Lecture 5

Intellectual Property

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Information Technology Changing Intellectual Property Landscape

- We benefit from access to high-quality television shows, music, movies, computer programs
- Value of intellectual properties much greater than cost of media
- Illegal copying pervasive
- Internet allows copies to spread quickly and widely
- In light of advances in information technology, how should we treat intellectual property?

What is Intellectual Property?

- *Property* is a complex notion that is neither easily defined nor clearly understood.
- Property laws and norms establish relationships between and among individuals, different sorts of objects, and the state.
- Originally, "property" referred to land.
- Current conceptions of property also include objects that an individual can own – e.g., an automobile, articles of clothing, and a stamp collection.

Property

- Property should not be viewed it in terms of items or things, but rather as a certain kind of *relationship between individuals in reference to things*.

- If Harry owns a certain object (e.g. a Toshiba laptop computer), then Harry can control who has access to that object and how it is used.
    - e.g., Harry has the right to exclude Sally from using the laptop computer; or he could grant her unlimited access to that computer.

Locke’s Notion of Property Rights

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

Limits to Intellectual Property Protection

- Giving creators rights to their inventions stimulates creativity
- Society benefits most when inventions in public domain
- U S Congress has struck compromise by giving authors and inventors rights for a limited time

Prices Fall When Works Become Public Domain

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

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.)

Intellectual Objects

- The expression *intellectual objects* refers to various forms of intellectual property.

- Non-tangible or "intellectual" objects represent creative works and inventions, which are the manifestations or expressions of ideas.

Intellectual vs. Tangible Objects

- Tangible objects are exclusionary in nature, intellectual objects (e.g., such as software programs) are *non-exclusionary*.
- If Harry owns a laptop computer (a physical object), then Sally cannot, and *vice versa*.
- If Sally makes a copy of a word-processing program (that resides in Harry's computer), then both Sally and Harry can possess copies of the same word-processing program.
- Intellectual objects can be easily reproduced.
- There are practical limitations to the number of physical objects one can own.
  - e.g., there are natural (and political limitations) to the amount of land that can be owned.
- Countless copies of a software program can be produced – each at a relatively low cost.

Ideas vs. Expressions of Ideas

- If an idea is literary or artistic in nature, it must be expressed (or "fixed") in some tangible medium in order to be protected.
  - A “tangible medium” could be a physical book or a sheet of paper containing a musical score.
- If the idea is functional in nature, such as an invention, it must be expressed in terms of a machine or a process.
- Authors are granted copyright protections for expressions of their literary ideas, inventors are given patent protection for inventions.

Protecting Intellectual Property

Protecting Intellectual Objects

- One theory holds that a property right is a type of "natural right," which should be granted to individuals for the products that result from the labor expended in producing an artistic work or a practical invention.

- Another theory is based on the notion that property rights are social constructs designed to encourage creators and inventors to bring forth their artistic works and inventions into the marketplace.

Software as Intellectual Property

- A program's *source code* consists of symbols.
- Its *object code* is made up of "executable images" that run on the computer's hardware after they have been converted from the original source code.
- Initially, it was not clear, at least initially, that software programs should be granted copyright protection.
- Some argues that computer programs are more like inventions that could be patented.
- Software programs resemble algorithms, which, like mathematical ideas or "mental steps," are not typically eligible for patent protection.
- So, initially, computer programs were eligible for neither copyright nor patent protection.
- Eventually, however, copyright protection was granted to software programs.

Copyright

- Provides owner of an original work five rights
  - Reproduction
  - Distribution
  - Public display
  - Public performance
  - Production of derivative works
- Copyright-related industries represent 6% of U.S. gross domestic product (> $900 billion/ year)
- Copyright protection has expanded greatly since 1790

Copyright Protection

- Copyright law in the Anglo-American world was in response to concerns resulting from certain uses of printing-press technology.
- It was also in response to concerns about the widespread publishing of pamphlets made possible by the printing press.
  - The British monarchy wanted to control the spread of "subversive" and "heretical" works printed.
  - Authors wanted to protect their creative works from being reproduced without their permission.
- The American Colonies followed English law regarding copyright.

Evolution of Copyright Law in the US: A Brief Sketch

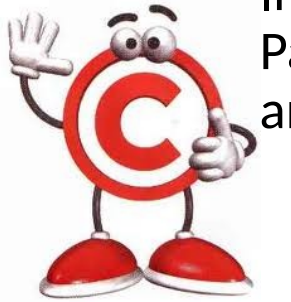
- The first copyright law was enacted in 1790.
- Applied primarily to books, maps, and charts.
- The law was later extended to include newer forms of media such as photography, movies, audio recordings, and so forth.
- In 1909, the copyright law was amended to include any "form that could be seen and read visually" by humans – this was in response to the player piano.
- The "machine readable" vs. "human readable" distinction had implications for decisions about whether software programs could qualify for copyright protection.

Evolution of Copyright

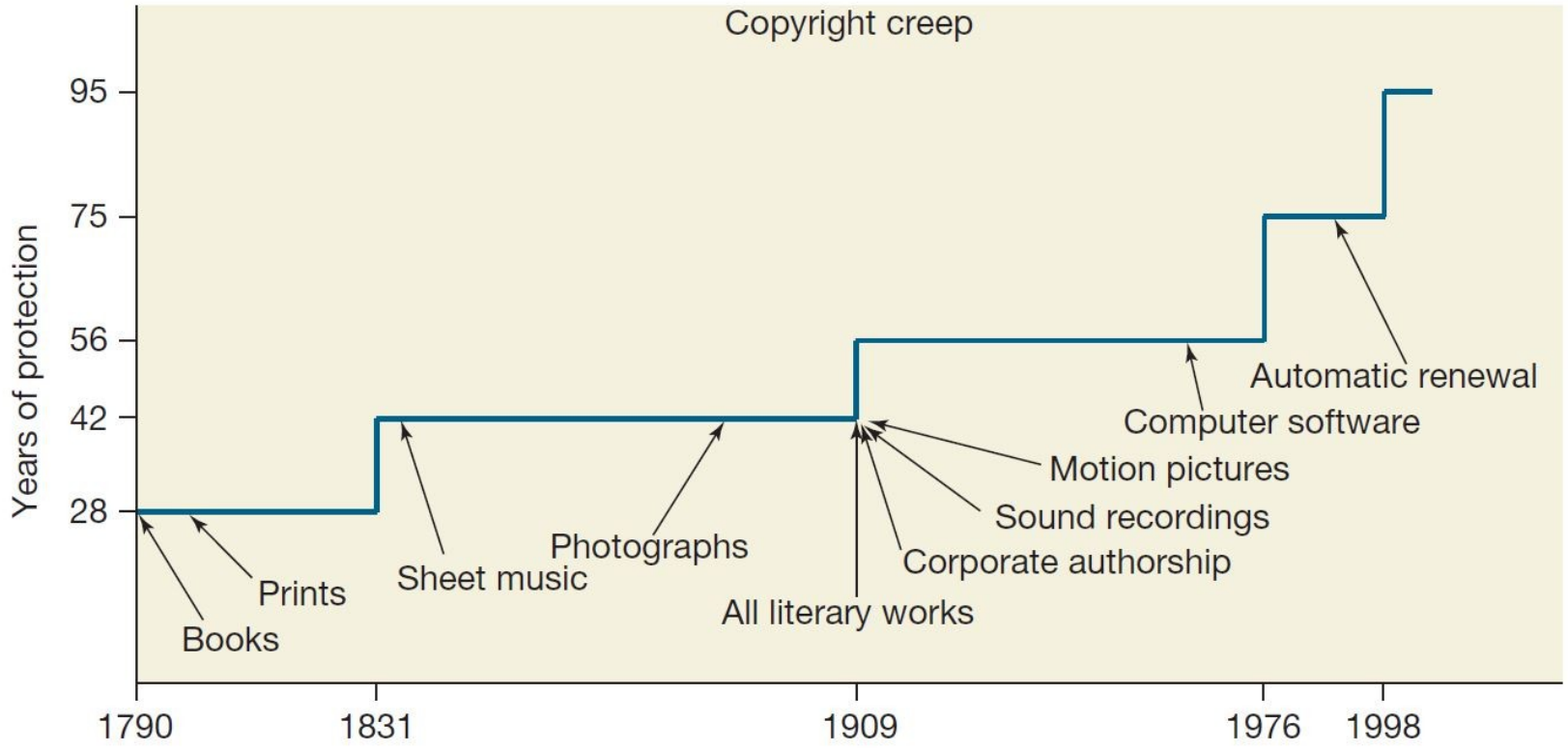
- A software program's source code can be read by humans.
- Its "executable code," which "runs" on a computer, cannot be read by humans.
- Beginning in the 1960s, arguments were made that computer programs should be eligible for copyright protection.
- Copyright law was significantly modified again in 1976.
- Under the 1976 Copyright Act, computer programs still did not clearly satisfy the requirements necessary for making them eligible for copyright protection.
- In 1976, the concept of a literary work was extended to include programs, computers, and databases that "exhibit authorship."
  - A computer program was defined under the US Copyright Act as a "set of statements or instructions to be used directly in a computer in order to bring about certain results."
- To get a copyright for a computer program, the author had to show that the program contained an original expression of ideas and not simply the ideas themselves.

Evolution of Copyright Law

- The Copyright Act was amended in 1984 with the Semiconductor Chip Protection Act.
- In the early 1990s, some argued that the "look and feel" of software, as well as the software code itself, should be copyrightable.
- They claimed that the user interface, which consists of features such as icons and pull-down menus, should also be protected by copyright law.
- Programs that have a similar user interface are referred to as "work a like" programs.
- The source code for these programs may differ significantly, even thought the user interface tends to looks very similar.
- Initially, Lotus Corporation won a copyright infringement suit against Paperback Software International, whose user interfaces included menus and buttons that resembled Lotus' 1-2-3 product.



Copyright Creep



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.

Case Study: Database Guru

- Rajiv employed at Felicity Software
- Signed a confidentiality and proprietary rights agreement
- Developed some database optimizations
- Moved to Unrelated.com, supervises team developing database software
- Realizes his optimizations would help team at Unrelated.com

Two alternatives for Rajiv

- "Clean room" strategy
  - Provide team with publicly available information
  - Provide team with performance targets
- Become personally involved
  - Ask team open-ended questions
  - Allow them to rediscover the optimizations he made at Felicity

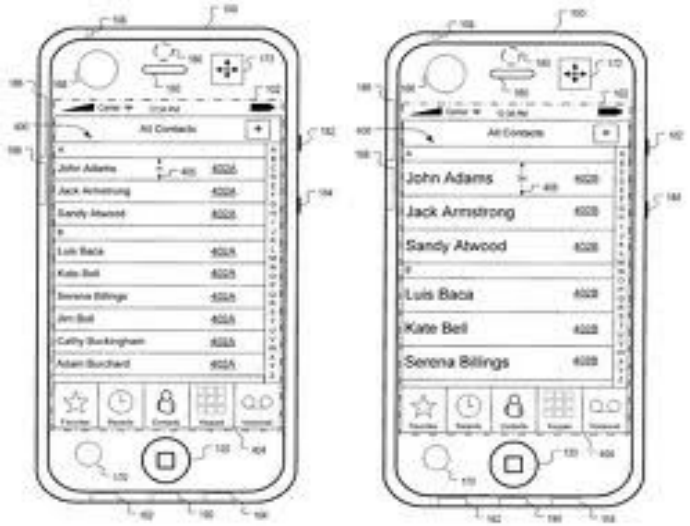
Kantian Analysis

- "Clean room" option
  - Rajiv does not violate agreement he signed
  - "You can share your expertise with others" is a rule that can be universalized
  - Morally right
- "Personally involved" option
  - If he does not asking leading questions, O K
  - If he asks leading questions, he is disclosing information and violating agreement he signed
  - Breaking a contract = breaking a promise → wrong
  - Is it reasonable to think he can avoid asking leading questions?

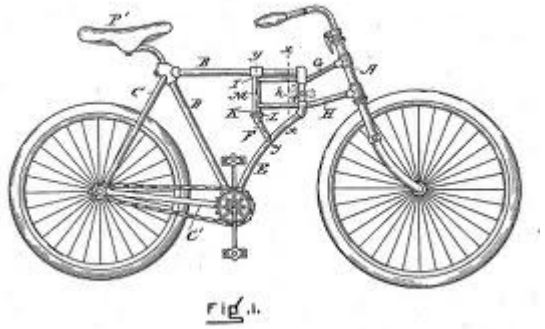
Patent

- A public document that provides detailed description of invention
- Provides owner with exclusive right to the invention
- Owner can prevent others from making, using, or selling invention for 20 years
- Patent protection can be applied to inventions and discoveries that include utilitarian or functional devices such as machines, articles of manufacture, or "compositions of matter.“
  - The Patent Act requires that three conditions must be satisfied:
    - *Usefulness*;
    - *Novelty*;
    - *non-obviousness*.

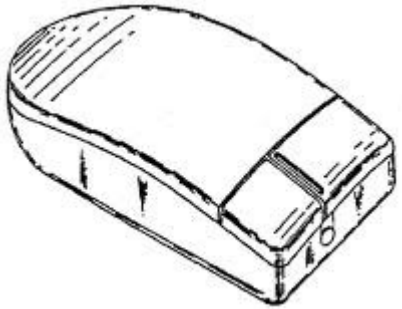
Patent



iPhone patent schematics



Mechanism for Bicycle



Mechanism for computer mouse

Patents

- Computer hardware inventions clearly satisfied the requirements of patent law.
- Computer software did not (initially).
- Beginning with *Gotshalk v. Benson* (1972), the US Patent Office and the courts established a strong opposition to patents.
- Benson applied for a patent for an algorithm he developed that translated the representation of numbers from base 10 to base 2.

Gotshalk vs. Benson

- Benson’s algorithm is an important feature of all programs.

- If granted a patent for his algorithm, Benson would have controlled almost every computer in use for 12 years.
  - The patent was denied to Benson on the basis of a policy that bars the granting of patents for mere mathematical formulas or abstract processes, which are such that they can be performed by a series of "mental steps" with the aid of pencil and paper.

Patent Proliferation

- The generous granting of patent protections has raised concerns about which kinds of features in the user interfaces on e-commerce sites should be eligible for patents.

- Should an e-commerce site that is the first to display a "shopping cart" icon in its user interface be able to patent that icon?

- *Amazon.com v.Barnesandnoble.com*

Trademarks, Service Mark

- A trademark is a word, name phrase, or symbol that identifies a product or service.
- The Lanham Act, also referred to as the Trademark Act, of 1946 was passed to provide protection for registered trademarks.
- The Act intends to ensure that the quality associated with a certain logo or symbol used by a business actually represents the quality that consumers expect (e.g., BMW label).

Trademark, Service Mark

- Trademark: Identifies goods
- Service mark: Identifies services
- Company can establish a “brand name”
- Does not expire
- If brand name becomes common noun, trademark may be lost
- Companies advertise to protect their trademarks
- Companies also protect trademarks by contacting those who misuse them

Trademarks, Service Mark

- Consider three common trademarks:
  - the red apple that symbolizes Apple and Macintosh computers;
  - the golden arch-like "M" that has come to symbolize McDonald's restaurants;
  - the expression "coke," which symbolizes Coca-Cola.
- To qualify for a trademark, the "mark" or name is supposed to be distinctive.
  - Halbert (1997) notes, however, a trademark for "uh-huh" was granted to Pepsi.

Trademark - examples

AOL v. AT&T

- America On-Line (AOL) tried to register a number of symbols as official trademarks.
  - For example, it applied for trademarks of its expression "You've Got Mail," "Buddy List," and "IM" (for Instant Messenger).
  - If AOL was allowed to register them, other providers who used these expressions would be infringing on AOL's registered trademarks.
- AT&T challenged AOL.
- The court ruled that the expressions were not unique to AOL.

Trade Secrets

- A trade secret is information used in the operation of a business or other enterprise that is sufficiently valuable and secret to afford an actual or potential economic advantage over others.
- Trade secrets can be used to protect:
  - formulas (such as the one used by Coca-Cola);
  - blueprints for future projects;
  - chemical compounds;
  - process of manufacturing.

Trade Secret - Examples

Fair Use

Information Wants to Be Shared

- De George notes that original copyright laws, covering print media, were designed to encourage the distribution of information.
- With recent laws covering digital media, such as the DMCA and SBCTEA, the distribution of electronic information is now being inhibited.
- The distribution of digitized information is now being discouraged, despite the fact that exchange it is easy and inexpensive.
- The original computing and Internet environments were governed by a principle similar to this.
  - Doug Englebart did not patent the mouse.
  - Tim Berners-Lee did not copyright his HTML code used for the Web.

Towards a “Fair” Intellectual Property System of Laws

- We should presume in favor of the principle that information wants to be shared (but not necessarily free). (Tavani, 2002)

- If we do this, we have a starting point for framing a reasonable policy for the information age that will both:
  - allow the flow of information;
  - reward fairly the creators of intellectual objects, including software manufacturers, in the cyber-age.

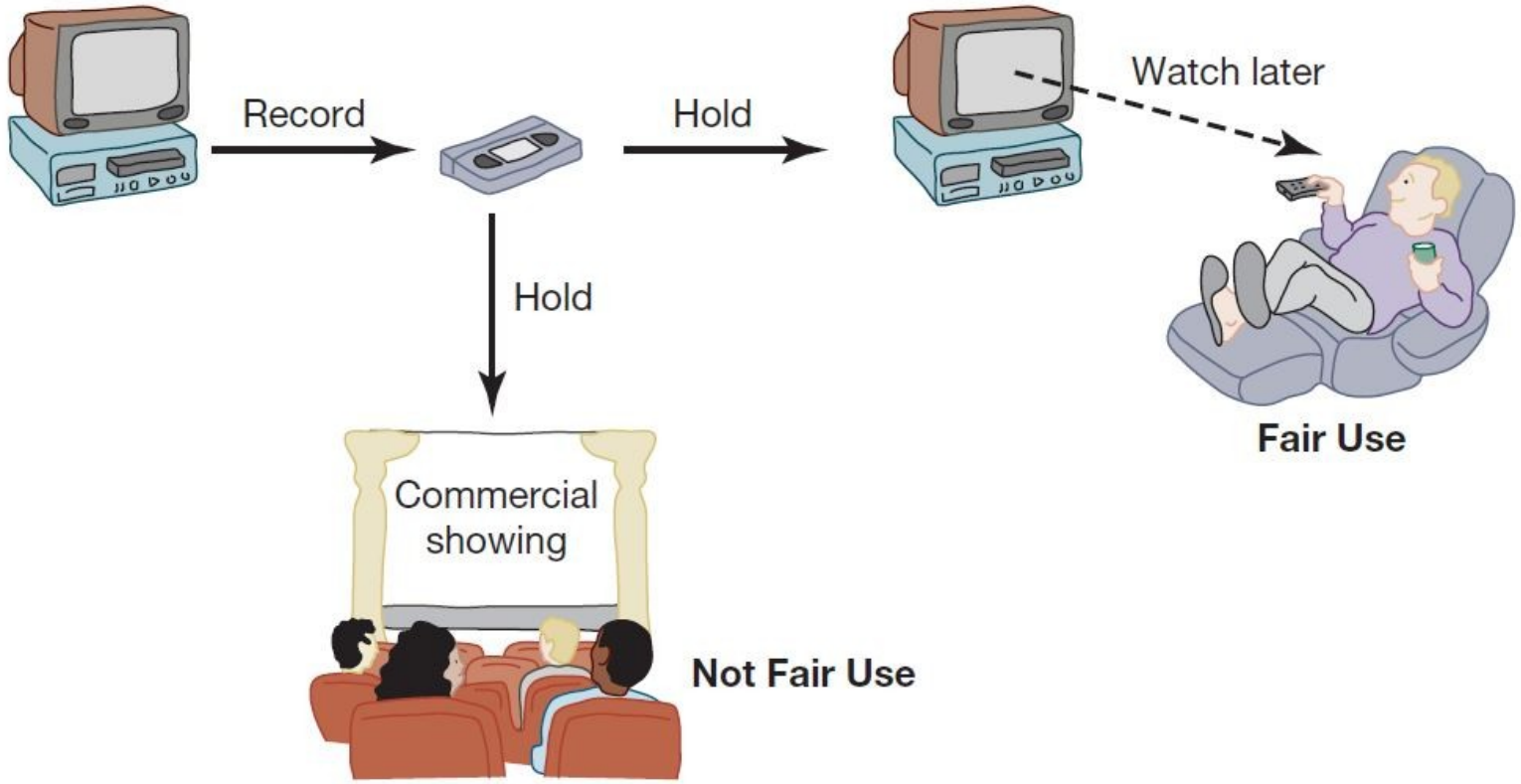
Fair Use Concept

- Sometimes legal to reproduce a copyrighted work without permission
- Those circumstances called fair use
- To judge fair use, courts consider four factors
  - Purpose and character of use
  - Nature of work
  - Amount of work being copied
  - Affect on market for work

Sony v. Universal City Studios

- Sony introduced Betamax VCR (1975)
- People started time shifting TV shows
- Movie studios sued Sony for copyright infringements
- U.S. Supreme Court ruled (5-4) that time shifting is fair use

Time Shifting



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.

Digital Recording Technology

- Copying from vinyl records to cassette tapes introduced hiss and distortions
- Introduction of compact disc a boon for music industry
- Cheaper to produce than vinyl records
- Higher quality
    - Higher price $\Rightarrow$ higher profits
    - **But** it's possible to make a perfect copy of a CD

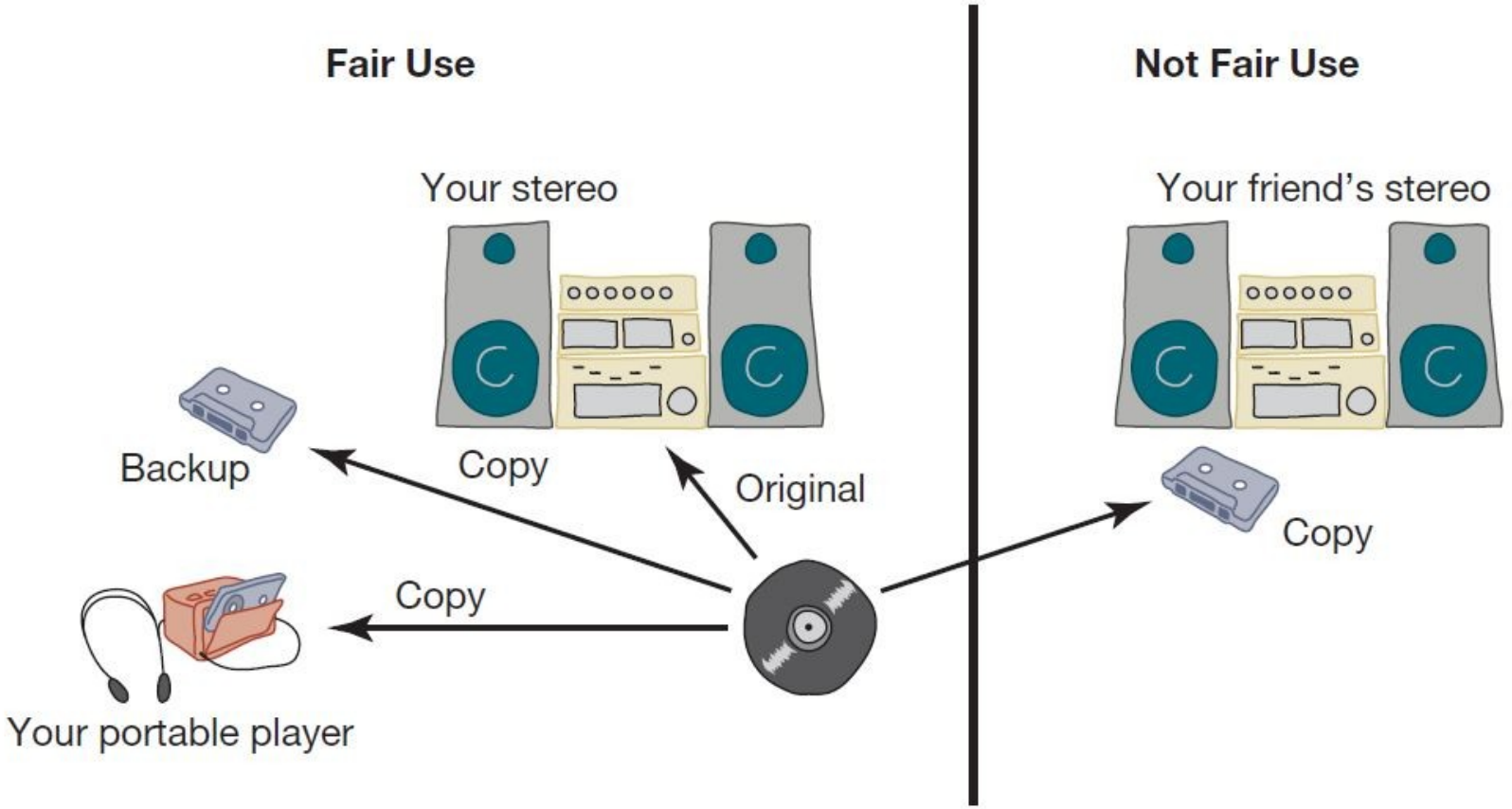
Audio Home Recording Act of 1992

- Protects rights of consumers to make copies of analog or digital recordings for personal, noncommercial use
  - Backup copy
  - Give to family member
- Digital audio recorders must incorporate Serial Copyright Management System (SCMS), so consumers can't make a copy of a copy

Recording Industry Association of America(RIAA) v. Diamond Multimedia

- MP3 compression allowed songs to be stored in 10% of the space, with little degradation
- Diamond introduced Rio MP3 player (1998)
- People started space shifting their music
- RIAA started legal action against Diamond for violation of the Audio Home Recording Act
- U.S. Court of Appeals, 9th Circuit, affirmed that space shifting is consistent with copyright law

Space Shifting



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.

Kelly v. Arriba Soft

- Kelly: photographer who maintained Web site with copyrighted photos
- Arriba Soft: created search engine that returned thumbnail images
- Kelly sued Arriba Soft for copyright infringement
- U.S. Court of Appeals, 9th Circuit, affirmed that Arriba Soft's use of Kelly's images was "significantly transformative" and fair use

Note: **Transformative** uses take the original copyrighted work and transform its appearance or nature to such a high degree that the use no longer qualifies as infringing.

Authors Guild v. Google

- Google announced plan to scan millions of books held by several huge libraries, creating searchable database of all words
- If public domain book, system returns PDF
- If under copyright, user can see a few sentences; system provides links to libraries and online booksellers
- Authors Guild and publishers sued Google for copyright infringement (copying books for commercial reasons)
- Judge ruled in favor of Google and dismissed lawsuit

Authors Guild v. Google

- Judge: Google Books is a fair use of copyrighted works
- Purpose and character:
  - Purpose is to create a massive index
  - Character is highly transformative
  - Precedent: **Kelly v. Arriba Soft Corporation**
  - Weighs in favor of fair use
- Nature of work being scanned: mostly nonfiction
  - Weighs in favor of fair use
- How much being scanned: entire work
  - Weighs against fair use
- Effect on the market: stimulating book sales
  - Weighs in favor of fair use


DIGITAL
MEDIA

Digital Rights Management

- Actions owners of intellectual property in digital form take to protect their rights
- Approaches
  - Encrypt digital content
  - Mark digital content so devices can recognize content as copy-protected

Digital Millennium Copyright Act

- First big revision of copyright law since 1976
- Brought U.S. into compliance with Europe
- Extended length of copyright
- Extended copyright protection to music broadcast over Internet
- Made it illegal for anyone to
  - Circumvent encryption schemes placed on digital media
  - Circumvent copy controls, even for fair use purposes

Secure Digital Music Initiative

- Goals
  - Create copy-protected CDs
  - Secure digital music downloads
- Consortium of 200 companies developed “digital watermarking” scheme
- Failed
  - Internet copying became huge before **Secure Digital Music Initiative** (**SDMI**) ready
  - Some SDMI sponsors were electronics companies
  - Digital watermarking encryption cracked

Sony BMG Music Entertainment Rootkit

- Millions of audio CDs shipped with Extended Copy Protection, a DRM system
- Prevented users from
  - Ripping audio tracks into MP3 format
  - Making more than 3 backup copies
- Relied upon Windows “rootkit” that hid files and processes; usually only hackers use rootkits
- Huge public outcry once secret uncovered
- Sony BMG stopped production and compensated consumers

Online Music Stores Drop Digital Rights Management

- When iTunes Music Store opened in 2003, all music protected with a DRM scheme called FairPlay
- FairPlay blocked users from freely exchanging purchased music
- Songs couldn’t be played on more than 5 different computers
- Songs couldn’t be copied onto CDs more than 7 times
- Songs purchased from iTunes Store wouldn’t play on non-Apple devices
- DRM-protected music purchased from other online retailers couldn’t be played on iPod
- Consumers complained about restrictions associated with DRM
- European governments put pressure on Apple to license FairPlay or stop using DRM
- In 2007 EMI began offering all its songs without DRM through the iTunes store
- In 2008 Amazon reached an agreement with all four major music labels to sell DRM-free music
- Apple followed suit in 2009

Microsoft Xbox One

- Microsoft announced cloud-based gaming experience for Xbox One (June 2013)
  - User could play any game without disc in tray
  - Automatic software updates of every Xbox One
- Controversial features of licensing arrangement
  - Disc could be shared only once
  - Second-hand market restricted
  - Xbox consoles would have to check in every 24 hours
- Microsoft backtracked
  - No need to connect to Internet
  - Freedom to lend, rent, buy, sell discs
  - Disc must be in tray to play game

Peer-to-Peer Networks and Cyberlockers

Peer-to-Peer Networks

- Peer-to-peer network
  - Transient network
  - Connects computers running same networking program
  - Computers can access files stored on each other's hard drives
- How P2P networks facilitate data exchange
  - Give each user access to data stored in many other computers
  - Support simultaneous file transfers among arbitrary pairs of computers
  - Allow users to identify systems with faster file exchange speeds

Cyberlockers

- Also called file-hosting services or cloud storage services
- Internet-based file-sharing services
- Allow users to upload and download password-protected files
- Support workgroup collaboration
- Make sharing of copyrighted material easy

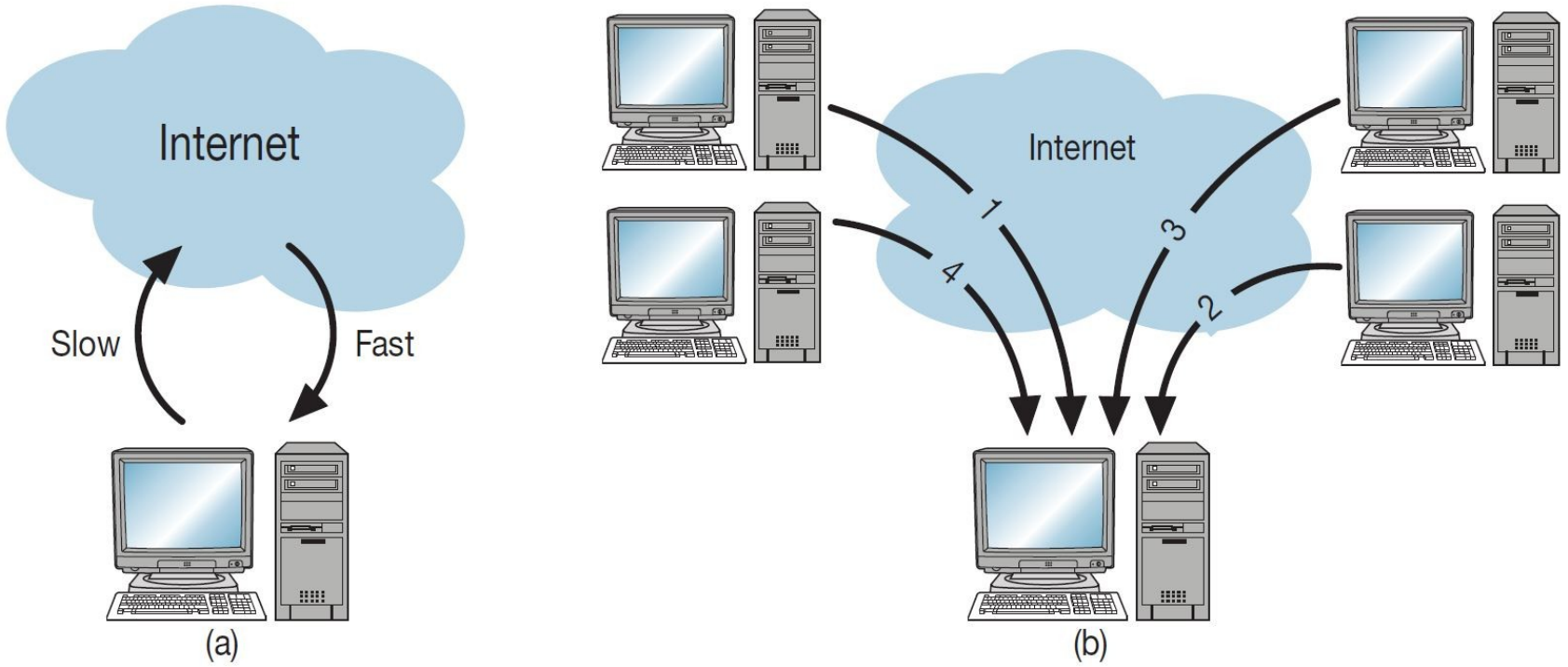
Napster

- Peer-to-peer music exchange network
- Began operation in 1999
- Sued by RIAA for copyright violations
- Courts ruled in favor of RIAA
- Went off-line in July 2001
- Re-emerged in 2003 as a subscription music service

BitTorrent

- Broadband connections: download much faster than upload
- BitTorrent speeds downloading
  - Files broken into pieces
  - Different pieces downloaded from different computers
- Used for downloading large files
  - Computer programs
  - Television shows
  - Movies

Concept Behind BitTorrent



(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.

Legal Action Against the Pirate Bay

- The Pirate Bay started in Stockholm, Sweden
- One of world's biggest BitTorrent file-sharing sites
- People download songs, movies, TV shows, etc.
- After 2006 raid by police, popularity increased
- In 2008 the International Federation of the Phonographic Industry sued four individuals connected with site
- Defendants said the Pirate Bay just a search engine
- Found guilty; sentenced to prison and fined $6.5 million
- Meanwhile, the Pirate Bay still operational
- More than 150 proxy servers all over the world

Software Copyrights

- Copyright protection began 1964
- What gets copyrighted?
  - Expression of idea, not idea itself
  - Object program, not source program
- Companies treat source code as a trade secret

Violations of Software Copyrights

- Copying a program to give or sell to someone else
- Preloading a program onto the hard disk of a computer being sold
- Distributing a program over the Internet

Important Court Cases

- **Apple Computer v. Franklin Computer**
  - Established that object programs are copyrightable
- **Sega v. Accolate**
  - Established that disassembling object code to determine technical specifications is fair use
- **Oracle v. Google**
  - Google's copying of 11,500 lines of declaring code from 37 Java API packages was not fair use and violated Oracle's copyright

Safe Software Development

- Reverse engineering okay
- Companies must protect against unconscious copying
- Solution: “clean room” software development strategy
  - Team 1 analyzes competitor’s program and writes specification
  - Team 2 uses specification to develop software

Software Patents

- Until 1981, Patent Office refused to grant software patents
  - Saw programs as mathematical algorithms, not processes or machines
- U.S. Supreme Court decision led to first software patent in 1981
- Further court rulings led to patents being granted for wider range of software
- Thousands of software patents now exist
  - Microsoft files about 3000 applications annually
  - Licensing patents a source of revenue
- Secondary market for software patents
  - Patent-holding companies (a.k.a. patent trolls): Companies that specialize in buying patents and enforcing patent rights
  - Based on assumption that companies would rather settle out of court than spend time and money going to trial
  - RIM didn't settle quickly; ended up paying $612 million

Software Patents

- Critics say too many patents have been issued
  - Patent Office doesn't know about prior art, so it issues bad software patents
  - Obvious inventions get patents
- Companies with new products fear getting sued for patent infringement
  - Build stockpiles of patents as defense mechanism
  - Software patents used as legal weapons

Smartphone Patent Wars

- Nokia sues Apple, alleging Apple violated 10 of its patents (2009)
- Apple countersues Nokia for violating 13 of its patents
- Apple sues several Android smartphone makers
  - Accuses Samsung of copying “look and fee” of Apple iPhones and iPads, including rounded corners, tapered edges, use of a home button, and bounce-back affect when user over scrolls
- Samsung countersues Apple
- Escalates until more than 100 lawsuits filed by various manufacturers globally; billions of dollars in legal fees
- Smartphone makers agree to cross-license each other’s patents (2014)

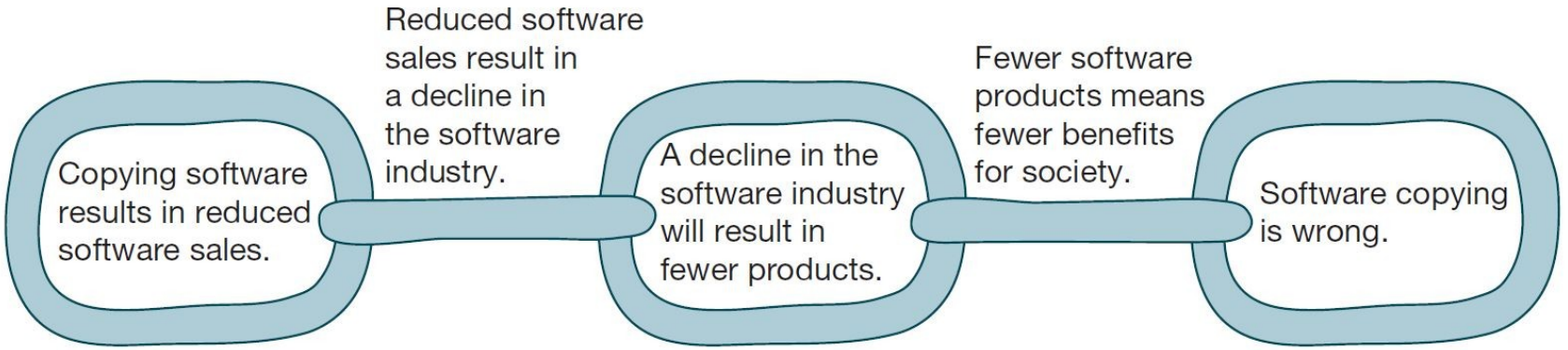
Do We Have the Right System in Place?

- Software licenses typically prevent you from making copies of software to sell or give away
- Software licenses are legal agreements
- Not discussing morality of breaking the law
- Discussing whether society **should** give intellectual property protection to software

Rights-Based Analysis

- "Just deserts" argument
  - Programming is hard work that only a few can do
  - Programmers should be rewarded for their labor
  - They ought to be able to own their programs
- Criticism of "just deserts" argument
  - Why does labor imply ownership?
  - Can imagine a just society in which all labor went to common good
  - Intellectual property not like physical property

Argument Why Software Copying Is Bad



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

Open-Source Definition

- No restrictions preventing others from selling or giving away software
- Source code included in distribution
- No restrictions preventing others from modifying source code
- No restrictions regarding how people can use software
- Same rights apply to everyone receiving redistributions of the software (copy left)

Beneficial Consequences of Open-Source Software

- Gives everyone opportunity to improve program
- New versions of programs appear more frequently
- Eliminates tension between obeying law and helping others
- Programs belong to entire community
- Shifts focus from manufacturing to service

Streamlining Creative Re-use

- Under current copyright law, eligible works are copyrighted the moment they are created
  - No copyright notice does not mean it's okay to copy
  - Must contact people before using work
  - That slows down creative re-use
- Free Creative Commons license indicates
  - Which kinds of copying are okay
  - Which rights are being retained
- Flickr has more than 250 million photos available under Creative Commons licenses

Summary

- To stimulate creativity in the arts and technology, governments grant limited ownership rights to creators of intellectual property
  - Trade secrets
  - Trademarks/service marks
  - Patents
  - Copyrights
- Goal: Provide creators of I P with rewards while ensuring public has access to their creations
- Fair use doctrine an example of trying to find the balance between rights of I P holders and the common good

Reference

- Ethics for the Information Age, 8th Edition by Michael J. Quinn (Pearson)
- Ethics and Technology: Ethical Issues in an Age of Information and Communication Technology by Tavani H. T.