apache Software Foundation. Reprinted with permission.)

Surveys indicate that the quality and dependability of open-source software is about the same as the quality of commercial software [119].

4.8.5 The GNU Project and Linux

The GNU Project and Linux are important success stories in the history of the open-source movement. Richard Stallman began the GNU Project in 1984. (GNU is pronounced “guh-new” with the accent on the second syllable. It’s a tradition among hackers to invent recursive acronyms; GNU stands for “GNU’s Not Unix.”) The goal of the GNU Project was ambitious: to develop a complete Unix-like operating system consisting entirely of open-source software.

In order to be fully functional, a modern operating system must include text editors, command processors, assemblers, compilers, debuggers, device drivers, mail servers, and many other programs. During the late 1980s, Stallman and others developed most of the necessary components. The GNU Project also benefited from open-source software previously developed by others, notably Donald Knuth’s \TeX typesetting system and MIT’s X Window System. Most of the software developed as part of the GNU Project is distributed under the GNU Public License, an example of an open-source license. (For technical reasons some programs have been distributed as open-source software under other licenses.)

In 1991, Linus Torvalds began work on a Unix-like kernel he named Linux. (The kernel is the software at the very heart of an operating system.) He released version 1.0 of the kernel in 1994. Because the other major components of a Unix-like operating system had already been created through the GNU Project, Torvalds was able to combine all of the software into a complete, open-source, Unix-like operating system. To the obvious chagrin of Stallman, Linux has become the commonly accepted name for the open-source operating system based on the Linux kernel. (Stallman urges people to refer to the entire system as GNU/Linux [120].)

4.8.6 Impact of Open-Source Software

Andrew Leonard summarized the impact of Linux this way: “Linux is subversive. Who could have thought even five years ago that a world-class operating system could coalesce as if by magic out of part-time hacking by several thousand developers scattered all over the planet, connected only by the tenuous strands of the Internet?” [116].

As a reliable open-source alternative to Unix, Linux is putting price pressure on companies selling proprietary versions of Unix. Many corporations, including Morgan Stanley, Credit Suisse First Boston, Pixar, and the E*Trade Group, have replaced Sun file servers with less expensive “Lintel” boxes—servers running the Linux operating system on Intel-compatible CPUs [121]. A 2004 survey of 140 large North American firms by Forrester Research revealed that slightly more than half of them were using Linux for “mission-critical” applications, and slightly more than half of them were running new applications on Linux [122]. However, another Forrester Research survey resulted in the conclusion that despite the shift toward purchasing Linux servers, large companies would continue to maintain servers running proprietary operating systems [123].

Linux is also putting pressure on Microsoft and Apple, which sell proprietary operating systems for desktop computers. The cost of commodity, off-the-shelf hardware has gotten so low that the cost of a proprietary operating system is a significant portion of the selling price of low-end systems. Retailers such as Wal-Mart have begun offering Linux-equipped PCs for about \$300.

While more than 90 percent of the personal computers on people’s desktops run Microsoft operating systems, Microsoft is clearly worried about losing market share to Linux. In the summer of 2002, Microsoft sent an email message to senior managers urging them to hold on to government and large institutional accounts at all costs. If a negotiation to renew a licensing agreement looked hopeless, managers were authorized to draw from a special fund enabling them to offer the Microsoft software at large discounts, or even for free. “Under NO circumstances lose against Linux,” the memo instructed [124].

4.8.7 Critique of the Open-Source Software Movement

The open-source movement has many detractors. They have raised the following criticisms of the open-source model of software development.

First, if a particular open-source project does not attract a critical mass of developers, the overall quality of the software can be poor [115].

Second, without an “owner,” there is always the possibility that different groups of users will independently make enhancements to a software product that are incompatible with each other. The source code to a single program may fork into a multitude of irreconcilable versions. (In reality, this possibility hasn’t materialized. Code forking would fragment the developer community, which is bad for everyone. Hence there are incentives to keep a single version of the source code. About 99 percent of Linux distributions have the same source code [115].)

Third, open-source software as a whole tends to have a relatively weak graphical user interface, making it harder to use than commercial software products. This is one explanation why to this point open-source systems have made greater inroads as servers than as desktop systems [115].

Fourth, open source is a poor mechanism for stimulating innovation. Currently, corporations invest billions of dollars developing new software products. By removing the financial reward for creating new software, companies will sharply curtail or even eliminate research and development. They will no longer be a fountain of new programs. The open-source movement has proven it is able to produce alternatives to proprietary programs (for example, StarOffice instead of Microsoft Office), but it has not demonstrated its ability to innovate completely new products.

4.9 Legitimacy of Intellectual Property Protection for Software

Licenses for proprietary software usually forbid you from making copies of the software to give or sell to someone else. These licenses are legal agreements. If you violate the license, you are breaking the law. In this section, we are *not* discussing the morality of breaking the law. Rather, we are considering whether as a society we ought to give the producers of software the right to prevent others from copying the software they produce. In other words, should we give copyright and/or patent protection to software?

Rights-based and consequentialist arguments have been given for granting intellectual property protection to those who create software. Let’s review and test the strength of these arguments. To simplify the discussion, we’ll assume that a piece of software is written by a person. In reality, most software is created by teams, and the company employing the team owns the rights to the software the team produces. However, the logic is the same whether the software creator is an individual or a corporation.

4.9.1 Rights-Based Analysis

Not everyone can write good computer programs, and programming is hard work. Programmers who write useful programs that are widely used by others should be rewarded for their labor. That means they should own the programs they write. Ownership im-

plies control. If somebody creates a piece of software, he or she has the right to decide who gets to use it. Software owners ought to be able to charge others for using their programs. Everybody ought to respect these intellectual property rights.

This line of reasoning is a variation of Locke's natural rights argument we discussed at the beginning of the chapter. It is based on the Lockean notion that mixing your labor with something gives you an ownership right in it.

Here are two criticisms of the "just deserts"¹ argument. First, why does mixing your labor with something mean that you own it? Doesn't it make just as much sense to believe that if you mix your labor with something you lose your labor? Robert Nozick gives this example: If you own a can of tomato juice and pour it in the ocean, mixing the tomato juice with the salt water, you do not own the ocean. Instead, you have lost your can of tomato juice. Certainly it would be unjust if someone else could claim ownership of something you labored to produce, but if there were no notion of property ownership, and everybody understood when they mixed their labor with something they lost their labor, it would be just.

Of course, we do live in a society that has the notion of ownership of tangible property. How can we justify giving a farmer the right to the crop he labors to produce while failing to give a programmer the right to the accounting program he produces for the benefit of the farmer?

Still, if we do want to give ownership rights to those who produce intellectual property, we run into the problems we discussed at the beginning of the chapter. The second criticism of the "just deserts" argument is that Locke's natural rights argument does not hold up well when extended to the realm of intellectual property. There are two crucial differences between intellectual property and tangible property. Each piece of intellectual property is unique, and copying intellectual property is different from stealing something physical.

4.9.2 Utilitarian Analysis

A second argument in favor of providing intellectual property protection for software producers is based on consequences. Failing to provide this protection would have net harmful consequences. The argument goes like this [125]: When software is copied, it reduces software purchases. If less software is purchased, less money will flow to the producers of software. As a result, less new software will be produced. As a whole, new software titles benefit society. When the number of new titles drops, society is harmed. Therefore, when software is copied, society is harmed. Copying software is wrong.

You can view this argument as a chain of consequences (Figure 4.13). Copying software causes software sales to drop, which causes the software industry to decline, which causes fewer products to be released, which causes society to be harmed. Logically,

1. Pronounced with the accent on the second syllable. Think of the related word "deserve."

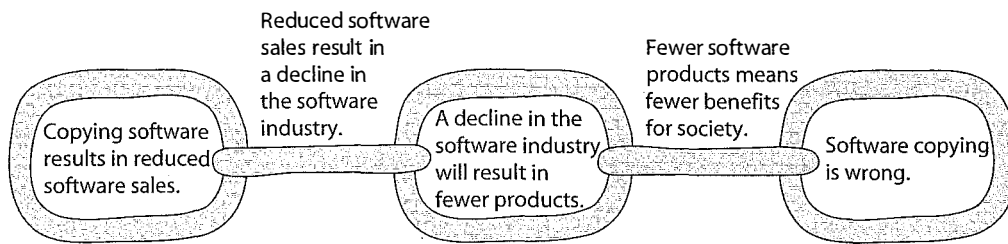


FIGURE 4.13 The chain of reasoning of a consequentialist argument for why copying software is bad. (Beth Anderson)

all of the links in the chain must be strong in order for the argument to be convincing. We will look at each of the links in turn, and we'll see that none of them are strong.

The first claim is that copying software results in reduced sales of software. When talking about software piracy, the computer industry cites the dollar value of the copied software as if each instance of copying represents a lost sale. Obviously this is an exaggeration. Not everyone who gets a free copy of a computer game has the money or the desire to purchase the game for \$50. In fact, sometimes software copying may lead to a sale. A person may not have been interested in buying a particular program. After trying it out for free, the person may decide it is so useful she is willing to buy a copy of the program in order to get access to all of the documentation, the technical support line, or another service provided to registered users of the program. It is fair to say that copying software sometimes results in reduced sales of software, but it is not always the case. Hence, it is incorrect to make a universal statement.

The second claim is that reduced sales of software will result in a decline in the software industry. An argument against this claim is the continued success of Microsoft, despite the fact that software counterfeiting is prevalent in some countries. A better argument against the claim is that it makes a strong cause-and-effect connection between the creation of software and financial remuneration. However, the open-source movement demonstrates many people are willing to create software without being rewarded financially. Some people write programs because they find it fun. Others are motivated by the desire to gain a good reputation by writing a program many people find useful. Advocates of open-source software, including Richard Stallman, suggest that the best way to stimulate innovation is to allow a free exchange of ideas and source code. From this point of view, allowing software producers to control the distribution of their code stifles, rather than promotes, innovation in the software industry.

Finally, the second claim assumes that software customers are solely responsible for the health of the software industry. In reality, other groups want to ensure that there are plenty of new software titles released. Intel, for example, makes its money from selling CPU chips. Every year the chips are faster. If a person owns a computer fast enough to run his current programs, he has little motivation to upgrade the hardware. However, if that same person purchases a new program that requires additional CPU cycles, he may be motivated to upgrade his computer. Hence it is in Intel's interest to encourage

the development of ever more computationally intensive computer programs. Software customers are not solely responsible for promoting the growth of the software industry.

The third claim is that new software packages benefit society. This is a difficult claim to prove. Certainly some programs would benefit society more than others. Hence, it's not the number of different programs that matters, it's what they can be used for. The utility of new software titles must be weighed against the utility of letting people give away copies of programs that would help their friends.

4.9.3 Conclusion

We have examined two arguments for why society ought to provide intellectual property protection to software creators. The first argument is based on the notion of just deserts. It is a variation of the natural rights argument we discussed at the beginning of the chapter. This argument is weak; it rests on the faulty assumption that a natural right to own property extends cleanly to intellectual property.

The second argument is based on consequences. It holds that denying intellectual property protection for software would have harmful consequences. It relies upon a chain of cause-and-effect relationships: copying leads to a loss of revenue, which leads to a decline in software production, which harms society. The strength of each of the links in the chain is debatable; taken as a whole, the argument is not strong.

Our conclusion is that the arguments for granting intellectual property protection for software are not strong. Nevertheless, our society *has* granted copyright protection to owners of computer programs. If you violate a licensing agreement by copying a CD containing a computer program and giving it to a friend, you are breaking the law. As we discovered in Chapter 2, from the viewpoint of Kantianism, rule utilitarianism, and social contract theory, breaking the law is wrong unless there is a strong overriding moral obligation.

4.10 Creative Commons

As we saw earlier in this chapter, some believe strong intellectual property protection stimulates creativity by dangling the prospect of financial reward in front of artists and inventors. Others believe that creativity is suppressed in such an environment. They argue that people are more creative when they are free to build on the work of others. Consider music, for example. It's not just rap musicians who sample the works of others to create new songs. Listen to the classical piece *Appalachian Spring* by Aaron Copland and you'll find that he used the Shaker hymn "Simple Gifts."

Information technology has created an environment in which an unprecedented amount of creativity could be unleashed. Never before has it been so inexpensive to record and mix music, combine photographs and computer-generated images, or tape and edit movies. Wouldn't it be great to take what others have done and add your own talents to produce even better works of art for everyone's enjoyment? Quoting the movie

Get Creative on the Creative Commons Web site: “Collaboration across space and time. Creative co-authorship with people you’ve never met. Standing on the shoulders of your peers. It’s what the Internet is all about” [126].

Strong intellectual property protection, however, stands in the way of this vision. Under current U.S. copyright law, works of intellectual property are copyrighted the moment they are made, even if the creator does not attach a copyright symbol © to the work. Since copyright is implicit, permission is required before use. The current system discourages people from building on the work of others.

Imagine the difficulty an art professor has trying to put together a Web site of images for an online course! She needs to request permission for every image she wishes to display on the Web site. Suppose there are three suitable images of Michelangelo’s *Pieta*. It may be impossible for her to tell in advance which, if any, of the photographers would be willing to let her use the image. It would be better if there were an official way for a photographer to say, “It’s fine if you use this photograph, as long as you give me credit for taking it.”

Stanford law professor Lawrence Lessig realized there was a need for a system that would allow producers of intellectual property to indicate to the world the rights they wanted to keep. Lessig asks us to think about instances of the commons, a “resource to which anyone within the relevant community has a right without obtaining the permission of anyone else” [127]. Examples of the commons include public streets, parks, beaches, the theory of relativity, and the works of Shakespeare. Lessig says that “there is a benefit to resources held in common and the Internet is the best evidence of that benefit . . . [T]he Internet forms an *innovation commons*” [127]. The reason Lessig calls the Internet an innovation commons is because its control is decentralized: one person can introduce a new application or new content without getting anyone else’s permission.

Lessig joined with Hal Abelson, James Boyle, Eric Eldred, and Eric Saltzman to found the nonprofit corporation Creative Commons in 2001. Creative Commons provides standard copyright licenses free of charge. Every license comes in three forms: human-readable, lawyer-readable, and computer-readable. With a Creative Commons license, you can retain the copyright while allowing some uses of your intellectual property under certain circumstances. Because you have published the circumstances under which your work may be used, others do not have to ask for permission before using your work [126].

How does the system work? Suppose you have taken a photograph and wish to post it on your Web site accompanied by a Creative Commons license. You visit the Creative Commons Web site (www.creativecommons.org), which allows you to choose between six different licenses, depending upon your responses to two questions (quoted verbatim):

- Allow commercial uses of your work?
 - Yes
 - No

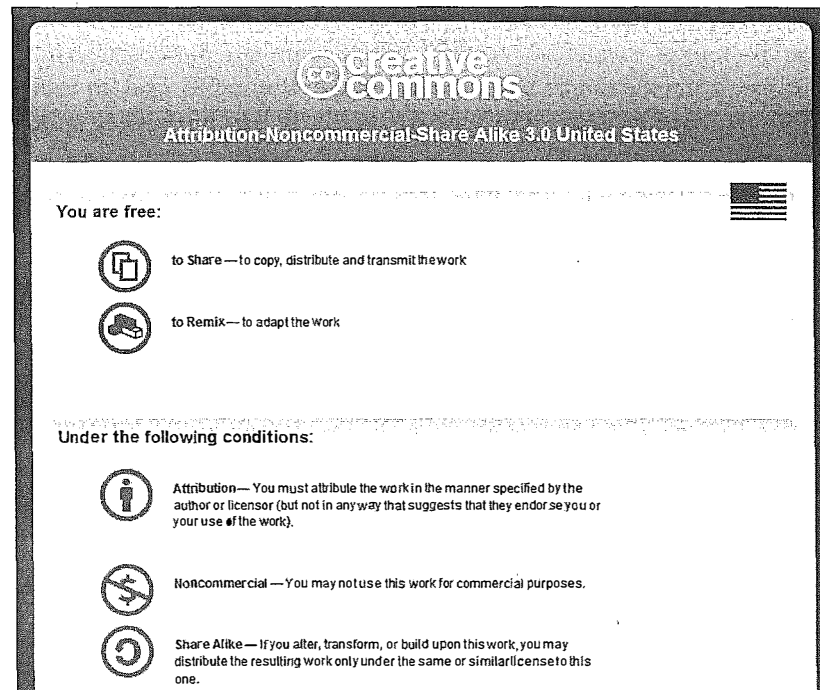


FIGURE 4.14 A portion of the human-readable summary of a Creative Commons license as it appears to a Web site visitor. (Screenshot from Creative Commons. Copyright © 2011 by Creative Commons. Reprinted with permission.)

- Allow modifications of your work?
 - Yes
 - Yes, as long as others share alike
 - No

After you answer these two questions, the Web site creates HTML code containing the appropriate Creative Commons license. You can copy the HTML code and paste it into the appropriate Web page along with your photograph. Visitors to your Web site will be able to see a human-readable summary of the license you have chosen (Figure 4.14).

Commercial artists may choose to use Creative Commons licenses to increase exposure to their work. For example, suppose you take a great photograph of the Golden Gate Bridge. You post it on your Web site with a Creative Commons license indicating the photograph may be used for noncommercial purposes as long as the user gives attribution to you. People from around the world think the image is stunning, and they copy it to their own personal Web sites, giving you credit for the photo. A travel agent in a foreign country sees the image and wants to put it on a travel poster. Since this is a commercial purpose, she must gain your permission before using the image. At that time you can negotiate a fair price for its use. Without the widespread distribution of the image through a Creative Commons license, the travel agent might never have seen it.

The computer-readable versions of the licenses are designed to make it easier for search engines to identify content based upon the particular criteria. For example, a history professor might use a search engine hoping to find an image of the Coliseum in Rome that he could include on his Web site. His purpose is noncommercial, and he is happy to credit the photographer, but he does not want to have to pay to display the image or write a letter asking for the photographer's permission. A search engine could return only those images that meet these criteria.

By 2008, about 130 million different pieces of intellectual property had been distributed using Creative Commons licenses. In 2009, the Creative Commons Attribution-Share Alike license became the principal content license for Wikipedia.

John Buckman has used Creative Commons licenses to create an online record label called Magnatune [128]. Magnatune puts complete albums online for potential customers to preview. Customers who wish to download an album or purchase a CD choose how much they wish to pay for it (between \$5 and \$18), with half of the proceeds going to the artists [129].

Summary

Intellectual property is any unique product of the human intellect that has commercial value. Because our society values property rights, simply calling products of the intellect "intellectual property" creates a bias toward ownership. Some believe the creators of intellectual property have a natural right to own what they create. However, paradoxes occur when we try to extend John Locke's theory of property rights to intellectual property. As we saw in our hypothetical scenarios involving William Shakespeare and Ben Jonson, intellectual property has two characteristics that make it significantly different from ordinary property. First, each creation is unique. That creates a problem when two people independently create the same work. Second, ideas are copied, not stolen. When I take your idea, you still have it. These paradoxes illustrate that Locke's natural rights argument for property does not extend to intellectual property. We conclude there are no strong arguments for a natural right to intellectual property.

Nevertheless, our society recognizes the value of intellectual property creation. In order to stimulate creativity in the arts and sciences, governments have decided to grant limited ownership rights in intellectual property to its creators. In the United States, there are four different ways in which individuals and organizations can protect their intellectual property: trade secrets, patents, copyrights, and trademarks/service marks.

A trade secret is a confidential piece of intellectual property that provides a company with a competitive advantage. The formula for Coca-Cola is a famous trade secret. A company may keep a trade secret confidential indefinitely.

A trademark is a word, symbol, picture, sound, or color used by a business to identify goods. A service mark is a mark identifying a service. Xerox is a well-known trademark identifying a brand of photocopy machine. Companies protect their marks to ensure they are used as adjectives rather than common nouns.

A patent gives an inventor the exclusive right to an invention for a period of 20 years. A patent is a public document, and after the patent expires, anyone has the right to make use of its ideas.

A copyright provides authors with certain rights to original works they have written: reproduction, distribution, public display, performance, and production of derivative works. Books, movies, sheet music, songs, and computer software are all protected by copyright. Industries producing products protected by copyright account for 6 percent of the U.S. economy, with about \$900 billion in sales. Over time, both the length of copyright protection and the kinds of intellectual property that can be copyrighted have increased significantly. Works created today are protected for the author's lifetime plus 70 years.

The rights given copyright holders are limited. The fair use doctrine allows certain uses of copyrighted works without asking the copyright holder for permission. To determine whether a particular use is fair use, courts consider the purpose of the use (commercial versus noncommercial), the nature of the work being copied (fiction versus nonfiction), how much of the copyrighted work is being used, and how the use will affect the market for the copyrighted work. Two court cases legitimized time shifting—recording a TV program for viewing later—and space shifting—copying a recording to make it portable.

The introduction of digital technology and the Internet have brought intellectual property issues to the forefront. Representing audio and video content digitally means anyone with the right equipment can make perfect copies. Internet technology enables these copies to be widely disseminated. Recording companies have responded by putting new restrictions on copying, even though sometimes these restrictions make it impossible for consumers to make copies that were previously considered fair use. Many digital rights management strategies have been abandoned or circumvented. Recording companies have begun to soften their stance toward digital rights management, as evidenced by the fact that consumers may now purchase DRM-free music from Amazon and the Apple iTunes Store.

Peer-to-peer networks enable people to swap files around the world. Many of these files contain copyrighted songs, TV shows, or movies. Napster facilitated the exchange of music files until it was sued by the Recording Industry Association of America (RIAA). A judge shut down Napster after Napster indicated it could not block 100 percent of attempted transfers of copyrighted material. However, other free file-sharing services such as Grokster and StreamCast took Napster's place. A diverse group of movie studios, recording companies, music publishers, and songwriters sued Grokster and StreamCast. The U.S. Supreme Court ruled that Grokster and StreamCast could be held liable for the copyright infringements of their users since they had actively promoted these activities. Grokster shut down its peer-to-peer network and paid \$50 million to copyright holders. Despite these legal victories by the entertainment industry, popular Web sites such as The Pirate Bay continue to facilitate the exchange of copyrighted materials on peer-to-peer networks. Meanwhile, the RIAA has sued or demanded out-of-court settlements from individuals who allegedly have distributed large numbers of copyrighted songs.

via the Internet. These legal actions have reduced the percentage of Internet users who illegally download music, or at least the percentage of Internet users who are willing to admit to doing it.

Until the mid-1960s, there was no intellectual property protection for computer software other than trade secrets. Now, both copyrights and patents are used to protect software. The case of Apple Computer versus Franklin Computer demonstrates that object code as well as source code is protected by copyright. The area of software patents is highly controversial. There are a large number of bad software patents, and many software patents have been issued for obvious inventions. Large corporations are stockpiling software patents, so that if they are sued for infringing another company's patent, they can retaliate with their own patent infringement counter-suit.

The open-source movement is an alternative to the more conventional proprietary model of software development. A great deal of the software that keeps the Internet running is open-source software. Linux is a popular operating system for servers. In addition, many low-cost netbook computers are also using the Linux operating system. The Android operating system is the most popular platform for smartphones. Popular open-source desktop applications are Firefox and OpenOffice.org.

We examined the question, "Should we give intellectual property protection to software?" There are both rights-based and utilitarian arguments why we ought to give intellectual property protection to software. The first argument is based on the notion of just deserts. It relies upon a natural right to intellectual property, which as we have seen is a weak right at best. The second argument is based on a chain of consequences: copying leads to a loss of revenue, which leads to a decline in software production, which harms society. Taken as a whole, the second argument is not strong. In short, we concluded the arguments for providing intellectual property protection to software are weak.

The story of the GNU Project and Linux demonstrate how thousands of volunteers can work together to produce high-quality, industrial-strength software. Today, millions of people have access to personal computers, digital cameras, digital recording devices, and the Internet.

Why can't the success of GNU/Linux be replicated in the arts? Imagine a culture that encouraged the production of new creative works from existing works, a culture in which songs would rapidly evolve, different versions of movies were exchanged and compared, and hypertext novels accumulated links to fan sites. Today's intellectual property laws make it difficult to achieve this vision in the entertainment field. Little can be done with a copyrighted work without first asking for permission, a labor-intensive process that puts a drag on innovation. Creative Commons is an effort to streamline the process by allowing copyright holders to indicate up front the conditions under which they are willing to let other people use their work.

Review Questions

1. What is intellectual property? Give ten examples of intellectual property.
2. Summarize John Locke's explanation why there is a natural right to property.

3. What paradoxes arise when we attempt to extend a natural right to property into the realm of intellectual property?
4. What are the ways in which an individual or firm may protect intellectual property in the United States?
5. What is the difference between a trademark and a trade secret?
6. What are the relative advantages and disadvantages of patents versus trade secrets?
7. When referring to copyrighted materials, what is meant by the term "fair use"?
8. Explain how advances in information technology have made it easier for consumers to violate copyright law.
9. How has the Digital Millennium Copyright Act affected fair use of copyrighted material by consumers?
10. What does the term "digital rights management" mean? Describe three different technologies that have been used or proposed for digital rights management.
11. What is a peer-to-peer network?
12. What property makes the peer-to-peer network FastTrack more difficult to shut down than Napster?
13. How does BitTorrent provide an order-of-magnitude increase in downloading speed, compared to Kazaa and Grokster?
14. The U.S. Supreme Court ruled that Sony was not responsible for the copyright infringements of Betamax customers, but Grokster and StreamCast were responsible for the copyright infringements of those who used their peer-to-peer networks. Explain the differences in the two situations that led the Supreme Court to reach opposite conclusions.
15. Why are patents considered an unreliable way of protecting intellectual property rights in software?
16. Suppose company A wants to develop a program that duplicates the functionality of a program made by company B. Describe how company A may do this without violating the copyrights held by company B.
17. When describing a software license, what does the phrase "open source" mean?
18. How has Linux affected the market for proprietary software?
19. Suppose your band has recorded a song and posted it as an MP3 file on your Web site. How can you allow people to download your music for noncommercial purposes while retaining your copyright on the song?

Discussion Questions

20. Benjamin Franklin created many useful inventions without any desire to receive financial reward. Is intellectual property protection needed in order to promote innovation?
21. Any original piece of intellectual property you have created, such as a poem, term paper, or photograph, is automatically copyrighted, even if you did not label it with a copyright notice. Think about your most valuable piece of intellectual property. Describe in detail the ownership rights you would like to claim on it.

22. If the Google Books out-of-court settlement is approved, people will be able to access millions of out-of-print books and read them online. Do you think the fact that Google will have the ability to monitor online page viewing will have a chilling effect on what people read?
23. Discuss the morality of posting the 32-character encryption key for HD-DVDs on Digg.com; the morality of terminating the poster's account; and the morality of re-posting the encryption key.
24. How does the debate over digital music illuminate the differences among ethics, morality, and law?
25. Is the concept of digital rights management doomed to failure?
26. What does the U.S. Supreme Court decision in *MGM v. Grokster* mean for the development of future peer-to-peer network technologies?
27. The current legal system allows both proprietary software and open-source software to be distributed. What are the pros and cons of maintaining the status quo?
28. Examine the analyses of Section 4.9 regarding the legitimacy of providing intellectual property protection for software. Do these arguments apply equally well to the question of providing intellectual property protection for music? Why or why not?
29. Should copyright laws protect musical compositions? Should copyright laws protect recordings of musical performances?
30. Which is more likely to be effective in protecting intellectual property in digital media such as CDs and DVDs: tougher copyright laws or new technologies incorporating more sophisticated anti-copying measures? Or is it hopeless to try to protect intellectual property in digital media?

In-Class Exercises

31. A plane makes an emergency crash landing on a deserted tropical island. Two dozen survivors must fend for themselves until help arrives. All of them are from large cities, and none of them has camping experience. The survivors find it impossible to gather enough food, and everyone begins losing weight. One person spends a lot of time by himself and figures out how to catch fish. He brings fish back to camp. Others ask him to teach them how to catch fish. He refuses, but offers to share the fish he has caught with the other passengers as long as they take care of the other camp chores, such as hauling fresh water, gathering firewood, and cooking.

Debate the morality of the bargain proposed by the fisherman. One group should explain why the fisherman's position is morally wrong. The other group should explain why the fisherman's position is morally acceptable.
32. Survey ten of your peers. How many own an iPod? How many own another company's portable digital music player? How many tracks were purchased from an online store? How many tracks were ripped from a CD the person owns? How many tracks were gotten for free?

33. Research your university's policy on bandwidth abuse and file sharing. What kinds of activities are explicitly forbidden? Is the policy sensible?

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