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THE DIGITAL ECONOMY: How Digital Goods Are Reshaping The Rules Of Commerce¹

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The telecommunications industry has been, for all intents and purpose, a commodity market. Telephone companies sold minutes of local and long distance calls, charging a usage charge for both in most cases. It is only in recent years that one can identify a shift in focus at communication as more of a service. The trend began with MCI's "Friends & Family" that treated a call as a community activity rather than minutes of communication. The result has been incredible market growth as well as a redefinition of the good. The entertainment industry is facing the same prospect, the results of which are likely to define the new rules of commerce in the Digital Economy.

The entertainment industry is characterised by the same economics as the pipes that often carry them: a scarcity in the number of channels and a high entry cost of the distribution networks necessary to reach the consumer. High entry costs are associated with the regional and national market presence necessary to build a critical mass of consumers to justify the initial sunk cost in artist development, production and marketing.

Whether it is radio airplay in key metropolitan markets, appearances on MTV, or procuring shelf space in Virgin Megastores, barriers to accessing the consumer represent the real market power held by the majors and the driving factor shaping everything from artist-label contracts to pricing restraints on retailers². By controlling the supply of content to the market, 'majors' have been able to preserve the market value of their intellectual property.

¹ This paper will be published in IDATE's special *COMMUNICATIONS & STRATEGIES* issue "From the Net to the New Economy: Critical and Prospective Views" and presented at the IDATE Foundation seminar on November 15 in Montpellier, France.

² See Wilson-Morris, Michele, Five Major Labels Settle With The FTC Over Retailer CD Pricing, MusicDish, 2000-05-11. <http://musicdish.com/mag/?id=974>



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Radio playlists have in fact been heavily guarded by the recording industry through legislation. As per the 1976 Copyright Act and subsequent amendments³, commercial radio is only allowed to play a certain songs from each CD and is restricted in how many songs they can play from a certain artist and label in a specific time period. That same radio market which provides an important marketing tool is restricted in its use of recorded tracks, for fear of cannibalising on CD sales.

In the last decade though, the cost of production has been eroding with the adoption of “home-based” recording equipment, providing content creators with affordable tools to create high quality content. This technological revolution in recording has come to head just as the maturity of the Internet brought new avenues for content creators to reach markets cheaply. The high cost of recording & manufacturing of entertainment products with the bottleneck of reaching the consumer has been replaced with the ability of new entrants to enter the market cheaply and quickly, thus lowering the value of a single product while raising the value of the market as a whole. The music industry has been the primary benefit to this revolution, however, it is quickly expanding to other entertainment industries such as film & television. New technologies is now allowing for affordable digital production and editing while the further deployment of broadband is creating the mass market to promote and distribute these products.

With the emergence of digital entertainment, whether a mp3, ebook or streaming video, there is an inexorable shift in the market from entertainment as a commodity to entertainment as a service, or an experience as some have referred to it. One reason is that the digital medium eliminates reproduction as it is subsumed in distribution. In a digital medium, a perfect copy of the original good is automatically created when it is requested. In addition, distributing (and creating) an additional copy is relatively costless. By merging (re)production and distribution, and benefiting from open platforms and formats, dot com’s in the entertainment sector have literally bypassed traditional production and distribution channels to reach the consumer. Napster is the perfect example of this new paradigm by turning every member’s computer from a client into an audio server distributing its individualised playlist of mp3 files.

³ Copyright Law of the United States of America and Related Laws Contained in Title 17 of the United States Code - Chapter 1, Section 114 - <http://www.loc.gov/copyright/title17/>



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This trend is seriously limiting content owners' ability to restrict the supply of intellectual property on a large scale and thus control its market value. This is placing the incumbent segment of the entertainment, and particularly music, industries in a very difficult position. Their traditional business threatens to go the way of the buggy while their intellectual property is being traded freely online.



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CHARACTERISTICS OF DIGITAL GOODS

Two principle factors that distinguish digital goods to their physical counterparts are the nature and cost of manufacturing or reproduction and distribution. In the case of the music industry, manufacturing costs consists of CD or tape manufacturing and copying of a static playlist of recorded tracks (the master) as well as CD inserts and casing. Although CD manufacturing may be characterized by low per unit cost and some level of diminishing costs, there are still some significant sunk costs in the building of CD manufacturing plants and scaling to meet fluctuating demand. One significant result of the presence of sunk costs is that the role of reproduction was a limited number of first press copies for independents and self-publishers. For example, manufacturing, packaging and distribution typically cost \$2.00 per unit for 250,000 CDs⁴.

In the case of digital goods such as a mp3 file, manufacturing costs consists in the initial investment in encoding software and processor power stored on a server. The encoding software is necessary to convert the master file into formats appropriate for online distribution such as mp3, RealMedia or Windows Media, and typically available for free over the Internet. The converted file is then uploaded and stored on an audio server. When a user visits a site from which the server is accessible and requests the file, he/she is effectively making a request for a copy of the 'master' stored on the server. All that is required for the actual copy to be made is enough available processing power from that server.

Thus, while outside of the sunk investment and management costs of the server, the marginal cost of an additional copy of the file is zero. The real implications lie in the relationship between reproduction and distribution in a digital medium. In the physical world, producers must deal with issues such as product warehousing, inventory control and distribution to a regional or national network of retailers. Beyond the actual distribution of the physical good, space must also be secured at the retail or marketing point. Securing retail and promotional space is probably the most critical factor in the success of a product due to limited shelf space at these points. There are only so many

⁴ See Love, Kenny, Major Label Revelation Wrought with Constipation, MusicDish 2000-01-06, <http://www.musicdish.com/mag/index.php3?id=107>



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retail points in a given geographic location, a factor accentuated in recent years by the changing nature of retail from small specialized stores to superstores such as Virgin and Tower Records. The inability to secure space in retail and marketing channels in major markets is one of the primary barriers that foreclosed the market for the independent sector.

In the online medium, a request for a digital file is made from a home or office computer, or increasingly from a mobile device such as a PDA or mobile phone. That client's device requests the file from the server that is then sent via the Internet backbone or cached server back to the client. Both the client and the server require a connection to the Internet backbone, via an ISP and backbone provider respectively. The series of subnetworks through which the file is routed en route to the client's ISP is effectuated through a series of public or private peering agreements where carriers reciprocally exchange traffic. A client connection will typically cost the consumer a recurring monthly fee with unlimited downstream bandwidth while hosting and bandwidth on the server side is charged as a two-part tariff with an initial fixed fee for a given level of storage and bandwidth. A typically virtual hosting agreement for example might provide 350 MB of storage and 8 GB of bandwidth transfer. Additional cost may also include digital distribution services such as Akamai's that cache static portions of an online presence closer to the consumer.

Unlike the physical world, there is no limit to the number of retail space. Anyone wishing to enter the marketplace need only add a new node and connect it to the Internet's network of computers. In fact, according to September 2000 Netcraft Survey Results⁵, there are over 20 million websites on the Internet. In addition, due to the Internet's decentralized nature of interconnected nodes, there are no geographic barriers to accessing virtual retail space outside of an Internet connection, and possibly linguistic and cultural differences. This effectively permits copyright owners to forego the expense associated with establishing and maintaining a regional, national or international distribution network and securing retail space to reach geographic markets.

⁵ The Netcraft Web Server Survey is a survey of Web Server software usage on Internet connected computers. Netcraft collects and collates as many hostnames providing an http service as it can find, and systematically polls each one with an HTTP request for the server name.



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One consequence has been to turn the online music industry into a virtual commons where copyright owners previously foreclosed from the marketplace made their work available freely for non-commercial purposes. Online music distributors (OMDs) were based on this very premise by allowing artists to make their music available to all, with an implicit understanding that the music was for private, non-commercial purposes. The copyright owners have thus benefited from the unparalleled exposure and by the sharing in advertising and other revenues with the OMDs, while the consumer gains a tool to access content that would otherwise have been foreclosed from the marketplace.

To provide a crude example of the impact on the market, we provide below the major and independent sector new audio releases⁶ on an annual basis.⁷

1992	1993	1994	1995	1996	1997	1998
18,400	20,300	36,600	30,200	30,200	33,700	33,100

In contrast, as of June 30, 2000, MP3.com's website contained over 515,000 songs and audio files from over 81,000 artists. In that month of June, MP3.com added an average of over 200 artists and an average of over 1,400 new songs and audio files each day.⁸

⁶ Audio releases include all new full-length audio product or re-release of catalog product previously released by another label.

⁷ RIAA New Release Figures. <http://www.riaa.com/MD-US-6.cfm>

⁸ MP3.com, Inc., FORM 10-Q for the quarterly period ended June 30, 2000, Commission File Number 000-26697



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EMERGENCE OF PEER-TO-PEER

Much has been said about the phenomenal growth of processing power, often citing Moore's Law. This is also a characteristic shared with growth in bandwidth, but equally points to its weakness: that even these growth rates barely satisfy the growing requirements of existing and emerging consumer and business applications. But if one considers the increasing demand for high performance computing requirements, they are on an entirely different scale.

A first step in addressing the problem has been computers offering a multiprocessor platform on a single machine. This has been a strategy actively pursued by Apple with its G4 PowerPC chip in order to retain its role in the multimedia and content production sector. But this demanded special "glue" chips or one-of-a-kind interconnection schemes. Massively parallel processing (MPP) brings the idea of multiprocessor platform machines to the next extreme by fitting up to up to 2048 processors on a single machine, typically referred to as a supercomputer.

To understand the relationship between MMP and peer-to-peer (P2P) networking, it is useful to consider the accomplishment of the Beowulf Project. Beowulf was the actual first implementation of using commodity off the shelf (COTS) base systems to satisfy specific computational requirements, where 16 DX4 processor machines were clustered into a high performance network of standard PCs under the Earth and Space Sciences (ESS) project for NASA. The cluster allowed for greater than a gigaflop/s sustained performance at a fraction (less than \$50,000) of the cost of a supercomputer. The success of the Beowulf project that has since extended beyond NASA demonstrated the power of networking as an alternative to the expense and complexity of dedicated supercomputing power.

Perhaps the best known and most relevant implementation of the Beowulf concept is the SETI@home project. The SETI Project (Search for ExtraTerrestrial Intelligence) is dedicated to analyzing all incoming radio signals from space for patterns that might provide an indication of intelligent life. But it generally faced a problem of a lack of resources to meet the processing power required to analyze all the incoming radio transmissions. To address the problem, a 300 Kb screensaver incorporating a software



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analyzing chunks of spectrum from the Arecibo Observatory in Puerto Rico while the client machine was idle was made available over the Internet. The resulting analysis from each client machine would be sent to SERENDIP (Search for Extraterrestrial Radio Emissions from Nearby Developed Intelligent Populations), supplementing the efforts of the spectrum analyzers on location. This has allowed the SETI@home project to provide an additional 13.5 trillion floating-point operations per second from individuals downloading the special screen saver.⁹

A notable difference between both projects that should be mentioned. In the case of Beowulf, the nodes in the cluster are dedicated to the cluster while the nodes in the SETI@home project is 'casually' dedicated to the SERENDIP lab at Berkeley University. By only dedicating nodes on the SETI@home network while the nodes are idle, the project has turned what would be client machines into part-time servers. This allows for more efficient use of otherwise underutilized computing power at little cost to all the nodes on the system, dispensing with the need for dedicated resources. This allows the project to capitalize on the networked computer aspect of MPP & COTS, using it to achieve far greater computational power than is possible in the Beowulf project, despite the 'casually dedicated' nature of the model.

P2P though extends well beyond distributing computational power as demonstrated by software like Napster. Napster is a software program that allows its users to 'share' mp3 files with other members of the network. The Napster software records and files the playlist of mp3 files to be shared with the Napster community on a centralized set of servers. As users search the directory of file names to locate and request the desired file, the software makes a one-to-one connection between the two computers, allowing for the transfer of the file. It is important to note though that Napster sole purpose is as a distribution point for the software and storing/maintenance of the directory. Its does not copy or host any files itself. As such, it simply acts as a mediator between the various nodes on the network.

⁹ "As of February, 2000, SETI@home has grown to encompass 1.6 million participants in 224 countries. The amount of computing time contributed since May, 1999 is equal to 165,000 years, averaging 10 Teraflops (about 10 times more than the largest supercomputer on the planet). It is the largest computation ever done, and has attracted the participation of 20,000 groups such as schools and private companies." <http://www.seti-inst.edu/science/setiathome.html>



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The implications of the emergence of digital goods and new distribution models such as P2P are simply revolutionary. As illustrated by earlier, the Internet represents a significant centralization from multiple inventory and retail points in the physical world to the single server-multiple client model. This leads to certain weaknesses with the model including bandwidth management issues. P2P though, by its very decentralized nature, alleviates the problem by spreading demand throughout the network. Thus, although specific nodes may be overburdened, the rest of the network will remain accessible. It should be emphasized that Napster is not a centralized P2P system in that the file directory system that allows users to locate and request files is centrally located on Napster's servers. This has not only made them subject to similar load balancing issues as traditional online distribution as well as leaving the legal entity that owns the servers subject to copyright liability.

Gnutella addresses this vulnerability issue by adopting a purely decentralized system. Instead of searching a centralized set of servers as with Napster, a query from a Gnutella user searches the Gnutella Network "horizon," or virtual vicinity. The system searches a segment of the network for the desired work, typically up to 1,000 host machines. Over the period of a connection, hosts fall off and join the node's horizon, allowing the search to be effectuated over a larger group of host than the initial segment. As users transfer files to its own machine, they then becomes available to a new set of host as the machine shifts from segment to segment. There is no centralized server through which all traffic is routed. The decentralized P2P concept has been further improved by Freenet, which uses intelligent routing and caching to further alleviate bandwidth load.



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IMPLICATIONS FOR DISTRIBUTION

Herein lies the danger for content owners and distributors. The music industry continues to be characterized by commodity pricing. This is largely due to the fact that major label revenues are predominantly derived from CD sales. As such, the focus of the industry's online strategy has been to prevent CD sales cannibalization through control of online product supply and distribution. In the absence of this control, copyright owners would be unable to maintain pricing control. The industry has thus taken the lead in defining new rules for online digital distribution that would replicate the same condition as offline.

This fundamentally concerns two factors: access to and use of content. In the traditional model, content owners determine a price at which they will make content available to consumers. A consumer in purchasing the copy acquires certain rights such as over the property of the CD (First Sale doctrine) and usage of the content (Fair Use). Under the First Sale doctrine, copyright owners relinquish exclusive rights to sell and distribute the purchased copy, while fair usage dictates how copyrighted material is used by the consumer. The First Sale doctrine in particular illustrates the contrast between the commodity and digital markets. When a consumer redistributes their purchased copy (of say a CD), he/she must actually relinquish and transfer his/her rights under the doctrine to the new owner, unless an additional copy of the work is made. The supply of CDs does not change, there is simply a transfer of property rights.

But, in the case of a digital good (say a mp3 file), there is no relinquishing of the purchased copy as copying and distribution are a single function. The consumer retains their First Sale rights over the original copy as well as imparting those same rights to the owner of the redistributed copy. Thus, the copyright owner in reality loses control over its monopoly right to dictate the manner in which the copyrighted work is distributed, and consequently its market price.

For this reason, content-based industries have been hostile to all home recording technology since the 8-track for fear that it would facilitate the illegal redistribution of their works. The reality has been that it was not economically feasible for the average consumer to make any significant impact on overall supply. But the new characteristics of the digital medium completely alter this reality, empowering the average consumer to



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become an important distribution channel. P2P provides an additional blurring of control that amplifies significantly this point. Even in the context of the Internet, copyright owners retained some control and enforcement of where their music was distributed. Major OMDs typically required proof of ownership of the copyrighted material while copyright owners such as the Harry Fox Agency, Performing Rights Organizations and the RIAA actively pursued the illegal distribution of copyrighted material over the Internet.¹⁰

Copyright owners' impotence in this area has been further highlighted by the case of Napster. Metallica, a leading band having sold tens of millions of CDs, have themselves led a public campaign against Napster, where Metallica songs are freely traded. Metallica hired a Web surveillance company and identified 317,377 Napster users who allegedly had copyrighted Metallica songs on their hard drives. After Metallica brought this list to Napster's attorneys, the 317,377 users were barred from using the Napster software. However, since, many of these users have returned under different Web pseudonyms. Realistically, the recording industry and bands such as Metallica cannot go after every such consumer individually. Another tactic has been the applying of pressure towards universities, where mass deployment of bandwidth has led the consumer wave towards services such as Napster, to remove Napster from being accessed by their network.

¹⁰ "The number of commercial sites in the U.S. generating DMCA (Digital Millennium Copyright Act) notices in the first six months of 2000 increased by more than 200% over the number of notices sent in all of 1999."

"There was also a 28% increase in the number of notices sent to link sites facilitating the downloading of unauthorized files in the first six months of 2000 over the number of notices sent in all of 1999, and a 348% increase in the number of online auctions removed from the internet in the first six months of 2000, compared to the same time period in 1999."

Recording Industry Releases Midyear Anti-Piracy Statistics, RIAA , September 19, 2000.



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REWRITING THE RULES OF COPYRIGHT

P2P, through the Napster lawsuit by the RIAA, has ultimately raised a more serious challenge that may redefine the rules of copyright. Napster's rebuttal to the preliminary injunction¹¹ filed by the RIAA with the 9th Circuit Court relies on a surprisingly simple argument: that the activity by Napster users consist of private non-commercial sharing of music, legal under the fair usage provision of copyright law.

To support this argument, the defense refers to the Audio Home Recording Act of 1992 (AHRA) and its interpretation by the 9th Circuit Court in the Diamond Rio case. "The Ninth Circuit held under the AHRA that the primary purpose of the AHRA was to facilitate personal use." In referring to AHRA, the defense points to the Act's Senate Report which states: "[t]he purpose of [the] Act is to ensure the right of consumers to make analog or digital audio recordings of copyrighted music for their private, noncommercial use."

There is little dispute that the sharing of copyrighted music over Napster has been for noncommercial purposes. Although Napster users benefit from the service and attach a value to the convenience and scope it offers, they receive no monetary compensation for their activity either directly or indirectly from making available mp3 files from the playlist on their hard drives. The intent of the activity is to share with a larger community recorded music they have encoded in the mp3 format for their personal.

To support its argument of private use, the Napster defense attempted to make the case by demonstrating that the activity performed through its service is analogous to what has been found as legal private use by the Court. It points to an Office of Technology Assessment report which determined that taping CDs or records borrowed from friends, and giving copies of one's own CDs or records to friends, to be synonymous with "personal use," "private copying," "home use," and "private use." It further refers to the Diamond Rio portable mp3 player which "merely makes copies in order to render portable, or 'space-shift,' those files that already reside on a user's hard drive."

¹¹ Opposition of Defendant Napster, Inc. to Plaintiffs' Motion for Preliminary Injunction, Case Nos. C 99-5183 and C 00-0074 MHP (ADR)



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The defense thus concludes: "If a consumer can copy an mp3 file from his or her hard drive without violating the copyright laws, it is self evident that Napster's Internet directory service does not violate the copyright laws either." This defense has attracted support from the computer and Internet industry, including the Commercial Internet Exchange, Computer & Communications Industry Association, Information Technology Association of America, and United States Telecommunications Association.



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THE ROLE OF DRM

In this environment, there are serious questions being asked regarding the ability of developing viable business models that will compensate copyright owners. To address the question, the industry has turned to digital rights management (DRM) as a solution to building a marketplace. DRM has two components: authentication and usage controls.

The business model behind it is to restore content owners control over intellectual assets by setting rules on how the good would be used by the consumer. As such, DRM to some extent is meant to restore the 'soft' rules in the Old Economy such as fair usage and first sale doctrine, and incorporate them in a 'hard' manner within the good. In this manner, content owner would be able to recapture some control over supply, and consequently value.

The authentication component ensures that the copyrighted work can only be accessed by the owner of that copy. For example, a consumer purchasing a digital file would require a key to unlock the security features and execute the file. As such, even in the case that the file were distributed over the Internet through a server or P2P platform, the new recipient would require the key to open the file. The usage controls component ensures that the copyrighted material is used in a manner consistent with the copyright holder's wishes. These include rules over how it may be stored, copied, distributed and played back. Often times, this key is housed on the users hard drive and is non-transferable to other hard drives. This has raised concerns of a further restriction on consumer's Fair Usage, not allowing users to transfer their audio file to another of their computers or PDAs.

The music industry's initial attempts at DRM came about with copyright protection directly on the CD product. Many of the latest CD releases of the top artists now contain encryption of the music to prevent mass pirating of physical CDs as well as slow the advance of the songs on these CDs showing up on software like Napster. However, the music industry has been slow to implement this encryption of CDs, possibly due to concerns that the encryption will be cracked by hackers as well as to its work on new formats such as DVD audio. Many artists have been complaining that the delay and un-enthusiastic endorsement of encrypting CDs is one the primary reasons for the proliferation of illegal digital files of copyrighted music on the Internet.



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Perhaps the best example of the industry's efforts is the Secure Digital Music Initiative (SDMI). SDMI was an initiative spearheaded by RIAA "to enable consumers to conveniently access music in all forms, artists and recording companies to protect their intellectual property and technology and music companies to build successful businesses in their chosen areas."

The impetus for the initiative a result of the RIAA's lawsuit of Diamond Multimedia Systems, Inc. The lawsuit claimed that the company's Rio portable mp3 player violated the Audio Home Recording Act (AHRA) of 1992, which requires manufacturers to pay royalties as compensation for the illegal duplication of music. The RIAA also argued that the Rio does not incorporate a serial copyright management system, which prevents the illegal manufacture/copying of second generation copies.

The purpose of the SDMI's Forum's work is to provide a technical environment for the secure distribution of digital music to next-generation portable digital music players (PDMP). As presently defined, the SDMI environment is made up of three layers: (i) the application layer which includes software to extract, store, distribute, playback as well as establish Usage Rights; (ii) the personal device (PD) layer which includes equipment used for the transfer and playback of SDMI-compliant content; and (iii) the Licensed Compliant Module (LCM) which acts as a gateway between the application and PD layers.

From the perspective of copyright holders, the key is in the ability to establish Usage Rules, which governs consumer's use of the SDMI-compliant content. The Usage Rules basically apply to three primary functions: copying, distributing and exporting SDMI-compliant content to non SDMI-compliant components. Distribution is controlled by a Check-out/Check-in feature The feature acts as a referee ensuring (i) that no more copies than are available can be transferred to a PD, and (ii) that original copies are destroyed as they are copied to the new destination PD or application layer. In addition, the copyright holder may limit the number of times music may be copied to other devices by 'binding' the content to a unique ID embedded in each PD.



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AN ALTERNATIVE VISION

In the absence of a secure distribution model, OMDs have relied on alternative assumptions that the marketplace is changing from a commodity market to a service one. This alternate model takes an opposite vision from encryption and DRM - in a digital medium, scarcity gives way to the plenty. In a service market, content is simply a vehicle around which value-added services and other revenue channels are developed over its life. Perhaps the best example of a similar transition is the video market. Traditionally, the value of a movie had been determined by box-office receipts, much as music's value is presently a factor of CD sales. But with technological innovation that brought cable to the home as well as the VCR, the value chain of video grew and spread across complementary markets. This significantly altered the value of content by extending its effective market lifespan through product repackaging and differential pricing. A video's value is the aggregate revenue generated initially from box-office receipts, followed by rental, pay-per-view and subscription cable, cassette sales and advertising-supported broadcast television. Further, revenues have been generated by the licensing of names & characters from the video. One need only to look to movies such as Star Wars and Disney's Toy Story to see the bonanza derived from character licensing for toys and third party promotions, just to name a few. Copyright holders are able to significantly expand their market by providing a menu of experiences that the consumer can choose from. Non-theater receipts presently account for 50% of Hollywood revenues.

MP3.com, the original leader in the market, has proposed the "music service provider" (MSP) model. By creating a new user experience around its content and leveraging its intellectual assets into new markets such as traditional retail and wireless markets, it has broadened its revenue base from initially web site advertising to subscription services, retail music revenues, syndicated radio advertising revenues, music licensing, and music-related merchandise. The MSP model thus interlinks all the different services associated with a music single or album, thus shifting the emphasis from the commoditized music to the value-added by those complementary services offered. As such, MP3.com acts more akin to a cable company versus a traditional music distributor: a basic service of free music supported by advertising, much like network TV, a subscription service which is analogous to the premium cable channels such as HBO, as well as My.MP3.com, a



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service similar to pay-per-view (except for the fee structure) by allowing consumers to listen to their CD collection anywhere, anytime, on-demand.

The value of content in this environment is in its ability to build and attract a sufficient number of listeners to build a critical mass. Under this model, viral marketing and market saturation are keys to reaching profitability. This model shifts the focus from the value directly extracted from a commodity through restrictive controls, to using network externalities and value-added services to create value.