

Freedom and Obsolescence: Software, Documentation, and Law

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This is about the consequences of free and restricted information on software, law, and textbooks, in particular consequences that have resulted from technological advance.

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Table of Contents

Introduction	1
Settle Disputes	2
The Lowered Cost of Information	4
Legal Implications of Technological Advance	7
The GNU GPL as a Legal Solution for Software	11
Textbooks and Casebooks	14
Final Words	17

Introduction

You know the definition of ‘**upgrade**’ for computer programmers:

... take out old bugs and put in new ones ...

Well, this talk will be a little like that, except that I am hoping that it will help you fix the new bugs ...

Law and Freedom

Because of technological advance, over the past few decades, old legal, technical, and social arrangements have become obsolete. New arrangements help progress and help us create a more civilized society.

How should we create and distribute textbooks and casebooks? What can you do as members of a law faculty, as computer people, and as librarians?

As a practical matter, textbooks and casebooks should be distributed in various forms. One form should be suitable for a student driving. None of the rest of us want that student to take his or her eyes off the road, so the student should listen. Another form should be for a student moving quickly through the writing. A third form should be for a student sitting in a chair and reading. Current technology encourages the production of these different forms, but habit hinders the use of this technology.

Those are the advantages to a student.

As a teacher of law, as a computer person, or as a librarian you need more legal freedom to modify what you use or handle. Often, only the main authors and publisher have incentive to prepare a book. With appropriate licenses, legal solutions exist to provide and to guard the legal freedom that permits you to modify what you use or handle. But again habit hinders.

Moreover, technically, you can produce what you want inexpensively and easily.

Put another way, a generation ago, there were three sets of hindrances: legal, technical, and social.

In the past generation, the legal and technical hindrances have been solved well enough for practical purposes, but the social hindrances remain.

My experience stems from software. These new freedoms, rights, and obligations and the new technology first related mainly to software. But they have become more widely relevant.

In short, we are seeing technological advances with legal consequences.

Outline of Talk

First, I will talk about the settlement of disputes, the familiar, but abstract nature of law. This fits with a major theme, that the lowering cost of information creation and reduplication has made old laws obsolete — although an old law also has provided the base for very strong legal protection.

As for technological advance: I will explain why organizations can expect lower costs for some kinds of development, a process, by the way, that Aristotle foretold 2300 years ago — except I doubt he thought it would actually happen.

After a brief discussion of how people use metaphor to understand new conditions, I will talk about a clever metaphorical extension that devalues the crime of murder, a metaphorical extension that is frequent.

I will also talk about the decentralized planning mechanism that the founders of the United States embedded in the United States Constitution. There are two reasons for this. First, the Constitution provides the supreme law of the land. Second, the economics inherent in the Constitution provides for progress.

And I will mention technological advances from a hundred years ago that required new laws.

Jumping to the present, I will talk about a legal tool that uses an old law to protect software, the GNU General Public License.

Then, I will discuss how the legal solutions for software freedom also work for textbooks and casebooks: we can extend the five rights and one obligation of the GNU General Public License; we can make use of the slightly different rights and obligations in the GNU Free Documentation License.

Moreover, for textbooks and casebooks, software developers have solved the non-legal, technical problems, although many improvements are needed. I will talk about them, too.

Finally, I will point out that individuals and corporations hinder the adoption of both the legal and the technical solutions. The hindrances come from individuals' bad habits and from corporations' unwillingness to adapt.

But you and others can overcome the problems that remain.

Settle Disputes

Law provides a way to settle disputes.

A great benefit of a reliable, quick, and honest legal system is that it enables you to settle disputes with strangers. Without law, you must depend on your family, clan, friends, or a criminal gang.

Family, friends, clan, and crooks can provide law of a kind — however that law is often unfriendly to strangers.

Similarly, for most people, time is valuable. They have only one life and dislike being involved with the law. Judgements must be quick.

In addition to showing that justice is done, the purpose of a trial is to determine what happened. A trial is like a scientific investigation. It is, or should be, a truth seeking social mechanism.

While the members of a legal profession may be found out if they are dishonest, it helps if they are honest, since a legal system must handle those

who are neither honest nor moral. In any event, a legal system must deliver honesty, even if its members are not. Otherwise, it loses legitimacy.

The Abstract and the Familiar

Our law, and its derivatives like property, is a highly abstract notion. Yet the law is so familiar to properly socialized adults that it feels concrete. Thus, most of the time, most people do not think of their possession of a car as the possession of a bundle of rights and obligations, although that is what it is legally.

Possession of a Doll, Possession of a Car . . .

One kind of law comes from notions of property, which begin in childhood. For example, a child has a doll. The child can hold, throw, or play with that doll. When he was young, my nephew spent hours with a plastic figure he could transform into different shapes. His doll was not abstract, but a real and solid object.

Now, presume that child grows and comes to own a car. My nephew has not grown that old yet, but I expect him to. If he parks his car illegally it may be towed. Then he cannot get his car back until he pays. If he does not pay, he loses the car.

At this point the car, a concrete entity, becomes an abstract piece of property. The relationship of the adult to his car is that of rights, his right to drive it in certain places, and obligations, his obligation to avoid parking in a tow zone.

While the car itself continues to be as solid as a child's doll, the relation of the adult to his property is different from the relation of the child to his property.

Similarly, a land owner has rights to his land. But he also has obligations. He must pay real estate taxes. If he does not, he loses his land. He has other obligations, too. For example, in Massachusetts, he has to permit hunters on his property, unless he puts up many no trespassing signs.

Most People are Extralegal

As a practical matter, most people on this planet are 'extralegal'. Ordinary people depend on their cultural understandings 'to do what is right'. They cannot depend on a 'rule of law' in the sense we mean.

They cannot settle disputes with strangers.

I mention this because more and more business disputes have parties in different cultures; in law schools, anthropology has entered the core.

The Lowered Cost of Information

I will talk neither about the complexity of laws nor about ‘gaming the system’, both of which serve to exclude many from the benefits of a reliable, quick, and honest legal system.

Instead, I will talk about technical advances that disrupt the traditional balance of rights and obligations, and that as a consequence destroy the legal system and lead to a ‘law of rulers’ rather than the ‘rule of law’, and I will talk about legal advances.

First, the advance in technology. This has made old arrangements obsolete.

The Lowered Cost of Information Reduplication

Over the past half century, we have seen a sharp drop in the cost of information reduplication.

Consider software. What has happened to software extends to writing and other intangibles.

The price of software may be hidden in the price of a machine in which software is pre-installed or it may be visible.

Right now, unless effective law enforcement raises the price, in a competitive, free market, a full computer operating system and office suite on a CD costs U. S. \$1.50 - U. S. \$2.50.

This is the competitive, free market price in which the cost of producing one extra unit comes to equal the price that the last customer is willing to pay. In a competitive, free market, it is the price towards which goods tend. Of course, in practice, goods and services are not always sold at such prices; I am talking of a tendency that impels a profit-seeking businessman.

There are three reasons to discuss such a tendency. Firstly, many do seek more, either as sellers or as buyers. Secondly, many of our social and economic arrangements encourage such seeking. Thirdly, there are good arguments that such a tendency leads to an efficient use of resources. When prices are close to their competitive, free market level, neither you nor I waste our time and efforts. (Of course, you must include all costs in your accounting system, including the cost of producing ‘externals’. Limited accounts and misleading prices provide false signals.)

The cost of the computer on which to run a CD is high, but a modern computer costs considerably less than any from 50 years ago. The price of a CD with data on it is much less than the cost of duplicating, marketing, distributing, and selling 650 megabytes in 1955.

This is a technological advance with legal consequences.

For reduplicating data, the incremental cost has dropped. In a competitive, free market, that means its selling price drops.

Indeed, nowadays, the only way to raise the price of reduplicated data is to enforce laws against inexpensive data transfers.

Lowered Initial Costs

In addition to a drop in the cost of information reduplication, the incremental cost, we have seen a drop in the cost of creating the first copy of certain informational entities, such as law books and computer programs, a drop in the initial cost.

There are several reasons for this. One is that it has become less expensive for people to work together at a distance.

In 1982, I took part in a discussion with people on the East coast of the U. S., the West coast, Canada, and St. Louis. We sent letters to each other. Unfortunately, there was a huge variance in the time it took for those letters to travel to their destinations. Sometimes it took less than a week for a letter to cross the United States; at other times it took more than three weeks. We did our business, but slowly.

Nowadays, the travel time for electronic messages is short. A new custom, no more than a generation or so old, is to wait a day before replying, so you have the time to consider a message calmly.

Some messages, such as bug fixes to a computer program, can be addressed immediately. For such messages, you do not want to use electronic mail, but a version control system.

These capabilities have been readily available in the richer parts of the world for a generation. These capabilities are spreading. This means that more people are able to work together efficiently even when geographically distant from one another. And, of course, the practitioners need not restrict themselves to programming. They can write or edit.

A second reason for the drop in the initial cost is that the cost of gathering information has dropped, unless the cost is kept high by a government.

A third reason is that we are richer.

2300 years ago, Aristotle spoke of the need for an aristocracy. Without one, he said, civilization could not occur. Only those who did not work for material motivations would have time to run a government, to create art, and to write plays and laws.

In Aristotle's day, a group that did not create material objects had to take them from others. Because of the lack of technological development, people did the work rather than machines. This is why Aristotle favored slavery, "until the shuttle", as he said, could "weave by itself".¹

¹ In Benjamin Jowett's 1885 translation of Aristotle's Politics, Section 1.4, the full quotation is:

... if every instrument could accomplish its own work, obeying or anticipating the will of others, like the statues of Daedalus, or the tripods of Hephaestus, which, says the poet,

Two millennia after Aristotle, inventors created automated textile machines; these machines could do the work that women, slaves, and other people had done before.

People need to eat to live. A minimal income is necessary. And, of course, people need to learn how to do things. Schooling is required. This costs time and money. So, to follow Aristotle, people who create must have some form of income. They need to be educated.

However, and this is the argument of those who favor volunteer work, in addition to working for paid income, which most economists define as the prime motivator, many people also work for internal reasons, for the pleasure of what they are doing, and for external reasons, to improve their reputation or status in the eyes of others, or because they are expected to work.

As a managerial and accounting matter, we find that people who write software have become more like the academics, novelists, artists, and aristocrats of the past.

Creating Software and Books

We can see the organizational requirements:

- Provide enough pay. People must survive.

If you have an exciting and sufficiently well defined project, you may gain volunteers. But do not count on that. Figure that the jobs that cause trouble will be boring and ill defined. So you will need to provide enough pay.

- Reduce generalized fear, such as the fear of losing one's income.
- Reduce the particular fear that thieves will steal one's work, possibly in a manner that is felt to be unjust even if legal.
- Provide for inexpensive communications.
- Provide for appropriate tools.
- Reduce the cost of inputs (and remember to include hassle as a cost).

In addition, we know that:

- People themselves must choose to work on a project and be self-directed. Otherwise, they will be less productive.
- In order to give a project a distinct form and direction, some person or group must create the first design.
- The design must possess strong and stable foundations, so others can add rooms and towers without the edifice falling down.

“of their own accord entered the assembly of the Gods”;

if, in like manner, the shuttle would weave and the plectrum touch the lyre without a hand to guide them, chief workmen would not want servants, nor masters slaves.

<http://www.mdx.ac.uk/www/study/xari.htm#1253b23>

- The design must be modular. Modules minimize the cooperation needed for small projects. Modules enable people to handle complexity. With modules, different and independent people can cooperate on larger programs.

This change to initial costs is the second kind of technological advance with legal consequences.

(I refer to the two types of cost as initial and incremental. Economists like to speak of ‘marginal’ costs but I prefer the word ‘incremental’ since it is more familiar to people who are not economists.)

That is the situation: over the past half century, entities that once cost a great deal to create and reproduce, such as computer programs, have come to cost less.

Indeed, nowadays software entities cost so little that people have given me CDs with complete systems on them. And various companies and people encourage me to download certain programs as well as books at no direct cost to me at all.

Legal Implications of Technological Advance

Returning to the implications of the advance in technology: over the past half century, previously expensive entities, such as computer programs, have become less expensive. This is because of advances in technology.

The law can try to prevent the legal use of technological advances. It may succeed. However, to hinder legal use successfully, law enforcement must be effective.

To be effective, law must go beyond police, judges, and lawyers.

Effective Law Enforcement

Over all, the only way to enforce laws is to encourage people to follow them voluntarily. A few will break the law, but mostly, people do what they think ‘is right’. From a society’s point of view, it does no good to expect people to break laws unless prevented.

Effective law enforcement costs. Effective law enforcement requires going beyond police, judges, and lawyers.

For example, to enforce the current law of copyright, children must be taught in elementary school that it is wrong to share games or learning that involve inexpensive data transfers.

Otherwise, children may grow up to favor sharing. If that happens, police actions that hinder sharing lose legitimacy.

Metaphor

A key factor is whether people think that a shirt that only one person can wear at one time is different from software that two people can use at the same time, or whether they think the two are similar?

The latter notion requires the metaphorical extension of the concept of property. The concept comes from what economists call a **rivalrous good**, such as a car which only one person can drive at any one time. A rivalrous good is one in which your use ‘rivals’ mine.

In modern law, the metaphor is extended so the notion encompasses a **non-rivalrous good**, a good which two or more people can use at the same time.

Law is a non-rivalrous good. Many people can obey the law at the same time. You obeying the law does not rival and does not prevent my obeying it.

But your wearing my shirt prevents me from wearing it. Your use of my shirt ‘rivals’ mine.

Laws and shirts are different.

Piracy, Metaphorically Extended

But there are organizations that tell us that shirts and laws are identical. That is the first metaphorical extension.

They also tell us that children and others who use the new technologies are acting as dreadfully as crooks on the high seas who rob and murder. These children and others are called ‘pirates’.

This is the second metaphorical extension.

You may have heard of this metaphorical extension of the word ‘**pirate**’: sadly, by applying this word to people who use advances in technology, these speakers attempt to lead listeners to think either that people who use modern technology are as bad as murderers or that murder is not so bad. Or else they lead listeners to think that the people who make such a metaphor disregard actual murders.

And they tell us that shirts and laws are identical.

But a society depends both on the security of its people and on modern technology. It must hate murder and favor learning.

The United States Constitution and Decentralized Planning

Leaving murder aside, consider the fundamental U. S. law for favoring advances in technology, the United States Constitution.

In the United States of America, the purpose of copyright and patents is
To promote the progress of science and useful arts, . . .

(U. S. Constitution, Article I, Section 8)

That is to say, copyright and patents enable the Federal government to influence the economy through bounty giving.

Unlike direct government subsidies, however, a copyright or patent does not directly take from government revenues, except through the costs of policing and courts. Such costs are usually not attributed to specific patents or copyrights.

Moreover, patent or copyright holders gain income only if others are considerably interested in the actions or information covered by the patent or copyright. Consequently, copyright and patents are, or were, thought to be among the better forms of government subsidy.

The idea behind both patents and copyrights was that new inventions or new writings are themselves common and inexpensive, but that the development and marketing of them is expensive. While individuals may come up with new inventions and new writings, only business organizations with considerable money could invest in the necessary development and marketing that makes inventions and writings worthwhile.

Hence, the U. S. Constitution permits investors to establish monopolies on inventions or writings “for limited Times”. During this time, investors may charge more for their manufacture than these products would in a competitive, free market.

The belief was that the extra income to the investors would motivate them to develop and market the products: to pay the high initial costs and to gain more back.

This was the trade-off: U. S. citizens would give up some of their rights to fair prices; in return, the government enforced restrictions would, it was thought, lead to more products becoming available than would have occurred otherwise.

A problem now is that patents and copyrights have become more widespread and their terms longer; and the nature of technology has changed.

It is now far easier and less expensive to manufacture some kinds of product than ever before. So a trade-off that may well have made sense in the past loses its justification, . . . *To promote the progress of science and useful arts, . . .*

In the United States, in so far as patents and copyrights fail their Constitutional purpose, they fail to have any justification in law. In every country, in so far as patents and copyrights fail to promote safety, quality, or opportunity, they fail to support civilization.

Because of the change in technology, certain laws have become obsolete. Such obsolescence is shifting us from a ‘rule of law’ to a ‘law of rulers’.

19th Century Industry

Technology has changed before:

In the latter part of the 19th century, technical advances meant that steel, flour milling, oil refining, and railroads all became high initial, low incremental cost industries.

A century ago, it cost a great deal of money to build a steel works. But once built, such a steel works could produce steel at a low incremental cost (up to a maximum). The same with railroads. It cost a great deal to build a railroad from New York to Chicago; but after it was built, the additional cost of running 100 extra trains per year was very little, relatively speaking (up to a maximum that was seldom achieved).

In the 1880s, American railroad companies asked for and the U. S. government created the ‘Interstate Commerce Commission’ to regulate railroads.

Raising the Cost of Discovery and Hindering Progress

Consider an implication of the current laws of patents and copyrights.

The laws encourage companies to rework what they have, rather than produce the best of the new.

Put simply, patents and copyrights raise the costs of gaining and using knowledge — not to the patent and copyright holders, but to those who lack legal access to that information.

Before undertaking a project, a developer must spend his or her time and resources determining what is permitted or forbidden (or an employer must do this).

Those who work for companies that have access to patents and copyrights find it less expensive to work in a manner that makes use of those patents and copyrights. These patents and copyrights cost their employer less.

Those who possess patents and copyrights will “systematically misallocate human creativity”, as Yochai Benkler points out.²

Worse, everyone loses:

... all strategies suffer some increase in their input costs, because of an increase in the probability that an input they need in their productive activities will be owned by another firm.

In short, restrictions on software hinder everyone. But they hinder those who work for a smaller business or who are independent more than they hinder those who work for businesses that own many patents and copyrights.³

² In *Institutional Economics of Public Domain*, Yochai Benkler, <http://www.law.nyu.edu/benkler/IP&Organization.pdf>

³ In addition, in long sentences, Benkler says,

Organizations that minimize costs by utilizing intrafirm sources of information suffer the least increase in costs, because access to their owned inventory continues to be at

The GNU GPL as a Legal Solution for Software

Restrictions on software hinder everyone. The legal challenge is to enable people and their programs to stand tall rather than become victims.

It was to meet this challenge that we developed the GNU General Public License.

Legally, how do you harness the power of police and courts to protect you and others, especially the small and the weak?

Placing a computer program into the public domain fails this challenge. Anyone may take that software, fix a bug, make an improvement, or simply make a change, and then restrict who may use that fix, improvement, or change. The same occurs with the Unix BSD license, which was created by the United States government.

Imagine two organizations, each with a computer program. If the second program is in the public domain or under a BSD license, people in the first organization can take anything they want from the second, make fixes, improvements, or changes, and then prevent the original developers and everyone else from making use of those fixes, improvements, or changes.

However, if the second program is under the GNU General Public License, when the the first organization publishes its changes, it must return modifications to the original developers and to everyone else.

Thus, the GNU General Public License ensures progress and the advance of civilization.

The Use of Copyright Law

The GNU General Public License protects itself and the rest of us by dressing in the armor of well established copyright law.

As Eben Moglen, who is a professor of law and legal history at Columbia University Law School as well as the General Counsel of the Free Software Foundation, said,⁴

The essence of copyright law, like other systems of property rules, is the power to exclude. The copyright holder is legally empowered to exclude all others from copying, distributing, and making derivative works.

marginal cost, regardless how extensive their power to exclude others from it. Organizations that rely on barter may be forced to engage in more aggressive rights acquisition, because an increase in excludability increases the probability that their utilization of a collaborator's information could provide grounds for a strategic suit. This increases the cost of using barter/sharing systems, but not the appropriability of its outputs.

⁴ Enforcing the GNU GPL,
Eben Moglen, 10 September 2001,
<http://www.gnu.org/philosophy/enforcing-gpl.html>

Moglen then went on to note that

This right to exclude implies an equally large power to license—that is, to grant permission to do what would otherwise be forbidden.

The power to license is the first key. The second is the legal principle that:

Licenses are not contracts: the work’s user is obliged to remain within the bounds of the license not because she voluntarily promised, but because she doesn’t have any right to act at all except as the license permits.

Thus, if the licensee does not meet the conditions of the license, it is revoked. Just as a licensee may not distribute software from Microsoft that he or she has not licensed, no one may distribute software under the GNU General Public License that he or she has not licensed.

It happens that many other licenses also include contract provisions. For example, copyright law does not prohibit decompilation; but some software licenses, which are more properly called “software licenses and contracts”, do include contract provisions that prohibit decompilation.

The GNU General Public License is simply a license; it is not a license and contract combined. Its conditions are straightforward: use, copy, redistribute, study, and modify the software, and pass on the same rights that you received.

Thus, as the license says,

You may charge a fee for the physical act of transferring a copy . . .

For example, I could charge you a million dollars for the software I have with me. But unfortunately for me, you may not want to pay that amount. You can find someone else who charges a great deal less. Indeed, if you do not require physical media for your transfer, many will permit you to copy the software gratis. If the transfer includes a CD or DVD, the cost will be a few dollars. Competitive, free markets are very good for buyers.

The GNU General Public License in more detail

In legal terms, freedom for software constitutes a bundle of five rights and one obligation:

- The rights are that you may use, copy, redistribute, study, and modify the software.

Of course, you personally may wish only to copy and use a particular piece of software. But that software is developed and improved by programmers and others who study, modify, and redistribute software. The whole bundle of rights is necessary.

The freedoms to use, copy, redistribute, study, and modify software are not intrinsic to the technology: there exists software that you are forbidden to use, forbidden to copy, forbidden to redistribute, forbidden to study, and forbidden to modify.

Software freedom is the opposite: it is the freedom to use, copy, redistribute, study, and modify software

- The obligation is that when a programmer fixes or extends work that others have done, and makes that work public, the copyright holder must pass on the same rights that he or she received, so that others may use those fixes and extensions.

Although these rights and obligation were intended for software, they fit legal writings and learning, too.

Patents are More Restrictive Than Copyrights

In addition to copyrights, I should mention patents, which can be more restrictive.

While copyrights are designed to enable a government to control expressions on behalf of copyright holders, patents are designed to enable a government to control physical products on behalf of patent owners.

In the old days, a competitor could usually invent around a patent, which kept down the cost of licensing. In effect, a patent was like a literary expression, covered by copyright, but in physical material.

Thus, patents prevented small companies from competing, since they could not afford to invent around a patent or to license it, but patents had little effect on large companies.

However, nowadays, even large companies find it hard or impossible to invent around a patent when that patent is on a mathematical notion or business practice.

The GNU Free Documentation License

The GNU Free Documentation License is intended to be a legal solution for documentation.

Although a computer program, a technical manual, and a poem are all bits on a computer, they have different characteristics to humans. For example, a computer program is like a cook's recipe, any part of which may change. A poem, on the other hand, is fixed.

Except as a parody, you would not want to change Wordsworth's famous lines,

... all at once I saw a crowd A host of dancing Daffodills;

to

... all at once I saw a crowd A host of dancing Tulips;

Poems In Two Volumes, Vol 2,
by William Wordsworth

So a poem, like an editorial or a scientific paper, but unlike a computer program, is properly invariant. (You can make fair use changes regardless

of license.) Parts of a technical manual are invariant, too, such as the introduction. The body, however, should change as the entity it documents changes.

The GNU Free Documentation License was designed for such a situation.

Moreover, since publishers seek monopoly or partial monopoly rather than change their business model to that of providing services like lawyers, the GFDL restricts you and me a little. Using the GFDL, you may require up to five words that you specify on the front cover and up to 25 words on the back cover, and if another publishes more than one hundred printed copies, that text must be included.

Thus, if a publisher prints more than one hundred copies of the Proceedings, you could require that publisher to print

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on each cover.

The GNU Free Documentation License was designed to balance competitive, free markets with hard copy publishers' desire for monopoly or partial monopoly. It offers a clear definition of what is 'commercial'.

Other licenses are more confusing legally, at least to lay people who read them. For example, if you license a manual under a Creative Commons License with a commercial restriction, may Dell sell a computer with that manual on it?

Fortunately, the Creative Commons organization emphasizes commercial, free software by offering the GNU GPL.

Textbooks and Casebooks

I am told that nowadays, legal texts are priced higher than they would be in a competitive, free market. An economist would refer to the top three publishers, all foreign owned, as an oligopoly. (Incidentally, in school forty years ago, I was taught how to price fix in such an oligopoly without breaking U. S. law.)

Thus, in law schools, as John Mayer told me,⁵

... faculty teach, use each other's textbooks and improve on them in the classroom — but the chain is broken there. There is little opportunity and no incentive for a faculty member to contribute ideas, changes and refinements back to the author or publisher of the original textbook. There are a million ways to teach, but very few ways to teach something well. The publishers, who were once very very necessary are now hindering the creation of a virtuous cycle of refinement and improvement.

Actually, it may not be the publishers who are blocking the creation of a virtuous cycle, freedom, and lower costs. It may be legislators who are

⁵ Personal communication

not modernizing the law. Or perhaps both: perhaps the publishers fear the future and are lobbying to avoid having to change their business models.

You may not be touched directly by others' freedoms, by quality, or by textbook prices; but you are affected indirectly. For example, for law schools, textbooks are what economists call a *complementary product*: when their price goes down, students have more money to spend elsewhere.

Single Input, Multiple Outputs

People mostly work with the 'surface expression' or 'rendering' of a document; they listen to it or read it.

Every document that is written or printed on paper has only one surface expression. This is what you read. However, every document produced with a computer can have at least three such renderings in addition to the deep representation in which it is stored electronically.

The three renderings are the typeset, printed output that PDF, PostScript, or DVI generate; HTML for Web pages; and Info for efficient online reading or listening.

In Emacspeak, Info provides a good fourth rendering: one to which you listen.

Consider a casebook: it consists of words. Often, nowadays, it comes only in one surface expression, that of a typeset, printed book. But the words can be typed into a computer. Indeed, many legal cases are already online; so is the United States Code.

It takes some copy editing to create a decent deep representation; and some thought to write a commentary. But once that is done, you can produce a typeset and printed book, a frugal format for reading or listening online, and a typeset Web page, all with commands that take less than a second to give.

When you do not offer both the auditory and the frugal, you exclude the 'situationally blind', such as car drivers who should keep their eyes on the road. And you exclude people who suffer from a low bandwidth connections or are using old or small devices, such as cell phones or PDAs.

Over the next few years, the number of 'situationally blind' will blossom. People driving will want to listen. For those with laptops, listening is simply a matter of downloading, installing, and learning existing free software. For those with cell phones or PDAs the technology for listening already exists.

Technical, Legal, Social

The creation and reduplication of textbooks and casebooks face three kinds of problem: technical, legal, and social.

The technical problems have been solved, whether you are working online, reading a book offline, or listening while you drive. With the appropriate

software and formats, it is easy to create multiple expressions from a single deep representation.

We can improve the technical solutions, especially the sounds of voices and the design of editing tools. We should improve them. In particular, I would like to see an editor or word processor that shows at least two of the surface expressions simultaneously. But the critical work has been done.

The legal problems have been solved by the GNU General Public License, by the GNU Free Documentation License, and by invariant licenses.

However, the social problems has not been solved, neither on a personal level nor on a corporate level.

On a personal level, many contemporary people write for just one output format. This is from habit. In the past, people wrote onto paper, either with pen or typewriter. Paper was the one significant form that output could take. In the past, the only salient blind were the permanently blind, and they are a small portion of the population.

Put in a way that might appeal to those who like acronyms,

- Paper provides a W T S W I W T R S interface
(spoken as ‘**what-swi-wi-ters**’),
‘What The Sender Wrote Is What The Recipient Sees’.
- Computers provide a Y R C H T V O L format
(spoken as ‘**yrch-ti-vol**’),
‘Your Recipient Chooses How To View Or Listen’.

Yet today, many people think only of WYSIWYG. They think of a ‘What You See Is What You Get’ program that provides a single, frozen typeset output. They do not think of a frugal but highly efficient online format or of a typeset online format.

A generation ago, man pages and Texinfo were developed for multiple outputs — typeset outputs for paper and ‘linked’ outputs for online work.

Sad to say, even computer geeks tend to write for just one format. I have seen this often.

On a corporate level, many companies resist changing their business models. As the cost of reduplicating information drops, they seek more governmental policing. Like the old time dumping of toxic wastes, governmental policing costs them nothing.

For civilization, to police against advances in technology is to fail.

The better business solution is to adapt, as IBM is doing for example. Businesses can sell services rather than package them as products that depend on policing to keep their prices high.

Such companies could become more like you, who sell your services.

As I said, for textbooks and casebooks, the technical problems have been solved. We can and should improve the technical solutions, but the critical work has been done.

The legal problems have also been solved.

Moreover, through action you can solve the social problems. Those of you who control funding should consider how best to spend your money. Those of you who can decide how to teach, or who work in libraries, or who work with computers — all of you can cooperate to create, modify, and reduplicate textbooks and casebooks.

Final Words

In conclusion ...

When I started with technological advances and freedom, in the early 1980s, my main focus was on software. After all, computer tapes with software and documentation on them were easy enough to duplicate and mail. None of us read books on a computer display, although Michael Hart had started Project Gutenberg a decade before. None of the machines I used had loud speakers. I could not listen to anything.

Nowadays, computer displays show graphics; the machines have earphone plugs and loud speakers. It is easy to format a document for both listening and printing at the same time.

Software, songs, movies, and law books have all become less costly, unless low prices are forbidden.