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## Peer-to-Peer Media File Sharing: From Copyright Crisis to Market?

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### Introduction

“But if you copy a piece of software a thousand times, what is the cost? ... Infinitesimal ... this is a problem ... and it isn't just a problem of economics. We have a system of values, of *morality*, based on people competing with each other to copy things, at the lowest possible cost per unit. But when the cost, the object of all of this competition, effectively disappears, what happens to our system? Life gets very puzzling.” (Jones 1998), p. 516 (emphasis as in original).

The use of Peer-to-Peer technologies for the exchange of digital information, including audio, text, and still and moving images presents both business and government policymakers with a profound dilemma. On the one hand, many copyright owners view Peer-to-Peer technologies as a new publishing medium that opens opportunities for new sources of revenue. On the other hand, copyright owners' customers are questioning why they should be prevented from or charged for using new technologies for acquiring, modifying, and exchanging information for entertainment, education, and cultural expression. In other words, the social convention of paying for a commodity whose marginal cost of reproduction is near zero has become increasingly frayed with the advance of technology.

Peer-to-Peer technologies have played a central role in improving the distribution of digital information and in facilitating copyright infringement. They provide means for improving the performance and functionality of the Internet as a storage and communication medium for a multiplicity of

applications – many of which have no direct relation to disputes over copyright. To alter these networks in ways that would protect intellectual property rights in the information exchanged over them would involve making major changes in the original architecture of the Internet, changes that might help create market power and ultimately a diminution in the value of the Internet as a medium for communication, (David 2001).

Current enforcement choices by copyright owners have created a legal quagmire of selective enforcement in which particular computer users are presented with large bills for copyright infringement and forced to choose between paying a settlement or attempting to defend their actions through litigation.<sup>1</sup> While there can be little doubt that many such users are, in fact, engaging in copyright infringement, there is far more doubt that their selection for civil prosecution represents a standard that is either fair or transparent.

Concerns about copyright protections being undercut by the advent of new technology are not new.<sup>2</sup> There are, however, qualitative differences between Internet applications such as Peer-to-Peer file sharing and earlier information reproduction and distribution technologies. Like the earlier technologies of plain paper copiers or magnetic tape recording, modern digital technologies provide a means to contravene property rights in information by facilitating the copying or “re-publication” of copyrighted materials. Unlike earlier copying technologies, however, the use of Internet-based technologies provides a means for large scale and global redistribution of the resulting copies. While there are additional distinctions (discussed below) between older copying and distribution technologies and those employing the Internet (including Peer-to-Peer file sharing technologies), it is the potential “volume” of illicit copies that might be distributed by Peer-to-Peer technologies that is of principal concern to copyright owners.

Rather than being confronted by a band of pirates who must invest in high volume reproduction technologies, create new (illicit) distribution channels, and promote the availability of their “products,” copyright owners face a ready-made and “viral” or contagious form of infringement. Internet technologies provide the means to engage in high-volume copying, a global distribution channel supporting the distribution of copies, and a means to establish person-to-person communication networks either for distributing these copies or making their location known. Copyright owners’ responses to this perceived threat include threatened legal action against individual users engaged in copyright infringement, and attacks and disruptions on centers or “nodes” of such activities on the Internet. These responses have

the potential to discredit and disrupt progressive uses of the Internet for education, cultural expression, and recreation as well as its exploitation as a new platform for market development.

The conflict between copyright owners and Internet users is creating a distinctive period in the history of Internet development that we will call the “copyright-crisis era.” This chapter pursues three complementary goals. The first is to provide a precise understanding of the influences that have produced the current “copyright crisis,” especially those aspects of the crisis that are influenced by technologies and social institutions employed to protect copyright in digital media. The second is to outline how some of the influences creating the “crisis” are being resolved – e.g., by turning roadblocks into efficient tollbooths. The third is to examine how the means for resolving this crisis are likely to shape a “post-copyright-crisis era” whose outlines are just beginning to become clear. In this post-crisis era, Peer-to-Peer technologies will play a continuing role in the evolution of Internet architecture and new public and private “spaces” or “domains” are likely to co-exist in an uneasy complementary relationship with their use governed by new institutions (rules, norms, and standards).

The next section identifies the key technological influences that have established the nature of the copyright crisis. This copyright crisis is not due only to the features of Internet technologies such as Peer-to-Peer file sharing. The ways that individuals use collections of information is co-evolving with the technologies – the emergent uses for and interests that users have in the information that they generate, purchase, or otherwise acquire are influenced by the capabilities that new technologies offer and these capabilities influence technological development. Following is a section devoted to examining how these changing user needs and behaviors create new practices and institutions (rules, norms, and standards) that influence the nature of the copyright crisis era.

The subsequent section returns to the interests of the copyright owners, examining their efforts to preserve existing models and to devise new models of protection for copyrighted materials. A central focus of this section is the compromise between copyright owners and users responsible for the “new generation” of music downloading services such as iTunes, Rhapsody, and MusicMatch. The last section examines the technological and institutional (legal and social norm) changes that are emerging as we move into the post-copyright crisis era. It provides a vision of what this era might look like from both the copyright owners’ and the users’ perspectives and concludes the discussion by highlighting some of the issues that are likely to remain unresolved.

## The Role of Technology in the Copyright Crisis

The Internet provides a myriad of methods for the publishing, reproduction, and exchange of information. Methods for recognizing and ignoring the provenance of information and for supporting or bypassing the control of information publishers or creators co-exist. The means for recognizing provenance and supporting publisher control are referred to as digital rights management (DRM) technologies. The goal of producers of DRM technologies is to create information storage and transmission domains in which copyright may be protected, most commonly by the use of encryption of media content so that only properly authorized “readers” or “players” can decode the information.

However, as with any other encryption system, once information has been decoded or “made clear” it may be captured and copied. Thus, for an encryption-based DRM management system to work, it must maintain control not only of decryption, but also how the user receives the information (e.g., a display, a sound reproduction, etc.), a goal that is at odds with the technical capabilities offered by the personal computer.<sup>3</sup> Moreover, the effort to retain control threatens to compromise many of the advantages of competition in computer software for playing media files, archiving their content according to users’ preferences, editing files to users’ tastes, or using media files on other “playback” devices that the user may own are either difficult to achieve or must be foregone entirely. As a consequence, DRM technologies have not been popular with users during the first 25 years of the personal computer era. The ways in which this unpopularity has been accommodated are considered in the section focusing on the evolution of producer strategies.

DRM has also historically seen as an encumbrance by the very people that would seem to have the most interest in employing it – information publishers. For example, music publishers distribute their products on compact discs (CDs) despite the fact that this medium of digital information recording can be used as a source of digital information for making flawless copies of the original.<sup>4</sup> Other schemes for preventing the copying of compact discs often create compatibility problems with the existing stock of hardware designed to play ordinary compact discs and ultimately have been only minor impediments for experienced users.

Traditionally, a primary goal of DRM was to prevent the creation of a decrypted version of information that could be transferred into the storage and distribution domains in which DRM is ignored.<sup>5</sup> This larger domain of services and applications in which the provenance and ownership of information is ignored is a basic feature of not only the personal computer,

but also the Internet. Historically, the principle of maximizing the interoperability of the Internet meant that the possibility of creating different “classes” of information with different rules as to how it might be exchanged was not addressed. A consequence is that the architecture of the Internet, as such, offers no tools for *blocking* copyright infringement.<sup>6</sup> It is unlikely that the architecture of the Internet will be re-engineered to provide such tools, and even more so because of the variety of DRM encryption technologies and standards that exist.

Those who choose to translate information from the information storage and distribution domains governed by DRM technologies to domains in which DRM is ignored do face some technological hurdles. This is particularly true for video media where the player may be closely linked to the display technology.<sup>7</sup> For audio media, however, a last resort (due to the reduction in fidelity of the signal), which always will exist, is simply to re-record the information as it is “sent” to the analogue output of the player or played through speakers. Technologies for overcoming DRM are specifically prohibited by the US Digital Millennium Copyright Act, but are generally available on the Internet. In general, DRM technologies should be viewed primarily as impediments to the average user’s ability to translate information between DRM- and non-DRM-respecting storage and transmission domains.

Once a media file appears in the information storage and distribution domain without DRM encryption, it can be reproduced efficiently through the use of a multitude of applications as well as the basic file management techniques provided by computer operating systems. The information file can also be distributed using a myriad of techniques ranging from e-mail “attachments” to Peer-to-Peer file sharing arrangements. All such distribution of copyrighted information is, from a legal viewpoint, copyright infringement. In terms of technology, however, there may be no difference between a “file” of information for which the original publisher is interested in maintaining control of copying and another “file” of information in which the original publisher has no such interest.

To the extent that users are capable of distinguishing a file that is likely to be “illicit” in the sense that distributing it to others almost certainly contravenes the copyright owners’ interests, “self-policing” is a possible means to limit infringing behavior. The copyright owner must, however, rely on social institutions (rules, norms, and standards of behavior) rather than on technological “fixes” to solve the problem of illicit copying. Efforts continue to be made to influence these social institutions with the hope that users will eventually accept the formal rules and embrace new norms and

standards of behavior that would prevent infringing behavior. So far these efforts have not had a significant effect on behavior – the volume of copyright infringement on the Internet remains large.<sup>8</sup>

Peer-to-Peer technologies have so far only been mentioned in passing as one of the means by which the re-distribution of information may be achieved using the Internet. This is because Peer-to-Peer technologies have tended to have more to do with the institutional nature of the copyright crisis than with technological innovation in information distribution. Peer-to-Peer technologies are a specific evolution of some of the oldest elements of the Internet architecture that were meant to permit processor and storage sharing in a computer network. Although Peer-to-Peer technologies have been touted by some as “revolutionary,” their basic principle of operation involving the distribution of files or file fragments over a network of mass storage devices is very similar to some of the earliest Internet applications involving the use of Gopher (invented at the University of Minnesota around 1991), a system for listing files available for download from computers distributed over the Internet.<sup>9</sup> In the context of the copyright crisis, the specific features of Peer-to-Peer file sharing have acted to diffuse or spread the responsibility for copyright infringement. Depending upon the point of view, these features may be viewed as a defect or a benefit of the technology. It may be most accurate to view them as a byproduct of the same approach to system design that governs the Internet more generally – services are designed to be as simple as possible and, thus, do not take account of issues of file provenance or ownership.

Peer-to-Peer file sharing may involve one of two practices. The first is “opening” a networked computer’s storage system to allow other users to read (and copy) information on the understanding that others are providing a similar level of access. The second is the “opening” of a portion of a user’s storage capacity to both reading and writing information by others with the understanding that the user will be able to store information on the storage systems of other users. The granting of these permissions creates “sub-networks” of exchange defined by a list of the Internet Protocol (IP) addresses of participating users, a subset of all of the IP addresses that define computers connected to the Internet. The choice of the method of “opening” has important implications. If the “opening” only allows other users to download files from a user’s computer, the user faces a risk of being sued for copyright infringement if any of the files on their computer contain copyrighted information. When the user allows others to store information on his or her mass storage system (typically a hard disk drive), there is the further element of risk that others may store information that infringes copyright, that has malicious content (such as viruses) or that may

be illegal in other ways (e.g., child pornography). To facilitate self-governance in such sub-networks, it is possible to block specific user IP addresses, although this may not offer an effective method of protection.

The final element defining a Peer-to-Peer file-sharing network is a scheme for locating the relevant files within the sub-network that a user may wish to receive or access. (This element is subject to very rapid ongoing technological evolution and it is, therefore, inappropriate to describe in any detail the current arrangements.) In the specific history of music file sharing, the original architecture of Napster involved a centralized registry of file locations and this centralization made it possible to assign Napster with the responsibility for directory listings that pointed to copyright infringing material. Later generations of software defining Peer-to-Peer sub-networks have been based upon a decentralized “search” for files and it is this decentralization that has diffused or spread the responsibility for storing infringing files to all of the participants in a sub-network. When the user has “opened” his or her computer for “uploading” of files from other users, the user has little specific control over what files are stored on his or her computer. The fact that infringing files placed by others are there and may have little to do with a user’s intent to infringe copyright, does not appear to provide a basis for defense against claims of copyright infringement.<sup>10</sup>

Where “uploading” of files in a Peer-to-Peer network is allowed, a copyright infringing file may appear in the sub-network and be replicated in a short period of time on many different computers – identifying the originating computer and hence the original user is thus very difficult if not impossible. The “state” of the sub-network at any moment in time with regard to which computers are storing which files is not recorded by any single computer, and this information is not required to be recorded – it can be entirely ephemeral so long as it is accurate at every instant in time. Ascertaining the entry of a new file would involve querying every computer in the sub-network simultaneously about the files available, which is, in general technologically infeasible. Thus, identifying the “origin” of a copyright infringing file is not generally feasible. It is, therefore, not possible to accurately assign responsibility for origination of copyright infringing files; the alternative is to pursue users that have such files, regardless of where they originated. The problem here is that legitimate uses of Peer-to-Peer file sharing involving “opening” to uploading are vulnerable to the risk that some uploaded files will be copyright infringing. Legal action against users with copyright infringing content has therefore, so far, focused on users retaining and providing access to large numbers of copyright infringing files, a situation that argues for intent to engage in copyright infringement.

In summary, the specific features defining Peer-to-Peer file sharing technologies are: (1) the elimination of a “central” source for information and decentralization of file storage and distribution within a sub-network of users each dedicating a portion of their mass storage to collective use (either by allowing access for downloading or for both uploading and downloading); and (2) the creation of a particular scheme for identifying the information that is collectively shared among users so that copies may be requested or transferred to other locations in the network. A byproduct of these two features is that the appearance and distribution of copyright infringing files is not easily “traceable.” The same network may be used for exchange of information that has no proprietary “sponsors” and hence no DRM-related encryption, information that is encrypted using a particular type of DRM software and is only “readable” by having a suitable DRM-enabled player, and copyright infringing material distributed without DRM encryption.

As the above discussion demonstrates, Peer-to-Peer file sharing provides an effective means of distribution for files of information that is largely indifferent to issues of copyright interest. The system is equally effective in exchanging encrypted information files that must be “unlocked” with a DRM technology and files that are not locked and can be utilized by the appropriate software – in the case of media files, an appropriate “player.” The system is also designed to create perfect copies – the binary content of a file distributed over this network remains unchanged and any particular copy is indistinguishable from any other copy of the same information. This feature of making “perfect copies” coupled with the automatic distribution of copies according to the demands of users allows unlimited duplication of information – a feature that is interpreted by copyright owners as unlimited capability for copyright infringement.

These capabilities are qualitatively different from earlier generations of copying technologies used to reproduce information content. Previous technologies from plain paper copy machines to magnetic tape recording (audio and video) shared two features. First, these technologies preserved a proximate relationship between the “original” and copies (multi-generation copies (copies of copies) involved degradation of the quality of reproduction) due to imperfections in the copying technologies. Second, copies remained “material” and thus could only be distributed through methods that were of similar efficiency to those used to distribute original content. The digital reproduction of information does not preserve proximity between the original and copies – copies and copies of copies are identical to the original. In addition, the distribution channel offered by Peer-to-Peer file sharing sub-networks of the Internet can be global in scope and involve an unlimited number of users.



This qualitatively new environment sets a new context for producer and user conflicts over the use of copyrighted information. On the one hand, existing or incumbent actors would like to preserve their rights and privileges in the new environment. On the other hand, new actors are providing technological options and capabilities that disrupt the existing distribution of rights and privileges. Policymakers are confronted with the need to restore balances established in a previous era, but in the process it is inevitable that all parties will take offence. For policy makers, who are accustomed either to nudging existing institutions toward some sort of accommodation or taking a centre stage role in making more dramatic changes in direction with substantial support from a cross-section of stakeholders, this is a no-win situation – hence the basis for characterizing the current era as one of crisis.

## **New Uses for Information, and the Copyright Crisis**

The current copyright crisis is influenced in a fundamental way by technological opportunity, but its nature and extent would be quite different if it was only about the acquisition of “pirated” copies of music and video recordings. To indicate the other influences at work, it is necessary to re-examine the uses of information and the relation of these uses to a “commodity based” model of information production and distribution. Several observations are needed to establish an alternative perspective on the relation of the “consumer” to media.

The history of media<sup>11</sup> development can be seen as involving several distinct trends – the proliferation of outlets by which media can be accessed, reductions in the cost of access, and increasing ability to “record” the media that individuals experience.<sup>12</sup> The last of these developments not only provides the point of origin for the copyright crisis, but operates with the first two to create expectations with regard to the ability of individuals to control their “media environment” – the times and places in which they experience media. The operation of markets as well as individual behavior has clearly demonstrated that people are interested in “programming” the time that they devote to experiencing media – they would like to be able to hear or see media of their choosing at the times and in the places of their choosing. Technologies that favor these developments generally appear to be accepted and many of these technologies involve the recording of media – either to “time shift” or to increase portability, i.e., making it possible to “place shift,” media consumption.<sup>13</sup>

The wider implication of these developments is that individuals have been partially empowered with the ability to recapitulate past experience or accumulate experience by the repeated “viewing” or “hearing” of a particular “piece” of media. This is an abstract way of expressing a collection of related ideas – a particular piece of media or “title” may be appropriated as in “they’re playing our song,” associated with other life experiences as in “that was the summer we saw Casablanca together,” or employed for a specific use as “when I am feeling a bit sad, I sing a few bars of ‘Singing in the Rain.’” All of these, as well as the many other ways in which individual lives are built in relation to media, indicate the larger contexts in which media are experienced not only once, but again in memory and with the possibility of supplementing that memory by the replay of the media. In this wider context, individuals are seeking to time and place shift their “re-consumption” of the media even in cases where they did not initially possess their “own” recorded copy of the media. From the copyright owner’s perspective this is all quite desirable – for some media titles, persistent demand for new copies and copies in new formats will emerge. For the individual “consumers” of media, however, the value of the media is created by their own specific relationship to it – it is a value that is co-produced by the associations and the “instrument” of the listener/viewer, and the need to re-purchase the media may seem a lot like someone else owning their memories or life experience.

Neither of these observations is sufficient to suggest a fundamental rupture of the economic or legal relationship between individuals and media – the fact that the value of a commodity involves a measure of co-production with a user is not a basis for concluding that it should be freely available. The proprietors of holiday resorts would certainly not accept the view that because someone had once had an important life experience at their resort, they should be given a free room on a return visit. The distinction is that the technologies of media recording have demonstrated to individuals that had they taken the trouble to turn on the video recorder or the tape machine they would be able to re-experience an engaging experience with the media.<sup>14</sup> The influence of this knowledge, however, is powerful in shaping expectations about “scarcity” that, in general, legitimate market exchange – we pay for things that we understand require the time and efforts of others to produce (Mansell 1999).

It is this understanding of the legitimacy of market exchange in relation to both the co-production of value and to the efforts required by others that creates difficulties for the preservation of the current system of copyright. For example, one may engage in social relationships that involve meeting at the local pub to discuss world affairs. In doing this, individuals are recycling the content of copyrighted news stories or broadcasts as their

own daily experience of world affairs is likely to be limited, perhaps reducing the collective demand for these and thereby damaging the economic interests of the copyright owners contributing this material. The extension of this model of “sharing” to the physical exchange of copyrighted material is not unusual – e.g., making copies of news stories for others. When this is done, copyright infringement has occurred. While the boundary between the two activities is clear in law, it may be obscure from the viewpoint of the individuals engaged in these activities.

The final observation to be made in relation to the evolution of users’ experience concerns collective institutions such as libraries that acquire recorded media and make them available to the library’s patrons, or used book stores that resell books and other recorded media no longer wanted by their original owners. The existence of libraries and used book stores can be seen by copyright owners as an incursion on their abilities to sell individual copies of recorded media to each consumer. Some individuals will borrow from the library rather than rent or purchase a copy. The resale of a “used copy” creates market competition for the copyright owner, reducing the price that they might be able to receive for new “original” copies. In general, these forms of collective sharing and market exchange of recorded media have been viewed as a socially appropriate “leakage” in the ability of the copyright owner to appropriate returns from sales of copies.

To summarize these observations, publishers of media often have an economic interest in maintaining control of individual copies of recorded media. This same economic interest has, however, led them to distribute copies of the media through a growing variety of channels and, in the process, provide access at declining costs in forms that are not effectively protected from copying or from being transferred from DRM-compliant to DRM-ignoring domains. Individuals in turn recognize that it is physically possible to retain copies of material they find of interest by using the proliferating array of technologies available for these purposes (ranging from plain paper copiers to video recorders). Moreover, the “ownership” of media is, from the individual’s perspective, clouded by the fact that the value of media is “co-produced” by the individual’s own experience of them. While from a legal and economic viewpoint, this “co-production” of value is ignored, the general acceptance of technologies that make it possible for an individual to control the time and place of media consumption indicate to the individual that he or she “owns” the copies in the sense of having physical control over their disposition. The existence of legal lines of demarcation between possible actions such as orally relating the content of a copyrighted news article and making a physical copy of it appear arbitrary and contrived to many individuals. This

artificiality is further highlighted by the existence of libraries and used-bookstores from which original copies may be borrowed or purchased with no marginal benefit flowing to the copyright owner. In sum, from a user's viewpoint the "rules" make little sense other than being a way for copyright owners to extract money from the user.

For economists, these observations amount to an account of the consequences of the economics of information – its features of expansibility (ability to be reproduced at low or no cost) and non-rivalry (abilities of one person to use information without it affecting the ability or value of another using it) assure that any rule setting mechanisms of control and payment (other than for the first copy) will be contrived and artificial in comparison to goods and services that are not expansible and whose use involves rivalry, i.e., only one person at a time may use the good or service. Such rules are, however, needed to provide an incentive to invest in producing the first copy of the information – without them the price of the first copy would have to cover all of the costs of production – an untenable proposition.<sup>15</sup> In other words, recorded media are rather unique economic commodities that require unique rules for market exchange to occur. The observations above, however, also suggest a second important economic feature of media consumption that completes the re-examination of the relation of the use of media to the commodity system.

Using media recording and re-recording allows individuals to further their experience of media in ways that extend beyond shifting the time and location of their experience with it. Technologies for editing and combining recorded media are becoming more powerful and useful. For example, new and potentially valuable opportunities emerge as we proceed from plain paper copying where copies may be annotated with pen and ink to the use of optical character recognition in which "copies" can be processed as hypertext documents whose "annotations" may be links to other documents explaining terminology or expanding upon the exposition of the "copied" text. "Sampling" audio files and re-editing them to suit the preferences of the user began with magnetic tape recording, and with the digitization of recorded music ever more powerful techniques for modification have emerged. The excerpting of video images and the electronic processing of image files are only beginning to develop, but suggest numerous possibilities for "customizing" content according to individual interests, or for recombining content to satisfy individual preferences. All of these techniques are employable by the individual for his or her own use. As that which individuals add to the original becomes, in their own view, more significant, the desire to share and exchange with others grows, and the rules governing such exchange and sharing appear to individuals to be more capricious and arbitrary.

From the viewpoint of many users of information, it is not only that copyright arbitrarily constrains their use of recorded media, subjecting them to licensing arrangements that are opaque and fees that are arbitrary, it is that these rules force them into a position of passivity – their role is to serve as a receiver for recorded media and even where the media may be replayed for their own use an indefinite number of times, their exchange of this recorded media with others in ways that might allow independent viewing or modification of their content is viewed as a violation of the privileges and rights of the copyright owner. These constraints ignore what is technologically possible and socially desirable (at least for that part of society comprised of information users) in the use of recorded media and create an artificial scarcity in order to preserve the incentives for the initial creation of recorded media.

## **Evolution of Producer Strategies**

Because Peer-to-Peer distribution of digital content including copyrighted materials, has the features of a “super copy machine” allowing thousands or millions of potential customers to exchange identical copies of copyrighted material with one another, producers do have legitimate concerns about whether their existing business models will be able to survive. At the same time, users’ abilities to interact with one another in a common cultural space are limited to the extent that an important part of their cultural experience is based upon copyrighted information. One cannot directly share the experience of video, music, or other content despite the technological capabilities of doing so without being branded a “pirate” and facing legal sanctions. Predictably, this has led to a situation resembling a war or insurgency in which some users simply reject the legal rights of copyright owners and proceed to exchange what they want with whom they want because they have the capability to do so.

The resulting tension that emerged in the opening years of the twenty-first century was uncomfortable for all concerned. Producers found themselves in the position of having to take legal action against actual or potential customers. Users face legal risks in using the technological capabilities of the new communication medium, the Internet. Producers of Peer-to-Peer technologies had to negotiate with courts as to whether their technologies “facilitate” copyright infringement because of the uses made of these technologies. This situation was neither stable nor encouraging – it risked “poisoning” the Internet as a method of distributing digital content because users may come to disbelieve that it is a legitimate means of

acquiring any type of content. In attempting to discourage copyright infringement, producers were generating bad publicity and ill-will concerning their existing rights while having very little impact on the volume of copyrighted information exchanged through Peer-to-Peer networks. Moreover, by discouraging the informal pirating activities of individuals, the activities of actual pirates – those making counterfeit copies of original media – may have been enhanced. There was a substantial possibility that an entire generation would reject the legitimacy of existing rules governing copyright protection.

Two very different defenses of the current copyright system appeared to prevail within the copyright industries. The first defense is essentially economic – copyright is an efficient incentive scheme for supporting investment in a variety of different products, many of which do not recover the costs of production and promotion. Without this incentive, producers argue that both the variety and quality of copyright material would be diminished. This argument is subject to rational assessment and is consistent with asking questions like, “would a convenience-based business model (one that competes with ‘free’ distribution that is less well organized and promoted) recover the costs of production and promotion costs in the media industry?” or “what are the long term consequences of widespread distribution of “free” content for the promotion of commodity sales (e.g., physical CDs and related merchandise) of a particular creator’s work?”

The second defense is based upon a “natural rights” theory that publication, like performance, is an act of artistic creation and those that interfere with the absolute right to control reproduction are diminishing the creative artists and their agents, the publishers. Without contesting the moral or ethical validity of this defense, it is apparent that it is less amenable to rational analysis. Any alteration to copyright laws or any change in technology that produces negative effects for even one artist must be opposed – changes in the current system should provide higher standards of protection for the protection of the absolute rights of artists (and their publishers) to control the copying of their work.

Either argument confronts the real-world situation that users of copyrighted information are able and willing to share copies of copyrighted material using file transfer capabilities provided by the Internet including Peer-to-Peer and other methods (e.g., e-mail, ftp, etc.). Those who are making rational economic calculations will ask questions such as what will happen if we encourage or commission selective “pollution” of this “free distribution” system with corrupt files, or select a sample of infringers to be pursued with legal action (preferably with substantial publicity) in order to enhance the value of legitimate distribution. Those who maintain that

copyright provides an absolute right to control reproduction will be willing to unleash entrepreneurial legal firms to “bounty hunt” infringers en masse and to attack all infrastructures supporting such infringement with all possible means.

In the first five years of the “copyright crisis” era (2001–2006), most publishers have limited themselves to the first of these strategies. This may only mean that the latter community, those in favor of absolute property rights, is willing to see if more modest measures are sufficient to curb the behavior they see as undesirable. It may also reflect concerns that more aggressive actions will not be supported by the litigation system, which must hear those cases that are not settled after threats of legal action, and that will eventually receive complaints based on claims of “denial of service” or other legal remedies for practices aimed at disrupting file sharing networks. The most complete “cycle” of the conflict between copyright owners and the users of information has occurred in the case of online music file sharing and the history of this case provides some insights into likely outcomes with other digital media.

In the case of music file sharing, the principal technology employed is the MP3 technical standard for recording audio files with music content developed by Fraunhofer Gesellschaft, a public research laboratory in Germany.<sup>16</sup> Fraunhofer developed the MP3 technology according to the technical challenge of creating a technical standard for music compression (a smaller number file size than the original) that would preserve as much of the perceived audio fidelity of the original recording as possible. The use of this technology for copyright infringement has been facilitated by “conversion” software that makes it possible to copy or “rip” original content from a purchased CD into an MP3 file. The dramatic reduction in file size provided by the MP3 format facilitates the exchange of MP3 files over the Internet and has been the basis for a burgeoning market in portable “players” able to store hours of musical entertainment (a technology facilitating “place shifting”). Copyright owners have been unwilling to sell MP3 files directly to users because of the widespread exchange of such files.

Several different strategies have been developed to resolve this apparent impasse and the current state of the market involves rapid growth of “music downloading” services with different approaches to DRM. The most interesting of these services from the perspective of balancing producer and user interests is the development of Apple Computer’s iTunes music distribution service. iTunes is neither the first nor likely the last scheme for distributing digital content protected by a DRM system and dedicated “players” that respect the DRM system. iTunes does, however, have two distinguishing features. The first is that it is linked to a successful

(at present, approximately 45% market share) portable music player, the iPod, which supports a DRM format proprietary to Apple Computer, and second, it can also be used to make MP3 copies by a somewhat convoluted method.<sup>17</sup> Major recording companies as well as smaller independent labels have been willing to provide content to iTunes despite the potential leakage into the “pirate” domain of this content. In this case, copyright owners have demonstrated a willingness to participate in a new business model that provides only a *partial* or “weak” DRM protection for content.

The technology developed by Apple Computer is based on a bet that the convenience and functionality of staying within the rules will prevail – that customers will elect to purchase their “master” copies from iTunes (and hence indirectly from the recording industry) rather than acquiring them through direct exchange with other computer users. In effect, Apple Computer is offering high quality music files that can be removed from DRM only by suffering “quality loss” and following an elaborate procedure for making DRM-independent copies of the recording relative to the results that the user could obtain by purchasing a copy of the original disk.<sup>18</sup>

A business model similar to iTunes has been employed by others such as Rhapsody, a company whose original model was based on a “streaming” service (music chosen by the user is played on an on-demand basis with no “downloading” or saving of the file). Rhapsody has made it possible for users to “burn” copies of certain songs to compact disks. In Rhapsody’s explanation to users about what they can subsequently do with the recorded copy, the similarity of online and physical acquisition is explained:

Question: “Once I burn CDs using Rhapsody, can I make copies of them?”

Answer: “The same legal conditions apply to CDs burned using rhapsody as any music CD you would purchase at a retail store. CDs burned using our service may be copied solely for personal use of the subscriber. You may not make copies for others.”<sup>19</sup>

Other music downloading services, such as those offered by MusicMatch or Walmart, are based upon Microsoft’s digital media player technology, which retains DRM control, requiring the user to employ DRM-compliant players.<sup>20</sup> Among the companies offering such services is Napster. Napster was the original leader in Peer-to-Peer file sharing whose service was closed by court order because it employed a centralized server to locate copies of files users were willing to share and therefore could be assigned blame for the fact that many of the files users made available were copyright-infringing. The “new Napster” model is based upon the strong protection model offered by Microsoft’s Windows media player technology and the DRM-compliant WMA (windows media audio) format.<sup>21</sup>



The iTunes business model as well as the recording industry's willingness to participate in this market, indicate a possible resolution to the copyright crisis period in Internet media exchange. The key elements of this model are: 1) the development of DRM compliant models for distribution of original content; 2) the provision of a popular DRM compliant player platform that provides users with a means to meet their desires for time and place shifting of media consumption; and 3) the ability to create (at some inconvenience) copies of the media for other purposes (some of which may constitute copyright infringement). With respect to the third element, the iTunes model (as implemented by iTunes and Rhapsody) is competing with the "strong" DRM model based on the use of Windows WMA format. WMA format files may be "locked" permanently, preventing many users from transforming files into other formats (such as MP3), and therefore require the purchase of WMA-compliant players. A market test that is now underway in the music download business is whether the iTunes model will prevail over the strong DRM of retail models based upon WMA and Windows media player and preliminary results indicate that the iTunes model is preferred.

A principal question about the extensibility of this "limited intellectual property rights (IPR) protection" model is whether the second element, the creation of a popular DRM compliant player platform, is essential. The main contribution of the existence of a DRM compliant player platform is that instead of "forcing" users into a particular pattern of behavior this business model "channels" or "shapes" their behavior by making it more convenient and straightforward to stay within the boundaries of DRM than to stray from these boundaries.<sup>22</sup> Rhapsody's on-demand service can be seen as an online DRM-compliant player combined with a complementary download service providing greater portability. The absence of a player platform (either of the physical iTunes/iPod or virtual Rhapsody type) might well encourage users to exploit the third feature of the model to exchange media content with one another rather than acquiring it from the distributor. Widespread behavior of this sort would "unravel" the incentives for media publishers to provide their content to such distribution services because of unacceptable revenue leakages. The result of such an unraveling would be to shift the advantage towards the Microsoft Windows media player and WMA alternative.

A historical case provides some indication of the resistance that DRM can provoke. A common standard for transportable video files is DivX, such as those downloaded from Peer-to-Peer networks in contravention of copyright. DivX is a compression standard that ironically was developed to support a business model employing DRM-compliant player platforms to compete with conventional DVD rentals. DivX-encoded DVD video media

could be distributed in a “self-destruct” format so that after a number of playbacks the DRM compliant player would no longer work for the media.<sup>23</sup> Despite the apparent advantages of not having to make a return trip to the rental outlet, user resistance to this player led to a campaign against the player and appears to have delayed motion picture studio willingness to license films for distribution of DivX-encoded DVDs. The result was a withdrawal of the player platform from the market. The DivX compression standard did, however, remain in active use and software for converting conventional DVDs into DivX compressed files has become a major standard for online distribution of copyright infringing video content. Even after compression, however, the Internet distribution of video media represents a technical challenge due to the size of files that is easing as consumer broadband capacity increases.

One means of addressing the issue of network capacity may be the home entertainment network in which networked personal computers or other devices based on transient storage of media files are used to “order and acquire” media for future playback. If the user is willing to order in advance, downloading times of hours are not a fundamental problem (although the resulting flow of information of this sort over networks may create its own problems).

To summarize this discussion, the experience with the distribution of DRM compliant music, text, and video media files has produced a notable success in the case of iTunes, which employs a “limited IPR protection” model. The iTunes model is reproducible. Rhapsody, which is primarily a library subscription service for “streaming” or “play on demand” music, offers a similar “limited protection” sale of content, but only for a portion of its total library. With iTunes, the development of a DRM compliant player technology to “channel” users’ behavior away from copyright infringing use of the media appears to be an important feature in garnering music publisher support for content. At the same time, however, the iTunes model does not provide a “hard barrier” preventing users from making copies of music for various purposes including infringement of copyright when they distribute content to others. The iTunes model is in active competition with the Windows media player and the related WMA format which is a “strong” DRM system, preventing the conversion of files into the DRM-indifferent domain (e.g., by the creation of MP3 files).

In the case of video and film media where strong DRM prevails, as in the case of the DivX player, the technology has not been very popular with users and, in the case of DivX, provoked active campaigning by users against the technology. Whether similar issues will emerge with HD TV DVDs remains to be seen.

In the cases of iTunes and Rhapsody, publishers have clearly accepted a model that compromises between *absolute* protection of copyright and user acceptance. With slight variations, it seems possible to extend this model to other media. This appears to be the path that is now leading out of the current copyright crisis era – nonetheless, it leaves several questions about the nature of the post-crisis era to be addressed, the subject of the next (concluding) section.

## The Post-Copyright-Crisis Era

The preceding discussion has a very important limitation. It does not consider the effects on the variety and nature of media that will be made available or will come into existence as the consequence of a passing of the “crisis” struggle over copyrighted content. If a business model of partial protection of copyright content becomes the prevailing standard there are a series of implications for the existing “packaging” of media, the opportunities for entry in media publishing by both artists and publishers, and the nature of the “underground” in which copyright infringement continues to be practiced by some users.

This section considers these implications in order to provide a vision of the post-copyright-crisis era that is somewhat brighter than the scenario in which the crisis might be prolonged indefinitely, sustained by the continued existence of a large copyright-infringing underground and the relentless pursuit of these infringers by a growing and largely self-financing (from settlements and litigation awards) tribe of lawyers representing copyright owners’ interests.

The co-existence of different channels for the distribution of media suggests, and perhaps even requires, a degree of product differentiation. One method for establishing this differentiation for physical media is the “packaging” in which media is contained. Contemporary packaging reflects the evolution of past technologies. For example, the markets for compact disc collections of up to 74 minutes of musical content (“albums”) co-exist with other markets such as “singles” and compilations. The “album” compact disc roughly corresponds to the previous technology of LP (long play) vinyl records while the heritage of the single recording extends to the origins of recorded music.<sup>24</sup>

The CD, like its predecessor, provides the LP recording with a significant amount of “value added” in the form of “liner notes” and other information about the recording while “singles” (vinyl or CD) have only very basic packaging.<sup>25</sup> Many of the informational or artistic qualities of

this packaging can, in principle, be reproduced in the online distribution system but, in doing so, it is information, rather than the form and aesthetics of the package, that is reproduced.<sup>26</sup> It seems likely that, for the foreseeable future, distribution of physical musical recordings will continue, not only because of the “value added” by packaging, but because of the portability and amenities in shelving and organizing personal collections of musical media in a physical format.

Similar practices are employed in the case of video media, although the size of the “single” market, e.g., a single one-hour television program, initially appeared to be smaller. This has changed with the “packaging” concept of the “season” of episodes, a collection of DVDs providing an entire year of a particular television series. The DVD packaging format is often based upon “additional features” of potential interest to viewers such as documentary footage on the making of the film, interviews with the director or actors, and scenes that were not included in the final version. All of these features are part of the packaging that adds value to the physical distribution of media.

These observations about media packaging indicate that there are a variety of possible “formats” for online distribution. If the markets for online musical and video media content grow, they will support more diversified and specialized offerings. What can be said at this stage about such markets is that the online market for music appears to be focused more on individual “songs” than on albums (the online market for classical music recording has not yet developed strongly) and this initial focus may prove to be persistent as the market expands simply because listening habits have, in recent years, become more focused on a stream of singles than on the playing of entire albums.<sup>27</sup>

The flexibility in formatting provided by online distribution has a number of implications for the production of media content. At present, the economics of physical media promotion and distribution make it highly desirable to focus on “hits” that will sell tens of thousands more copies than the average recording. Hits or “blockbusters” offer important economies of scale in promotion and important advantages in competing for shelf space in the physical media outlets where such shelf space is very limited (e.g., retail stores in which recorded music is only one department that must compete with other products for shelf space). There are some corresponding features in the online environment – the “home page” and various “departments” of an online media store will have limited space for display advertising with the likelihood that “best selling” media will be highlighted.

Once the user begins to interactively state preferences and search for material, however, the “shelf space” for storing media offerings has no inherent limits. Moreover, because a successful online media service will draw upon a national or global audience the contents of the media library can be viewed and accessed by far more people than any single retail outlet (as the market grows, the number of users accessing the online store is likely to exceed the number of customers at even the largest outlets of retail chains for music and video). Finally, it becomes possible to create new “intermediaries” including the artists themselves, providing a guide to discography and other outlets for recorded work.

The very large library capacity of online stores raises an important empirical question about how concentrated demand will be. What share of sales will be accounted for by the top 1,000 or 10,000 offerings? At what size will an addition to the library attract zero customers? There is little evidence as yet on which to assess this issue. An interesting example involves Rhapsody, the on-demand music streaming service discussed earlier. In the case of Rhapsody, users purchase a subscription to the entire library, any entry of which can be played on demand and the amount played is limited only by the user’s available time.<sup>28</sup> In a recent examination of the issue of user demand in the new environment that appeared in *Wired* magazine (Anderson 2004), and subsequently as a book (Anderson 2006), showed that the drop off in interest in additional listings was unexpectedly small. *Every* entry in Rhapsody is being played by some user, and this trend in “consumption” was keeping up with the very rapid pace at which new content was being added to Rhapsody.<sup>29</sup> This suggests that the size of the “store” in the online environment combined with the diversity of the audience may support a great deal more diversity than is currently present in media industries.

This finding implies the interesting possibility that the online market for media may lead to greater diversification of media content, creating markets for more artists and publishers than the current physical distribution system supports. Moreover, the same capacity suggests the possibility of additional or “variant” offerings of “hit” recordings, the creation of alternative versions of the same movie, and a much greater variety of media content from all kinds of producers.

This diversification of user demand also would raise the value of the music distribution services as providing guides to content including interactive processes for suggesting new media related to the previous choices of the user, ability to search for additional work by the same artist or involving some of the same artists as previous work, and the possibility of a much larger collection of “complementary” media related to artist, venue, content of the media, history of the recording or composition, etc.

All of these possibilities are extensions of the “centralized” server model that has been employed by iTunes, Rhapsody, and other similar music distribution services. Extending this model to the Peer-to-Peer environment is relatively straightforward and offers further possibilities for the spread of the limited protection model of media distribution. Like the earlier Napster, the centralized file server can be used as a means to locate content on Peer-to-Peer networks with the distinction that the centralized file server will only be available for the location of DRM compliant material, the path now being followed by the reborn Napster as well as KaZaA following its capitulation to similar litigation.

Peer-to-Peer networks may still be used for other models of information access including infringement, but the nature of the competition between DRM-compliant and DRM-indifferent content is quite distinct – the “copyright advantage” becomes the ability to provide centralized information resources with regard to the availability of content that is distributed in the Peer-to-Peer network and excludes DRM-indifferent content.

This pushes DRM-indifferent content to a more marginal position – exchanging infringing copies among networks of friends resembles the older practice of lending recordings to others to make copies, rather than “re-publishing” the record for an unlimited number of users. It will still be possible to find infringing copies of the “hits” distributed on Peer-to-Peer networks using other means of indexing and there are likely to be continuing conflicts as publishers take legal actions against services and users. Whether these actions, which have cumulatively been targeted at thousands of users, will serve their stated purpose of “educating” users or will fuel a growing “underground” of file exchanging remains to be seen.<sup>30</sup>

If commercialized media downloading services are capable of attracting users away from the underground, the result could well be a substantial growth in entry opportunities for new media of all kinds. It is likely that the commercial model will continue to support the concentration of revenues in the “top hits,” and the business model of investing in their production and promotion. The extent of this concentration may, however, be significantly reduced as users diversify their media acquisition behavior and larger amounts of content are made available. In part, the reduction in concentration may be a consequence of greater spending on a more diverse collection of media – a preference for variety. In part, the reduction in concentration is likely to come from a modest reduction in the revenues from the biggest hits as consumers opt for greater variety.

This generally optimistic scenario remains clouded by the prospects for a continued struggle between the producers and users of copyrighted information. While the agencies of copyright owners may regard prosecuting thousands of file sharers as an educational lesson – those thousands as

well as the tens or even hundreds of thousands who actively or tacitly support greater balance between copyright owners and the users of information constitute the onset of an even broader conflict whose ultimate resolution could be a dramatic restructuring of copyright owner privilege.

At one extreme, a relatively small change in the law for remedying copyright infringement to limit actions against those who do not personally profit from infringement, would substantially alter the balance between producer and user rights in copyright information. A less confiscatory approach would be to impose a tax on the use of the network or the producers of hardware that is non-DRM compliant and the distribution of this tax to copyright owners. For those who advocate a “natural rights” theory of copyright, either of these proposals would be heretical, amounting to the confiscation of property – for those who see copyright as an arbitrary rule governing the allocation of rents from the state grant of monopoly to copyright owners, such responses might well appear to be in the social interest.<sup>31</sup>

## Notes

1. The “selectivity” of the enforcement has not yet failed to meet the requirements of US criminal law where it is not only necessary to demonstrate that the authorities have chosen to prosecute one party rather than others similarly situated, but also that the prosecuted party is a member of some group or class of individuals (e.g., the offence of being of Chinese ethnicity while operating a laundry in a wooden building, a landmark decision in the US Supreme Court’s definition of the selective prosecution defense, 118 U.S. 356 *Yick Wo v. Hopkins*, [http://www.law.cornell.edu/supct/html/historics/USSC\\_CR\\_0118\\_0356\\_ZS.html](http://www.law.cornell.edu/supct/html/historics/USSC_CR_0118_0356_ZS.html) Accessed 2 September 2006).
2. Facetiously, it is tempting to suggest that the relevant category of persons being pursued is “relatively naïve users,” those who do not take the precaution of obscuring their identities before infringing on copyright.
3. Resolving conflicts between publishers and “re-publishers” was, along with the aim of suppressing heretical texts, a principal goal of the first copyright laws (see David 1993) One of the first studies to consider the problems of copyright protection in the digital era reviewed the history of earlier electronic copying technologies (see Office of Technology Assessment 1986).
4. Concisely, there are many points on the paths that data follows in the personal computer that can be used to divert data streams to mass storage – hence, copying the signal when it becomes “clear” of encryption. This possibility is being limited in two ways. First, the US Digital Millennium Copyright Act (US Public Law No. 105-304, 112 Stat. 2860 (Oct. 28, 1998)) and the relatives of this Act in other countries have criminalized the production and sale of hardware and software technologies for achieving such diversions. Second, the creation of DTCP (digital transmission content protection), a DRM technology, and its embedding in HDTV display devices makes it possible to send an encrypted signal to the display device, eliminating the possibility of signal diversion.
5. This is a consequence of the standards adopted for players and recorders, which do not incorporate encryption. Consumer electronics CD recorders make two concessions to DRM. They accept only a particular type of recordable CD, the “music recordable CD” which is recognizable due to the setting of a “disk application flag” during the manufacturer of the disk. The recorder also sets a flag on the data of the recorded disk indicating that it is a copy and most recorders will not record *from* a disk that has had this flag set, barring copies of copies.
6. Other methods that are sometimes referred to as DRM techniques may be employed to trace the provenance of a particular recording with the aim of creating evidence of infringing copies rather than blocking the copying of information.
7. Other DRM technologies, such as “watermarking” that do not actually block copying can be employed to detect and trace copyright infringement.



8. See footnote 3 on HDTV display devices. However, the technique which is analogous to the re-recording of audio material is the videotaping of the display, a technique that at present is used to create source material for “pirated” film releases.
9. Liebowitz 2006.
10. While Gopher is a “client-server” application, the assumed asymmetry between “clients” and “servers” have eroded over time, obscuring the legitimacy of this distinction. On the original specification of the Gopher protocol see RFC 1436, <http://www.cse.ohio-state.edu/cgi-bin/rfc/rfc1436.html>, Last Accessed 3 September 2006.
11. Electronic Frontier Foundation, <http://www.eff.org/IP/Peer-to-Peer/howto-notgetsued.php>, last accessed 3 September 2006.
12. In this chapter, rather than repeating the term “digital media” the term media is employed to refer to all forms of information that might be shared with others and that might be recorded digitally. Thus, printed books can be “scanned” as digital images and are media in this definition. This definition includes information that is not ordinarily considered as media – e.g., personal communications such as e-mail messages.
13. The term “experience” is used along with the term “consume” in what follows. The latter term suggests a commodity relationship that does not necessarily apply to all forms of media – e.g., a family photo album shared on the Internet. Experience is therefore used in more general contexts while “consume” is used in those contexts where the publisher of the information is likely to be seeking an audience of “customers” or “readers” who may directly or indirectly (e.g., through advertising support) be a source of revenue.
14. Technologies that do not ordinarily involve time or place shifting, but still involve some user control of the “programming” of media consumption include video media rental, pay per view television and video on demand.
15. Of course this is not always an option; consider viewing a film in a cinema. Although the cinema film cannot, strictly speaking, be “shared” with others, the continuum of talking about the subject of the film, describing the plot, showing excerpts of the film, and acquiring a video recording of the film are all approximations of having seen the film.
16. The “effectiveness” of copyright protection is in relation to the principle alternative – providing a collective payment from society to information producers. For some types of information, e.g., scientific results, it has been possible to create a governance system that regulates the size and influences the nature of initiatives undertaken. For recorded media it is generally believed to be infeasible or undesirable to take a collective decision as to the amount of media that it is desirable to produce or to direct the activities of those who create recorded media with a few exceptions (e.g., certain forms of pornography).

17. The MP3 technical standard employs acoustic science to achieve a higher standard of fidelity to human perception of musical recording and is therefore most useful for content of this type. For many users, the perceived loss of audio quality of an MP3 file is small or insignificant, making a compressed file equivalent to the original.
18. iPod market share from Canalys (<http://www.canalys.com/pr/2005/r2005091.htm>, accessed 5 September 2006). It is possible to use iTunes to record (“burn”) a standard audio disc that can be “ripped” or stored in standard files that can, in turn, be converted in to MP3 files using other software, effectively moving the music from the DRM-compliant to the DRM-indifferent domain. Note, however, that the first step produces an audio file that is technically inferior to a copy that might be made from a compact disc manufactured by the copyright owner.
19. The AAC (Advanced Audio Coding) file compression format offered by Apple Computer is somewhat higher quality than the most commonly used settings for MP3 files. The MP3 format does, however, offer higher quality formats that exceed the quality offered by iTunes’ ability to record AAC files to MP3 disks. To employ these higher quality settings requires a higher quality original or a “master” copy such as a commercially distributed compact disk. It is important to note, however, that only a small proportion of the population can consistently identify the difference between the original and an AAC version of a musical recording.
20. Rhapsody, FAQ Section, <http://www.listen.com/faq.jsp?sect=answer>, last Accessed 3 September 2006.
21. The Websites for MusicMatch and Walmart’s music downloading services are reachable from their home pages, <http://www.walmart.com/> and <http://www.musicmatch.com/>, last Accessed 3 September 2006.
22. Napster, <http://www.napster.com/>, last Accessed 3 September 2006.
23. Apple has extended the iTunes business model to other media including audio books and videos. The principles identified above have been applied in each case although, in the case of video, users may have to use specialized equipment and software to transfer content to some devices.
24. The following account draws upon Mansell and Steinmueller (2000), pp. 322–323). The term DivX is not an acronym; it is derived from the company’s name that invented it (DivX Networks, Inc.) Confusingly, DivX (Digital Video Express) is the name this company employed for their limited play business model that employed DivX-encoded DVDs of film and a player platform for these DVDs.
25. For example, wax cylinder recordings were of individual compositions.
26. There is a problem of circularity here as the lower investment in “liner notes” and other features of the single influences the size of the market for this format as well as being a consequence of the smaller size of the market. A purely economic explanation is probably less convincing than the historical explanation that the promotion of LP recordings required additional “value added” to justify the higher unit price of such recordings as compared to earlier formats.

27. Abilities to pursue these strategies are and will continue to be supported by the copyright on such content, which can be used to pursue organized attempts by others to copy this information. The emergence of alternative “liner notes” and guides that do not infringe copyright can be expected as the size of the digital market grows.
28. More cynically, many would observe that the contents of many albums are “filler” for a few songs that are outstanding. Whether this is true, or continues to be true, when there is a level competitive playing field between albums and singles remains to be seen.
29. As noted earlier, Rhapsody is also following the emerging business model allowing users to record their own copies of an offering. This service is priced per item.
30. A possible criticism of this conclusion is that the marginal cost of playing an additional recording on Rhapsody is zero due to the fixed charge subscription nature of the service. However, this argument ignores the opportunity cost of user time – unless actual demand for these “fringe” recordings exist, users should be allocating their time to recordings for which they have a defined preference. Users may be exploring what their preferences are, but this is both consistent with their behavior and with the implications of the analysis and is a behavior that has an opportunity cost.
31. Borland 2004.

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