



# Knowledge Management Consequences of the DMCA

**Patrick Riley**

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Professor AnnaLee Saxenian

Jennifer Kurkoski



## 1.0 Introduction

“Congress shall make no law... abridging the freedom of speech, or of the press..”

- *U.S. Constitution, First Amendment*

“Congress has 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.”

- *U.S. Constitution, Art. I, Sec. 8, Cl. 8*

In our modern world, these two quotes from our country’s constitution are seemingly contradictory. Can software code, written in an object oriented language, be considered speech? Does Congress have the ability to limit the freedom of speech if there is commercial precedence? Apparently, even after 200 years, these two quotes continue to confuse judges and legislators alike, as *Eldred v. Ashcroft*<sup>1</sup> of the Supreme Court demonstrated. However, what is clear was the rationale behind the introduction of copyright law. Intellectual property, including copyright law, was born to encourage innovation of intangible forms.

Broadly speaking, copyright confers *property rights* on ideas. Property rights, of course, are the cornerstone of market economics, facilitating exchange among producers and consumers (Barzel 1989). This remarkable and significant decision by our forefathers to invest in ideas has roots dating back to Francis Bacon’s *Novum Organum* of 1620.<sup>2</sup> Make no mistake about it, copyright law would give “creators” (being writers, scientists, etc.) an incentive to create, by offering a limited monopoly of the rights to their

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<sup>1</sup> ***Eldred v. Ashcroft*, 537 U.S. 186 (2003)** was a case heard before the Supreme Court of the United States, challenging the constitutionality of the 1998 Sonny Bono Copyright Term Extension Act (CTEA). Oral argument was heard on October 9, 2002, and on January 15, 2003, the court held the CTEA constitutional by a 7-2 decision.

<sup>2</sup> “For God, on the first day, only created light, and assigned a whole day to that work, without creating any material substance thereon.” Bacon’s writing seem to counter Aristotle cosmology and was quite timely: *Novum Organum* was composed when the world was busy with land exploration, conquests, and settlement of satellite territories. *Novum Organum* suggested a refreshing change in strategy for enriching these ambitious and expanding nations... instead of land expansion value, focus on the properties of nature, and using science, build a vast array of opportunities for wealth.

creation, be it a book, an innovative drug, or a software program. Clearly, economists, historians, business people, and legislators, can agree on the benefit that copyright law creates to all of society, by rewarding those who convert information into ideas, and ideas into innovation. Legislators, however, also recognized that information flows and innovation rely on an eventual freedom of information from the granted exclusive right, and that creative works should not remain forever in the possession of their creators (thus the term “limited”).

Quite unequivocally the purpose is a public purpose: with the desire to enrich society by eventually returning all intangible works to the public domain, so that innovation continues to advance the world. These competing views speak to the delicate balance to be struck between monopoly, on the one hand, which is conferred by a copyright, for example, and innovation through freer access to ideas and information, on the other. In the last few years, however, this delicate balance seems to have shifted. In this paper, I will argue that the established pattern of developing Intellectual Property (IP) legislation, namely, the last two updates of the Copyright Act, disproportionately favors original creators, and harms the development of a culture of information flows and innovation in the United States. These amendments to the Copyright Act, the Sonny Bono Act and the Digital Millennium Copyright Act, over-compensate the ownership rights of large companies, seemingly forgetting that the original intent of copyright law was to provide limited monopoly *as an incentive to create*. Even worse, this group of companies (which I will call the “knowledge cartel”) that stand to profit greatly from these Copyright Act extensions are limiting information retrieval, information flows, the creation of information organizations, research, education, and future innovation.

## **2.0 Brief overview of the legal provisions**

Copyright protection covers not only such traditional works of authorship as books, photographs, music, drama, video and sculpture, but also software, multimedia, and databases. A definitive feature is that copyright protects the expression of an idea, rather than its subject matter. The so-called “fair use” doctrine permits the limited reproduction of copyrighted works for purposes of criticism, news reporting, teaching (i.e., copies for classroom use), scholarship and research. The Sonny Bono act extended copyright protection by 20 years for cultural works copyrighted after January 1, 1923. Previously, individual copyrights would last for as long as the author was alive plus an additional 50 years. The new law extended that to 70 years for individuals and from 75 to 90 years for corporations. The incentive to legislate and police copyright law is understandable: it is estimated that \$5.7 billion comes in to U.S. firms from the rest of the world.<sup>3</sup>

### **2.1 The Digital Millennium Copyright Act of 1998 (DMCA)**

The stated purpose of the Digital Millennium Copyright Act (DMCA) is to ensure the protection of copyrighted works in the digital world by fortifying the technological blocks on access and copying of those works within a legal framework. This amendment to Title 17 of the U.S.C. (the Copyright Act) was signed into law on October 28, 1998 as the United States’ implementation of the World Intellectual Property Organization (WIPO) Copyright Treaty adopted by countries around the world two years earlier. Due to significant pressure from the movie and music industry, the DMCA implemented these recommendations in a much

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<sup>3</sup> Yang, Guifang & Maskus, Keith E., 2001. "Intellectual property rights, licensing, and innovation in an endogenous product-cycle model," *Journal of International Economics*, Elsevier, vol. 53(1), pages 169-187.

stricter fashion than required, giving copyright owners broader protection than was intended in the international treaty.

It had been almost twenty years (1976) since the Copyright Act had a significant revision, a revision that was sorely needed to address the realities of the digital age. Copying and disseminating of copyrighted material had become ubiquitous and existing legal frameworks were ill-equipped to deal with these new challenges, particularly digital piracy. Not long ago, artists and authors had only to contend with the limited illegal distribution of their works in hard-copy form; they now faced the reality of digital piracy. Digital distribution was a radical change in scope of potential piracy: once copied, the Internet allows for limitless and free distribution of data. To combat this one must prevent the copying itself. Piracy was and continues to be a major challenge for companies worldwide. According to a survey conducted by the research firm International Data Corp. for the Business Software Alliance (BSA), some 36 percent of the software installed on computers worldwide in 2003 was pirated, representing a loss of about 29 billion dollars to companies. The study incorporated operating systems and consumer software, as well as business software applications, to give a more accurate picture of the global software piracy problem.

The first provision of the DMCA prohibits the act of circumventing technological protection systems (e.g. breaking an encryption on a protected PDF file to an unlocked state), the second and third ban technological devices that facilitate the circumvention of access control or copy controls (e.g. composing or providing a software tool that allows for the circumvention of protected PDF files), and the fourth prohibits individuals from removing information about access and use devices and rules (e.g. providing false or removing copyright information). The first three provisions are also distinguishable in

that the first two provisions focus on technological protection systems that provide access control to the copyright owner, while the third provision prohibits circumvention of technological protections against unauthorized duplication and other potentially copyright infringing activities.

In an effort to demonstrate just how unlimited a power the DMCA gives “creators”, some of the final drafts had no exceptions, creating a situation where Mafia bosses and terrorists, oddly enough, might have been able to challenge evidence from law enforcement or intelligence agency decryptions by using the DMCA anti-circumvention provisions of 1201 (a)(1), (Samuelson et al, 2003).<sup>4</sup> An exception was later made for intelligence organizations, as it was clear to Congress that the DMCA’s potential limitation on the information sharing and flow of the FBI or CIA would be detrimental for national security. The Copyright Office of the Library of Congress is also exempt, and has the right to circumvent products as part of the process of determining a new creative work can be given Copyright protection, and for archival purposes. (It is interesting to note there is a quadruple negative in the law here.) Despite the intent to curb digital piracy, the trouble with some of the DMCA provisions is that they could, and have, been used to stifle otherwise legitimate activities, information retrieval, information flows, research, etc. while doing very little to prevent large scale piracy over the Internet. (For additional details of the DMCA, see Appendix A below.)

### **3.0 Case studies**

“We are in danger of learning the wrong lessons about innovation. ... As a result, we risk neglecting those capabilities that are the real wellsprings of creativity in the US economy -the capacity to integrate across organizational, intellectual, and cultural

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<sup>4</sup> Lemley, M., Samuelson, P., Menell, P., Software and Internet Law 462 (2003).

boundaries, the capacity to experiment, and the habits of thought that allow us to make sense of radically ambiguous situations and move forward in the face of uncertainty.” (Lester and Piore, 2004)

In an effort to suggest that the DMCA contributed to a reduction of creativity and innovation, I will use some case studies of legal action of the past few years. It was not long until the in-house attorneys of large firms decided to abuse the DMCA to “control” innovation in a way to benefit their profits by stifling competition. This idea of attempting to control a new or volatile industry gives hints of large firms’ attempts to suppress “disruptive technologies” (Christensen, 1997), and the protection of the “knowledge cartel.”

Naturally, Microsoft will be my first exemplar member of the “knowledge cartel.” Andrew Huang, a graduate student in computer science at MIT and an owner of the Microsoft Xbox wrote a research paper on how an Xbox owner can circumvent their game box, and (gasp!) use it as a Linux machine. Microsoft immediately prevented him from distributing the exact Xbox keys needed to unlock an Xbox. Instead, he modified his paper to explain how to get the keys to circumvent an Xbox. This paper was highly influential and downloaded by hundreds of thousands of developers. His paper encouraged a number of other Xbox open source projects to start up on ways Xbox owners can customize the game console. Upon graduation from MIT, Huang composed a book, "Hacking the Xbox" that was published but subsequently dropped by Wiley subsidiary Hungry Minds, under pressures of possible legal lawsuit under the DMCA. In addition, the Department of Justice used the DMCA to shut down the Huang-inspired ISONews.com, a Web site community of developers that exchanged ideas, built custom software, and distributed Xbox-customizing software tools. The site’s owner was

imprisoned. Huang then decided to self-publish it through Americart, a provider of online shopping cart services, who eventually declined to sell the book because it feared legal ramifications from the DMCA. On one hand, innovation deserves its just reward, and Microsoft should be protected from thief of intellectual property (such as counterfeit Xboxs or copied Xbox games.) Yet, on the other hand, a free and competitive market place is also required to preserve innovation, information exchange, and to ensure fair markets. Once Microsoft sells that Xbox to an individual, they should have the ability to tinker, develop, discuss, and use it in whatever creative ways they chose. This suppression of Andrew Huang's paper not only violates his Constitutional right of free speech, it also sends chilling effects to others who may have wanted to contribute in a similar format of information exchange and innovation. As evident in this case, innovation is controlled by the "knowledge cartel" firms that fear innovation that they are powerless over.

Another company known for its attempted control over competitive innovation is Sony. A startup company named Connectix developed software which emulated the Sony PlayStation on a Macintosh or PC computer. That is, someone who purchased a Sony Playstation computer would be able to play the game on a Macintosh or PC computer. In an effort to prevent any copying of the game, Connectix implemented the same authentication scheme on their software so that only authentic Sony Playstation games could be played. In addition, in an effort to ensure compatibility between the emulator and the PlayStation games, Connectix had to reverse engineer the Sony PlayStation.<sup>5</sup> When circumventing the Playstation, says the court, they violated the

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<sup>5</sup> One step of the reverse engineering process involved loading the PlayStation's basic input/output system (BIOS) into a computer and running it repeatedly as Connectix engineers developed software which interacted with the BIOS. Once they completed this

DMCA. The startup company, Connectix, was not selling a tool that circumvented the authentic and their software allowed for only Sony Playstation games to be run through their program. However, this software innovation, which may have been beneficial for Sony in that they would sell more profitable games to Mac or PC users and potentially would have likely enlarged the Sony Playstation community, was deemed illegal.

Sony also used the DMCA as protection for their Aibo product, a \$1,500 robotic dog that can learn tricks, take pictures, bark and interact with its environment, a sort of Tamagotchi on steroids. Some of these Aibo owners decided to customize the Sony dog by programming it to do interesting tricks. By expertly tweaking Aibo's code, thousands of Aibo enthusiasts enabled their dogs to boogie to Madonna's "Vogue," talk like the Terminator, or double as a breadbox-sized walking surveillance camera. In 2002, one of the developers named "AiboPet" decided to make an online community of Aibo developers at AiboHack.com, which offered such downloadable freebies as "Disco Aibo," a dance program, and "Brainbo," a voice-recognition package. Sony attorneys sent a cease-and-desist letter to AiboPet, explaining that Aibohack.com and its development and even end user members were in violation the Digital Millennium Copyright Act (DMCA).<sup>6</sup> Under such pressure, AiboPet removed most of his site.

Five observations are noted about this case. First, companies should not expect that preventative technological factors will explain the adoption of an innovation or the transformation of work (Chandler, 1992; Winter and Taylor, 2001). Sony should have

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software, the Connectix engineers developed their own BIOS to interact with the software. The repeated running of the BIOS caused the making of numerous temporary copies of the BIOS in the computer's random access memory (RAM). Sony asserted that these copies infringed the DMCA in the BIOS.

<sup>6</sup> Sony specifically pointed to the following: a) the contents of the site contain Sony copyrighted software which are being copied and distributed in violation of Sony's rights; b) the site provides the means to circumvent the copy protection protocol of Sony's AIBO(tm) Memory Stick(tm) to allow access to Sony Aibo-ware software; and the site promotes the distribution of your original software such as "Disco Aibo", "Aibo Scope", "Bender Aibo", etc. which appear to have been created by copying and decrypting Sony's software.

expected that based on history, cultural factors, social trends, the adoption of the Aibo would be made up greatly of early adapters who will likely want to tinker with their new robotic dog. Second, AiboPet was not profiting (nor did it seem he planned to in the future) in any way from his online community of developers. Third, AiboHack.com sounds much like what Powell et al. (1996) described as “networks of learning,” which they argue does the real innovating, namely because they are passionate about a technology, and have access to a wide array of knowledge from thousands of individuals all rapidly advancing the technology. Helper et al (2000) would likely consider this community of volunteer developers as “collaborative learning” and suggest that Sony should be appreciative of this ability to “learn by monitoring” this innovative, information-pooling community. Fourth, Sony was not selling competitive “customizations” as could be found on AiboHack.com. Imagine, for the sake of argument, that AiboHack.com was a profitable company instead, AiboHack Incorporated. Should Sony be allowed to denied AiboHack Inc. the so called “second mover advantage” in evolving technology by using the DMCA? In this regard, Sony once again seems to be using the DMCA as a “backdoor patent” to prevent even the attempt to innovate the Aibo without Sony approval. Last, and most importantly, the case illustrates how a major corporation can immediately silence creativity, information flow, exchange and innovation of individuals and organizations by using the DMCA in ways that were previously never possible. This would be akin to Lego suing an enthusiast who made his own add-on figures or pieces (as long as he didn’t sell them) that Lego was not making. Such abuse of the DMCA is made possible by the imbalance of the Act’s provisions, and will likely continue to stifle creativity, innovation, and development.

The Sony cases above offer compelling evidence of attempted “lock-in” effects by large firms to reinforcing their control over competitive innovation by using the DMCA. Another example of this attempt to limit innovation can be found in HP and Lexmark business models, post-DMCA. Decent inkjet printers from HP or Lexmark can be bought for less than \$10 after rebate in many cases.<sup>7</sup> The practice of inkjet printer producers to sell their printers at highly subsidized prices is an example of a “durable purchases lock-in,” because inkjet printer producers know that buyers will have to purchase inkjet cartridges as they use their printer, and producers can make significant income selling these cartridges. However, much to the dismay of HP and Lexmark, some companies have sprung up that specialize in copying the design of their inkjet cartridges, or reusing old ink cartridges and selling generic inkjet cartridges for less than HP or Lexmark. Once the DMCA was enacted, however, HP and Lexmark found a way to control the previously competitive market of inkjet cartridges. In probably one of the first times in HP history, HP Legal was giving designs plans to HP engineers: design a printer with cartridges that share a cryptographic “secret handshake,” knowing their new printers and cartridges would be protected by the DMCA from other companies’ encroachment. HP and Lexmark could innovate the production of their cartridges to reduce the price in a competitive fashion, or offer a competitive feature that would benefit consumers, but with the security of the DMCA, they instead invested in an authentication chip which eliminates competition. A company called Static Control, which prior to 2003 had made generic cartridges for Lexmark printers, now successfully reverse engineered the new Lexmark cartridges in an effort to again produce generic

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<sup>7</sup> TigerDirect.com currently offers a Canon Epson Stylus C84 high definition 22ppm Inkjet Printer for free after rebate. <http://www.tigerdirect.com/applications/SearchTools/item-details.asp?EdpNo=634704&Sku=E17-3441>

cartridges for sale. Yet, the secret handshake is a "technological measure" that "effectively controls access" to the copyrighted printer software. By doing the secret handshake, Static Control cartridges circumvent that technological measure. Therefore, Lexmark cartridges are now protected, as price-innovative generic cartridges like Static Control's are circumvention devices that are illegal under the DMCA.<sup>8</sup> What previously was unprotected is now completely protected. Consumers of Lexmark printers can only buy Lexmark cartridges with the real secret handshake, effectively locking-in consumers and securing their once competitive and once volatile field.

Large firms' attempts to control competitive innovation by capitalizing on the DMCA exist not only in hardware. With the advent of ever more computing power and increased bandwidth, online gaming has become immensely popular and profitable. One online community called battle.net, owned by Blizzard Entertainment, allows users from all over the world to connect and play Blizzard PC videogames with and against each other. Blizzard charges a subscription fee for members of battle.net.

A group of volunteer developers came together and composed their own online gaming community, the *bnetd* project, and distributed free, open source software that allows individuals to do essentially the same thing as Battle.net: connect to users, form teams and "gaming rooms," and play games with each other. In addition, the open source bnetd project also allowed users to chat, take screen shots, and a number of other advanced features that the paid Blizzard battle.net did not offer. Blizzard sued the individuals for creating the free online community and distributing the open source software that emulates Blizzard's free Battle.net gaming service, under the DMCA's

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<sup>8</sup> Lexmark v. Static Control Company, 253 F. Supp. 2d 943 (ED Ky. 2003)

provisions of circumventing access control measures, and sued their ISP (Internet Gateway) on trafficking in devices that facilitate this circumvention. Blizzard's access control measures consist of “CD Keys,” which are codes that Blizzard's online gaming service, battle.net, uses to verify the authenticity and uniqueness of a user's game. Since *bnetd* effectively skipped the CD Key checks that battle.net performed, Blizzard alleged, *bnetd* circumvents a measure that effectively controls access to Blizzard games. This is yet another example of independent developers and hobbyists organizing an online community for information exchange and innovation. Unfortunately, this is yet another case where a “knowledge cartel” firm was successful in convincing two judges (first case was appealed) that the community’s creative work was a violation of the DMCA, and was effected closed down. Blizzard’s approach towards its consumers is strikingly opposite to the work of Neff and Stark (2003), who describe a similar information system in which consumers are encouraged to assume significant responsibility of beta testing the software, and allows consumers to become producers who then actively shape the particular technology. With Blizzard’s success, other content companies are now considering shutting down online communities that offer a similar networked experience.

Another case study on DMCA litigation against innovation is based on the DVD protection Content Scrambling System (CSS) that is the standard in all DVD players and DVDs around the world. CSS is supposed to encrypt DVD data so it can be read only by “licensed” (i.e., MPAA-approved) DVD players and computer programs (Windows Media Player, Apple iVideo). However, the MPAA CSS' licensing section, the DVD Copy Control Association (DVD-CCA), flatly refuses to license CSS to projects such as LiVid (Linux Video) or MPlayer, or any other software title for Linux users. A

Norwegian named Jon Johansen, and likely the 18 million other Linux users in 2001 wanted to watch store-purchased DVDs on his Linux computer, (which had a DVD-ROM) but due to the licensing boards refusal, there were no programs that would correctly play the DVDs. So he developed DeCSS which both unlocks the CSS on the DVDs to make it possible to play in the Linux operating system. Others have been able to use this decrypting program for fair use activities. When I was working at the Berkeley Center for Law & Technology at Boalt Hall, I was asked by a copyright professor to take a clip of the movie, 12 Monkeys, so that he could show the allegedly infringing segment of film that was being litigated to his students. This clearly helped the class understand the particular elements of the case, and the entire class was better off because the professor showed this clip. Unfortunately, my activities in decrypting the clip from the original DVD were, in fact, illegal, according to the DMCA.

Ironically, while Johansen won Norway's prestigious "Karoline Prize," awarded annually to a Norwegian high school student with excellent grades who makes a significant contribution to society outside of school, at the behest of the Motion Picture Association of America, Jon was brought to trial for his compatibility hacking. Meanwhile, a number of developers had taken Johansen's DeCSS code, including a code developer magazine, and published and posted the code on 2600.com. Many projects grew from Johansen's code, including an interesting program so that blind people can experience a DVD on Linux, or a program for people to make an archival copy of their purchased DVDs, or a program so that parents could select to "edit out" what they deemed was harmful content. However, all these projects, and the communities and even magazines that exchanged this code were sued and shut down. Although almost all of the

innovation adapted from Johansen's DeCSS had noninfringing uses and features, but since the projects and programs break the CSS encryption, all violate the DMCA. Those that invented CSS still have a complete monopoly on any derivative products relating to commercial DVDs, and have successfully used the DMCA to eliminate competitive research, product development and even scholarly research on the subject.

In one final example of fair use circumvention, Mr. Sklyarov and other Russian programs created a software program that circumvented protected PDF files, allowing individuals to print, search, and make notes on their PDF files (uses that are prevented with some protected PDF files). The software also was created for disabled individuals, who can "read" PDF files with screen readers or other accessibility technologies. Because of this, Mr. Sklyarov was arrested by FBI agents for violating the DMCA, while giving a lecture on this breakthrough at DefCon 10, an annual computer conference.<sup>9</sup> In response, the Russian government issued a travel warning for Russian programmers entering the U.S. and also foreign scientists from other nations have expressed serious concern at entering the U.S. Many academics from outside of the U.S, especially those in cryptography, do not attend conferences in the United States anymore.<sup>10</sup> The technical protection measures in information files (such as the protected PDF file) that prevent accessing the underlying content of the copyrighted materials hinder legitimate noninfringing uses vital to scholarship and science, such as individuals searching of

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<sup>9</sup> Fun tidbit: I attended that conference and those subsequent to the arrest and they now have a game called "Spot the Fed." If you think a member of the conference looks like a Federal Agent, you can, in a bantering manner, suggest this to a conference official, who will then check the person. If they are a federal agent, the "spotter" gets a free tshirt that says "I spotted the Fed." The agent gets to say, but only if they wear their own free shirt, "I am the Fed."

<sup>10</sup> <http://www.freedomforum.org/templates/document.asp?documentID=14535>

protected documents, or disabled individuals wanting access to the same information that is available to able individuals.

Up to this point, we have given a number of case studies of companies restricting research and development that is outside of their “knowledge cartel” firms. In particular with the DeCSS case, it also seems to be a fight over the control of future DVD innovation between Southern California (Hollywood, who has successfully limited innovation) and Northern California (Silicon Valley, where most of the communities and projects inspired by Johansen were formed). This suggests there almost may be a cultural differences between the two areas: Hollywood being composed of mostly businessmen from traditional educations and backgrounds and historically resist to technological change (ex: VHS, MP3), and Silicon Valley being composed of a diverse group, immigrants, and a healthy collection of established companies and innovative startups (Saxenian, 1994). However, in most of these cases above, those most affected were computer hobbyists or developers who were restricted, punished and banned due to the DMCA. This begs the question of what the wider effects of the amendments to the copy right law are, a topic I will now turn to.

#### **4.0 Effects**

A reader may be inclined to ask “how does this affect me?” I will suggest that the DMCA affects information retrieval, flows, and innovation on all levels of society, be it individual, organizational, and broader societal levels.

First, the fact that you, as a consumer, can legally backup or archive your purchased CDs (incase the original gets scratched, or to have two copies... one in your car, one in your stereo at home), but you currently cannot legally backup your DVDs is

simply a matter of strategy by the movie industry. Or that you, as a consumer of a video game, cannot join a free, open source online community, like *bnetd*, and play videogames with other gamers is a violation of your right to fair use. In limiting "circumvention devices" of *any sort* related to copyrighted works, the DMCA sets high limits on traditional consumer rights of fair use. As Judge Kaplan of the *Universal vs. Reimerdes* case noted "Congress elected to leave technologically unsophisticated persons who wish to make fair use of encrypted copyrighted works without the technical means to do so - with regard to the fair use doctrine, the DMCA fundamentally altered the landscape".<sup>11</sup> While the digital revolution has certainly created new challenges to existing copyright practice, many academics feel that the DMCA is not the legislation to promote and enable the new digital paradigm and traditional intellectual property rights to merge. Rather, it is a reactive measure; an attempt by the media industries to halt the wave of progress and effectively an attack on consumers' rights and interests.

In conducting research, students and academics are also affected by the DMCA, especially in the terms of information retrieval (IR). IR is one of the most basic steps in obtaining knowledge or creating innovation. Here I define it loosely as indexing, searching, and recalling data, particularly text or other unstructured forms. An example of information retrieval could be a college student searching for academic information on Google, or a scientist using a database to find a particular DNA sequence. By the use of "protective devices" like in the case study of the PDF encryption and laws that protect these protections (the DMCA), information can be "locked up," and in case individuals

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<sup>11</sup> *DeCSS is a generic term for software that decrypts DVD movies. Two of the first such programs were DECSS.EXE (for Windows) and css-auth (a package of C code for Linux.) The motion picture industry sued Eric Corley, published of the 2600 magazine, and two other defendants, to prevent distribution of this code.*

attempt to unlock it, even for the use of academic or research purposes, they may be sued for breach of the DMCA. In this case, searching a copyrighted work that was purchased by the individual would not usually be a copyright infringement, but with the DMCA it is. A real life example can be illustrative. A friend of mine is composing a paper for one of her courses. In composing this paper, she wants to do a word search through some PDF files downloaded from electronic journals, on which UC Berkeley subscribes. Many of the academic articles, she found were “locked” in the sense that searching, highlighting, and even printing had been made impossible. Frustrated due to her inability to do basic information retrieval searching, I told her about a program called PDFKey which decrypts the protected PDFs so she could search, highlight, and print her articles to complete her paper. Three points should be made about this example in which both my friend and I circumvented the protection and essentially violated the DMCA. First, if she had not told me of her frustrations, she likely would have just used the few papers that she had in paper format or the unprotected PDF files that she could print and search through, and ignored the protected files. Second, the protection means that most of these papers would not have been available via Google or Google Scholar, even if they were placed on the web, because they do not allow for text searching (if they are not on Google or Google Scholar, do they really “exist” in this highly searchable age?). Third, it is difficult for scholars to know exactly why they are unable to print, highlight or search documents. All Linux users would be unable to read the protected files. Those with PDF Reader version 5.0 and below would simply not be able to open the protected PDF files, and instead, get a message suggesting they should update their PDF Reader. Even for those with new versions of PDF reader, when opening a protected file, there are no

implicit visual indications or message as to why they cannot print, highlight or search documents, people may simply assume the file is corrupt, their software is not working correctly, or their computer is broken, and limit their information retrieval efforts. But even for those who notice the file is “protected” (there is a small icon in the newest version of PDF Reader that the file is protected once the file is opened), it is questionable as to whether a typical user would ever suspect that a program on the Internet that allow to unlock their purchased PDF files is illegal. The prohibition the DMCA makes on scholars using computer-assisted assistants for search, etc., is an artificial impediment of the progress of scholarship and science.

There are other examples of the hindrance of academic research by the provisions of the DMCA. Suppose that Ann is a music major student who wants to search through her extensive iTunes collection for repetitious rhythms in popular and alternative music. She would also like to save her findings, the music snippets that she needs for her final paper. However, iTunes music is composed in protected AAC files which allows playback only in trusted applications such as iTunes software and in her iPod. Ann’s music search program, where she can perform thematic searches of particular music scores only accepts standard music formats such as MP3 and WAV files. Ann does a Google search and finds a software program called iOpener, a software program that will convert her music from protected AAC to MP3 files so that she can do her searching and analysis. Ann has violated the DMCA, even though she paid for the music files and is using them in a “fair use” manner.

On an organizational level, such examples as have been referred to above, show the limits on scholarly research, and the resulting challenge to all research institutions in

the U.S, caused by the DMCA. In a time where electronic sources of research are ever increasing in number, the restrictions to the use of such resources impedes not only individual research but knowledge generation on universities as well. Additionally, as the case of Mr. Sklyarov shows, the exchange of information between international scholars and US scholars decreases due to the reluctance of academics in some fields to attend conferences on United States territory. The academic norm of knowledge generation through accumulation is thus impeded by the strict, protective measures of the DMCA.

Private companies and some organizations that are highly reliant on information retrieval may also have difficulties building knowledge management systems given the limitations of the DMCA. As shown previously, some public organizations, such as AiboHack or bnetd project that brought together developers and provided a medium for knowledge exchange were effectively shut down. The same problems exist for private companies. McDermott shows that recent developments and improvements in information technology have encouraged many companies to imagine new ways for staff to share knowledge and insights. As McDermott suggests, most companies realize that leveraging knowledge in a productive way is quite difficult and more dependant on community building rather than the particular information technology. This, he says, is not because people are reluctant to use technology, but that they need to share knowledge that is neither obvious, (ex: easy to document in an email). Information technology such as eBooks and PDF files have helped to inspire the knowledge revolution, but with laws such as the DMCA, which effectively can prohibit individuals from printing, making notes, and searching, knowledge management and information flows are greatly disrupted.

On a societal level, there are also consequences of the DMCA. On the basis of the impediments to knowledge generation and innovation pointed to in the above, society as such may be on the losing team. Even though some of the innovations made in the case studies, like dog tricks in the AiboHack.com case, may have a limited, private use, others have much more profound effects, or may set a precedence that will eventually affect the average citizen. The software program created by Mr. Sklyarov could be used by disabled people, who would not otherwise have access to the information in protected PDF files due to the inability to search (and scan) it with accessibility devices. Additionally, the PDF-encryption does not allow Linux users or people with older versions of Adobe Acrobat to read the files. In all, the anti-circumvention clause in the DMCA prevents certain people from accessing information, thus creating an asymmetry of information between different groups of society.

The DMCA may also have a more subtle effect on innovation in the long run. As has been argued by Katzenstein<sup>12</sup> in a study of the effect of law on institutional norms, the legislature and the courts shape the normative environment of individuals, thus influencing their behavior (Katzenstein, 1998). In the case of Microsoft's Xbox, Huang had to drop publishing his book due to fear of legal ramifications. The owner of the website community created around the ideas of Huang was imprisoned, making him less likely to engage in or host a similar web community in the future. The developers and members of the dissolved communities of the Huang, the Aibo, the DeCSS cases and others will also most likely over time restrict their participation in such activities out of fear for legal repercussions. If lawsuits on violations of the DMCA soar, individuals may

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<sup>12</sup> Mary Katzenstein (1998): "Faithful and Fearless: Moving Feminist Protest Inside the Church and Military," Princeton, N.J.: Princeton University Press

internalize the restrictions of the law, leading them to abandon development activities and innovation in the longer run.

The amendment to the Copyright Act in 1998, the Sonny Bono Act, also has a potentially significant effect on the societal level of innovation. The Act extended the lifetime of a copyright by another twenty years (added to the existing 50 years) but applied equally to both currently existing *and* all future copyrights. Consider that if the laws in 1976, '92 and '98 had not passed, anyone today could do pretty much whatever they please with writing I had done in the 1960's without taking the time to locate me and ask my permission. By today's current law, a person using my work, and not breaking the law, would have to seek me out, or in the probable event that I'd died, seek out my heirs and obtain permission before using my work, even if I believed the work was not valuable enough to merit protection when I first wrote it. In the two decades after the passage of the Sonny Bono Copyright Extension Act, over a million patents will open to the public domain, yet no copyrights will. Not only does this present harm public progress, it presents a legal and business issue for creators and companies who have to clear the rights to use the works of others. Because of the large number of term extensions and business consolidations, it becomes difficult to determine what works belong in the public domain and who owns the rights to those works if they are not public.

Is there any innovative incentive to society if Apple Records can continue to charge full price for Beatles music of which they have already profited significantly in the last fifty years?<sup>13</sup> If so, where is there new innovation? Instead, imagine a reasonable

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<sup>13</sup> Contrary to popular belief, Michael Jackson does not own the "rights" to the Beatles. Michael Jackson owns the lyrical copyright, not the copyright on the recorded music tracks from the Beatles.

copyright exclusivity of 50 years; a world where every book, every movie, every piece of music, or every scholarly article with at least 30 years of age was available on the Internet, for free. Imagine what kind of information retrieval, information flows, organizations, and the kind of innovation that could occur with such a rich public domain to work and build with. It is not difficult to understand how the Sonny Bono Act or the DMCA has made this dream even less likely to be reality any time soon. Why create when you can legislate? That seems to be the attitude of many of these “knowledge cartel” firms who abuse the DMCA for greater profitability at the cost of the total value to society. As noted in Christensen (2000), it is natural for large, hierarchical firms to want to control “disruptive technologies” and innovation in ways where they can maintain dominance. Granted, creators should receive exclusivity to their work as an incentive for the continuation of innovation. However, the current trend in copyright law amendments seem to be creating a chilling effect on academic research, information retrieval, unforeseen monopolies of once competitive markets, and an asymmetry of information between different groups of society. Legislators need to realize that in today’s knowledge economy, non-market strategy is of increasing potency in the competition over ideas. Many of these non-market strategies are extremely harmful to information exchange, knowledge management, and overall innovation. There needs to be more balance in copyright law to make certain that knowledge-based businesses do not sculpt the law in novel, unintended strategies of control, and instead offer society innovation, and a wealth of information and knowledge to build from.

## Appendix A:

The DMCA has two main parts:

1. One part is the anti-circumvention provisions, which make it illegal to "circumvent" a technological measure protecting access to or copying of a copyrighted work.
2. Another part gives web hosts and Internet service providers a "safe harbor" from copyright infringement claims if they implement certain notice and takedown procedures (We will not be examining this)

The DMCA introduced a new category of copyright violations that prohibit the "circumvention" of technical locks and controls on the use of digital content and products. These anti-circumvention provisions provide the legal backing behind any technological systems used by copyright owners to control access to and copying of their digital works.

The DMCA contains four main provisions relating to anti-circumvention:

1. a prohibition on circumventing access controls [1201(a)(1)(A)];
2. an access control circumvention device ban (sometimes called the "trafficking" ban) [1201(a)(2)];
3. a copyright protection circumvention device ban [1201(b)]; and,
4. a prohibition on the removal of copyright management information (CMI) [1202(b)].

The first provision prohibits the act of circumventing technological protection systems (e.g. breaking an encryption on a protected PDF file to an unlocked state), the second and third ban technological devices that facilitate the circumvention of access control or copy controls (e.g. composing or providing a software tool that allows for the circumvention of protected PDF files), and the fourth prohibits individuals from removing information about access and use devices and rules (e.g. providing false or removing copyright information). The first three provisions are also distinguishable in that the first two provisions focus on technological protection systems that provide access control to the copyright owner, while the third provision prohibits circumvention of technological protections against unauthorized duplication and other potentially copyright infringing activities. It is important to note that these provisions of the DMCA, although seemingly stifling to the security and encryption field, have far greater consequences for society in general.