Abstract

Digital technologies and, especially, the Internet are profoundly reshaping the motion picture industry. Video-on-demand heightens the trend toward digitalization and disintermediation. In the short term, the increasing use of digital technologies may result in significant cost reductions throughout the value chain. In the long term, the digitization of film production and distribution may induce a significant restructuring of the motion picture industry. Digital film delivery may displace physical films, videos and DVDs, thus threatening the long-term survival of video rental stores and other middle layers in the value chain. Taking an economic and strategic perspective, this paper examines the impacts of digitization on the motion picture industry with a focus on disruption and disintermediation of the value chain.

INTRODUCTION

The motion picture industry has not been traditionally perceived as a high-tech business. However, recent advances of digital technologies and, especially, the Internet are changing the movie industry. Digital technologies not only have the potential to reduce the cost of the movie-making process, but also have profound implications for structural change of the entire industry. With the Internet, movie producers and studios may bypass traditional distributors and deliver movies directly to end consumers through new technologies such as video-on-demand (VOD). New broadband connection, digital file compression, streaming and encryption technologies would make video-on-demand a viable reality. Entire business segments may be disintermediated while traditional players in the middle of the value chain may be eliminated or forced to transform their business models into new types of aggregators and intermediaries. The Internet thus raises the issues of disintermediation, restructuring of the value chain, and shift in bargaining power. These are the research issues we seek to study in this paper.

A disruptive technology is a technological innovation that revolutionizes a standard way of doing business. By their very nature, disruptive technologies, like fax machines, VHS videocassettes, and MP3 music files, often threaten to overturn entrenched industries and stalwart business models. Take video-on-demand, for instance. Not since the introduction of the videocassette recorder has a disruptive technology so threatened the very heart of Hollywood. Not only does video-on-demand explicitly seek to usurp the traditional channels of delivering movies, but it also challenges the profitability and fortitude of a number of related industry sectors.

The video rental sector is particularly vulnerable. Here, the Blockbuster and Hollywood rental stores face an immense challenge to the value proposition that they hope to offer the consumer. Location and selection have been two compelling criteria in the video rental industry, but video-on-demand negates their utility significantly. With VOD, selection is almost infinite and geographic proximity is inconsequential. Hence, disruption of the industry becomes real.

It is with this critical eye to the future that we address the impending disruption that new digital technologies will have on the motion picture value chain, especially how the Internet will affect the digital distribution of motion pictures. We recognize that MP3 and Napster’s disruption of the music industry is only a prelude of the phenomenon to come for the movie industry.
industry (Zhu and MacQuarrie 2001). The only thing preventing this from happening has been the lack of sufficient bandwidth and the compression technology necessary to transmit digital pictures and sound in good quality and acceptable speed. Once these inhibiting factors have been removed by technological advances, the movie industry is likely to experience chaotic transformations.

The goal of this research is to assess the impact of the Internet and VOD technology on the motion picture industry. Of particular interest is how digitization of film production and distribution will affect the structure of the value chain. The research will also identify the players that are most vulnerable to disintermediation. For example, digital film delivery may displace physical films, videos and DVDs, thus threatening the long-term survival of video rental stores and other middle layers in the value chain. The emergence of the Internet as an online film distribution channel also changes the competitive dynamics of the industry. The theoretical foundation is based on the economics of digital goods and transformation of industry structure (Bakos and Brynjolfsson 2000; Shapiro and Varian 1999; Varian 1999; and Vogel 1998).

For the remainder of the paper we address these issues in the context of various segments along the motion picture value chain. We look into the ramifications of VOD on movie studios, distributors, theatres, video rental stores, and cable companies. We start with the underlying technology that will make all of this possible. It is from this point that we move into the other facets of this topic.

**DIGITAL TECHNOLOGIES**

A set of technological developments drives the change in the motion picture industry. The main technological forces include:

- broadband Internet connection;
- digital file compression;
- streaming media; and
- encryption.

These technologies allow video files to be digitized, stored and transmitted via digital networks, which in turn made video-on-demand possible. VOD allows the viewer to choose from a large database of movies located on a video server, and have full control on playing the movie (for example, start, pause, replay, rewind and fast forward).

Video-on-demand is transmitted primarily through two media: digital cable network and the Internet. Cable companies such as Time Warner and Cox Communications are leveraging their fibre optic network with VOD technology companies such as Concurrent, Sea-Change and DivaTV to provide VOD to their network customers. With broadband Internet connections reaching more and more households, VOD through the Internet is also becoming a viable media for movie distribution.

**Digital Cable Networks**

To allow customers to select the movie from a standard database, the movie media is first uploaded to the mainframe computer for storage and distribution. The storage library accepts media from different formats and stores them in the library. The movies are then digitally uploaded to the video server of the cable company where the viewers can select the movie through the set-top box to the television. The selected movie is then uploaded to the digital link, which converts the MPEG file to an RF signal for transmission. Then the link establishes a one-to-one connection to the serving residence and the movie is ready to be viewed.

**Internet VOD**

Internet VOD sites provide similar services except that they bypass the cable company and play directly to the computer rather than to the television. VOD sites such as Mediatrip.com and Sightsound.com host the movie databases that the viewers can download to their computers. The movie files downloaded are usually compressed to speed up the download time. A typical movie is about 200 to 500 megabytes. Download time varies depending on the connection speed (presently about 20–40 minutes with a T1 connection). After downloading, the viewer has full control over the movie similar to VOD through the cable TV network (replay, rewind, fast forward). The file is viewed using a media program such as Windows Media Player or Real Player.

In order to view the movie, a password is necessary to launch the file. The files are encrypted to prevent file swapping. In the case of Sightsound.com, the password is actually computer specific, so it prevents the movie file from launching from another computer. The movie can either be purchased or rented. In the case of rentals, the movie has a time limit at which the viewer can access at will, after which the authorization code has to be renewed prior to further viewing.

Currently cable TV connection has a higher penetration rate than Internet access in the United States. There are 68.5 million households (a 65.4% penetration rate) with basic cable as of year 2000. In comparison, 54.4 million households have Internet access (a 52% penetration rate). This suggests that the Internet would not take over cable TV in the short term. Yet the Internet is penetrating faster than any other media. The number of US homes with broadband Internet access grew quickly from 0.6 million in 1998 to 4.8 million in 2000. It took nearly 20 years for video cassette recorders (VCRs) to reach 85.8 million households, but it took approximately 5 years for the Internet to reach 50 million households — it appears that households will eventually adopt the Internet as one of the primary means of film watching. How long this will take is dependent upon technological development of
digital compression, VOD, streaming and other related technologies.

THE MOTION PICTURE VALUE CHAIN

The value chain of a motion picture includes production and distribution, as illustrated in Figure 1. The production of a movie is a complex process that involves many different owners and suppliers. Owners can include the screenwriter, producer and the movie studio that will ultimately distribute the finished movie. The creators of the movie, the content producers, can operate independently of the movie studios that market and distribute the movies. In this case, the movie studios act as the aggregator and distributor of the finished movies. Suppliers in the motion picture industry include the people that work on the movie, such as the actors and editors, the equipment manufacturers, the suppliers of the film stock, and the companies that develop and duplicate the finished film.

Production

The production phase is where the actual shooting of the movie takes place. The film that is shot each day is sent to the film lab for development into ‘dailies’ so that each day’s shooting can be reviewed during the production of the movie. The ‘dailies’ allow the movie producers to monitor the creation of the movie as it is being shot. After shooting has been completed, the movie is assembled during the post-production stage. During this phase, the raw film footage is edited and reduced into the final movie. Visual effects, music, sounds, and voice-overs are also added during post-production. Once the movie has been completed, it moves on to the duplication phase where thousands of copies are made for distribution to the movie theatres. A film duplication service is usually contracted to perform this function. It has been estimated that movie studios spend about $850 million a year on duplication services, and another $450 million in delivery-related costs (Putnam 1999). As is discussed later, these costs could be substantially reduced by digital films and Internet delivery.

Distribution

Motion pictures are typically distributed through multiple channels. Consumers differ in their taste, preference, urgency and willingness to pay for the movie. In order to maximize revenues, studios release films to the distribution channels in sequential release windows, typically in the following order: movie theatres, video rental stores, sell-through videos, pay-per-view television, premium channels, and finally basic cable/network/syndicated television. This is illustrated in Figure 2.

A film’s success depends largely on its theatrical performance, which in turn affects the performance in video rental and other distribution channels. Rentals (along with video sales) are a substantial revenue stream for movie studios. Video rentals and sales combined account for about $7.3 billion, or 48%, of the $15.1 billion of domestic
revenue in 1999 (Hollywood Entertainment 2000). This revenue stream is especially important to the large number of movies that are not box office hits and are not profitable in theatres.

In recent years, the major studios have faced rising production and marketing costs, with the average cost per film increasing from $26.8 million in 1990 to $54.8 million in 2000 (MPAA 2001). The rising costs of production and marketing encourage studios to seek cost-cutting opportunities, and digital distribution appears to be one such opportunity.

**IMPACT OF DIGITIZATION**

Before the Internet emerged, the revenue models, distribution channels and the industry structure related to motion pictures had changed little. As movies are being digitized, the nature of the industry structure will undergo significant transformations. We have identified that the major structural changes will be likely to occur in disintermediation and bargaining power. The digitization of film production and distribution has the potential to disintermediate some of the middlemen in the industry. In addition, the bargaining power of movie studios over the content producers may decrease and the number of content producers may increase due to the lower costs of digitally produced movies.

Yet the disintermediation and shift in bargaining power are structural changes of the industry that will take years to realize. In the short term, one immediate impact of digital technologies on the motion picture industry would be cost reductions in the various production and distribution phases.

**Cost Reduction**

In the production stage, there would be significant cost reductions if a movie were produced using digital technologies as opposed to physical film. Much like digital still picture cameras, digital movie cameras eliminate the need for costly film. In addition, the cost of creating ‘dailies’ can also be avoided. Traditionally, movies have been edited by physically cutting and splicing together the actual film stock. This was a tedious process that left much room for errors. With the increase of processing power, it is now possible to edit and assemble digital movies on a personal computer. Computers also reduce the cost of adding special effects and sound editing.

In the distribution stage, as discussed earlier, the Internet has created a new distribution channel for motion pictures. Currently, sites like AtomFilms.com allow users to watch short movies through streaming video. It is unclear if and when feature length movies will be made available over the Internet, but as adoption of broadband technologies increases and streaming technologies improve, the Internet distribution channel is likely to gain in momentum. In addition, digital projection systems have been introduced to replace the traditional film projection systems in movie theatres. Hence, not only individual consumers, but also movie theatres will increasingly rely on the Internet to ‘download’ digital movie files. The widespread adoption of digital technologies has the potential to reduce distribution costs dramatically.

Theoretically, digital movies could reduce the marginal costs of duplication to almost zero. The low or even zero marginal costs of digital goods have been documented in the literature (Bakos and Brynjolfsson 2000). This characteristic of digital video files may open up new strategic uses of bundling and versioning (Varian 1999).

**Disintermediation**

As movie production is increasingly digitized, and the Internet becomes a viable distribution channel, several types of businesses along the traditional value chain may be seriously impacted or even eliminated. The following players have been identified as most vulnerable to disintermediation, which is defined as the elimination or reduction of the middle layers in the value chain.

- **Film Manufacturers, Processors and Duplicators** – A movie that is produced digitally with digital cameras will eliminate the need for film stock. This leads to the potential for disintermediating not only the manufacturers of the film stock, but also the businesses that process and develop the exposed physical films. Initially, the need for ‘dailies’ will disappear, but as theatres become equipped with digital projection systems, the duplication of finished films will also be reduced if not eliminated. These businesses will either disappear or have to transform themselves into other types of movie-related service providers.

- **Distributors and Video Rental Stores** – The distribution of movies over the Internet will be likely to disintermediate the video rental stores. Once streaming technology and the Internet evolve to the point where the quality of the streamed movies can compete with the quality of videotapes and DVDs, the need to rent physical videotapes will be seriously reduced. As the use of the Internet to distribute movies increases, traditional video rental and retail businesses such as Blockbuster would have to adapt to digital videos and change their business models, or else they will face the threat of being eliminated. Disintermediation will happen: the question is ‘when’?

It depends on when the Internet will provide the kind of bandwidth and quality of sound and picture good enough to compete with videotapes.

We will discuss the potential disintermediation of other parts of the value chain in more detail in the ‘Implications’ section.
Shift in Bargaining Power

Currently, the high cost of producing a movie allows movie studios to exert a large degree of bargaining power over the content producers. This is due to the fact that many content producers require financing from the movie studios in order to pay for the high cost of production. The high production cost tends to concentrate the entire motion picture industry around a few major movie studios that have the money required to finance movie projects. The high costs also create barriers for new movie producers to enter the industry. As the digitization of movies increases, costs may be reduced to the point where small independent producers are able to finance their own movie projects. As movies can be self-financed by the content producers, bargaining power may shift to the content producers from the large dominant studios. As a consequence, the motion picture industry may become less concentrated, and a more competitive landscape may emerge in the industry.

IMPLICATIONS OF THE INTERNET FOR STAKEHOLDERS

We have discussed a framework to examine the major impacts of digitization on movie production and distribution. With this framework, we now analyse each of the stakeholders along the distribution value chain.

Movie Studios

When a motion picture studio releases a new feature, it effectively has a monopoly product – no one else can provide that same product. Thus, the studios release movies through sequential distribution channels as illustrated in Figure 2, to extract incremental sources of revenue by price discrimination. The fact that movie studios have control over the content will enable them to retain a powerful position in the new value chain. Still, to accommodate film releases over the Internet, studios may need to modify the release windows. Given the studios' reliance on theatres and video rentals for revenue, studios will have to maintain a balance between safeguarding the existing sources of revenue and the need for online distribution. When the Internet becomes a financially attractive means of distribution, studios may also need to revise the release windows – perhaps at the detriment of other distribution channels.

Compared to the music industry, movie studios are cognizant of potential piracy issues. The music industry did not encrypt digital music files and resisted offering music over the Internet. Napster exploded on the scene and caught the music industry completely off guard by allowing people to download music freely without paying for the songs. Knowing this, the movie industry has instituted encryption coding to control feature releases by distribution channel or by geographic market. Several major Hollywood studios, led by Sony Pictures Entertainment, are pursuing a new service that will allow consumers to buy movies over the Internet (Jacobson 2001).

While increasing consumer convenience, video-on-demand also provides the studios with instant feedback on the film from its viewers. Studios need to adapt their abilities to become providers of all future content – not just feature films, but also short films, and direct to video releases. The Internet short films can be a 'farm league' for identification of promising actors, directors and writers. Future release plans can be adjusted with information from viewer feedback to maximize further revenue. Hence, the interconnectivity of the Internet allows studios to capitalize on the data and information of customer preference and demand, which would otherwise be difficult to collect without the Internet and VOD.

Distributors

The role of the film distributor is to acquire film masters from the movie studio, copy them onto the media (reels for movie theatres, videocassettes for consumers), and distribute the product to different types of customers. This is the aspect of the value chain that will suffer most as VOD becomes more prevalent. The technology of VOD will entice movie theatres to invest in the equipment necessary to 'download' the films directly from the movie studios, instead of paying a distributor's markup to purchase a film. Even though the equipment would be expensive, movie theatres would realize that the investment would pay off, as the marginal cost per film would decrease substantially.

As movie theatres migrate towards this new model, the importance of the movie distributor will decrease. Both movie studios and theatres stand to gain by disintermediating the distributors and splitting the distributors' margin between them. Movie theatres could circumvent the distributor and acquire the film at a lower unit cost, while movie studios will encourage the rapid adoption of VOD because of the lower distribution costs. As a result, distributors will find themselves squeezed from their customers and suppliers simultaneously.

Movie Theatres

The industry, with 7,421 movie theatres, is already in flux. Theaters are closing older-style multiplex screens in favour of newer, larger megaplexes that feature more amenities. These include stadium seating, bigger screens, plusher seats, and other amenities. Video-on-demand will heighten the trend toward megaplexes. A similar situation occurred with the advent of the videocassette coupled with the inception of the video store. The pressure from videocassettes has forced theaters to make movie-going much more meaningful than just sitting down and watching a movie on a screen. It also forced movie theatres to show 'blockbuster' movies more than before. If a movie
did not do as much as expected, the movie theatre would pull the movie because the consumers chose to ‘wait until it comes out on video’. Video-on-demand will intensify the pressure. It will make the theatre business more differentiated with added valuable social experience, as VOD will enable the potential moviegoer to stay home, download virtually any movie they want in a relatively short time, and watch it at the exact time they want to watch it.

Since the trend to close screens will accelerate, there will be even greater pressures for movies run in theatres to make money. As a result, movie theatres increasingly have to weigh a movie’s potential success to determine whether to purchase and use their limited screens to show the movie. As a result, it is possible that a 20-screen megaplex might only be showing 5 different movies because the consumer will now prefer to wait until VOD to see movies not good enough to make the ‘top 5’. More pressure will be placed on movie studios to make movies good enough for theatres, while consumers can view the majority of films via the VOD format.

In terms of the risk of disintermediation, unlike the video rental stores, movie theatres are unlikely to be disintermediated. Watching films in theatres – with high-quality sound and lighting effects – is a unique and valuable experience that cannot be replicated easily over the Internet. It is a social experience that consumers value. It could be argued that the movie-going experience is ultimately where the movie theatres add value and not necessarily the movie itself. With most theatre circuits going to a ‘megaplex’ model, the intensified competition will force theatres to attract moviegoers with even more amenities than before.

**Video Rental Stores**

The Video Software Dealers Association estimates that about 50 million consumers make a trip to a video store each week. Video rentals are considered to be a valuable medium of entertainment for the following reasons: a broad selection of movies is available; consumers have control over viewing functions (start, pause and rewind); and more than one viewer can be entertained as a group or family for a reasonable price. At the same time, the market is extremely fragmented. The five largest video rental chains control only 41% of the market share, with the remaining 49% of the market served by single-store owners (MPAA 2001). The fragmentation is driven by the customer’s desire for convenience and location and by low barriers to competition – a rental business can be opened with little upfront capital and customers are willing to use the shop if it is close to home.

As discussed earlier, movie rentals and sales represent a large portion of studios’ revenue. The studios earn incrementally more revenue from video rentals than other forms of distribution (except via theatres). Naturally, studios are motivated to support a medium of providing the content that does not require the cost of producing videocassettes. At the same time, given a choice between driving to a video store to rent a movie (then driving back to return the movie) or simply downloading a movie from home, consumers would choose the latter. Thus, as video-on-demand is increasingly preferred by both movie studios and consumers, the rental industry will be increasingly squeezed from both ends.

However, existing rental companies have not appeared to be taking the threat of VOD very seriously. For example, Blockbuster’s stated growth strategy, according to its latest annual report, is to increase US market share to over 40% of the home video rental market within the next few years. They plan to accomplish this by increasing same-store revenue, expanding the store base (both in the US and internationally), and spreading expenses over the larger base (Blockbuster 2000). Hollywood Entertainment’s latest annual report provides similar plans for expansion: focused primarily on expanding the number of rental stores. Both Blockbuster and Hollywood Entertainment view their competition as other retailers that rent videos, and non-video providers (that is, direct broadcast satellite, digital TV networks). The companies either do not identify VOD as a competitive threat, or view it as a technology that is ‘many years away.’

Reacting to disintermediation – new business models. In order to survive, these companies must redefine their competition to include video-on-demand, and recognize this as the primary competitive threat facing their traditional business models. With the upcoming digital distribution – whether it is conducted by studios or by Internet-based distributors – video rental chains will be forced to adopt the Internet. Otherwise, it is possible that digital films’ displacement of videos as the dominant means of distribution may eliminate the video industry altogether.

Video rental chains may need to partner with a firm that owns the distribution technologies but lacks customer base. We have seen the first steps in this direction with America Online’s recent $30 million investment in the continued development of Blockbuster.com; Blockbuster’s contract with Metro-Goldwyn-Mayer to distribute films digitally online; and Hollywood Entertainment’s $90 million acquisition of Reel.com (a film-related search engine) which will eventually enable the company to distribute films digitally over the Internet.

As another potential business model, video rental companies may find new roles as content aggregators and filters (or infomediaries), providing a value-added service to end consumers who may otherwise have to sift through an enormous number of movie titles. Hence, there is a need for a VOD rental service provider: a company that has agreements with all movie studios to provide access to movies, maintain copies of digital movies on servers for downloading, support customer accounts, administer encryption keys, and collect rental fees. Existing large rental companies already have expertise in many of
these fields and have the name-brand recognition among consumers.

Cable Companies

The effects of video-on-demand on cable companies are strategically subtle. In the near term it offers the promise of a truly dynamic pay-per-view business model. In the long term it may challenge the fundamental underpinnings of the entire cable sector. It is this strategic aspect that we will now focus on. It will, however, require us to make certain assumptions regarding the future state of technological development. This includes superior compression technology, large, cheap and installed bandwidth, customer-friendly connections to the TV and performance equal to or better than today's standards. With these assumptions in place, we can then attempt to make a logical argument that VOD will not complement the cable industry, but could challenge one of the cable's primary business functions, content management.

Our theory is that, given sufficient technological capability and performance, VOD will relegate the utility of cable companies to network provider status. No longer will cable companies pick and choose which channels appear on its subscriber-based network or garner profits from pay-per-view programming, but cable companies will be charged with ensuring superior quality-of-service through their installed infrastructure. After all, why would motion picture companies offer their movies to the cable company pay-per-view channels when they can market them directly to the consumer through an Internet portal?

Such technologies are already coming online. For instance, Internet2®, a non-profit consortium of 180 universities and over 60 private companies, is developing and deploying advanced network applications and technologies over an infrastructure that is superior to the existing Internet. This infrastructure makes high resolution, streaming or packeted imagery a reality. Furthermore, current compression technologies allow normal length movies to be compressed into a digital format of VHS quality and transmitted via the Internet within an acceptable download time. Finally, quality of service and interconnectivity over the Internet is increasing dramatically.

These innovations make it easier for motion picture studios to sell their products directly to the consumer thus lowering their respective barriers of entry into the market. Should studios choose to leverage this technology, consumers could then bypass cable's monopoly on what they view and link directly to the studios themselves. As the web-based intermediaries become the norm, cable companies will not be able to restrain the number of Internet channels appearing over their infrastructure. These same Internet firms will be able to disseminate their films over any other substitutable medium, like DSL or phone lines.

In sum, cable companies face a strategic threat to their current business model. Shortsighted actions to capitalize on the capabilities generated by VOD may come at the cost of the long-term threat to the profitability of the industry as a whole. Then VOD would truly become a disruptive technology for the cable companies.

CONCLUSION

We have examined how digitization of film production and distribution will affect the structure of the motion picture value chain. This is an important topic because not only does the motion picture industry represents a $15 billion business but also it illustrates how digitization will induce deep transformations in industry structure when the nature of the product changes from physical to digital. The interplay between technology and business goes well beyond the movie industry. The economics of digitization may have wider implications for other digital goods industries. For example, digital music, online magazines, and e-books will likely confront the same challenges soon, where digitization of products and delivery herald a significant change in established business models.

Traditionally a physical good, movies are increasingly being digitized. This permits distribution through the Internet in conjunction with video-on-demand technologies. Different economics of digital goods brings fundamental differences in the production and distribution process, which in turn would cause transformations in value propositions, business models, and industry structure. Video-on-demand is a disruptive technology in the sense that it has the potential to change the entire landscape of the motion picture industry. Various stakeholders in the industry will have to adapt and change their business models or risk being eliminated from the new value chain. The bottom line is that as VOD develops as an industry standard, the industry segments with control of the two most important assets, content and customer, will eventually hold the power in the new value chain.

These predictions are contingent on the technological developments and adoptions by various players. How soon the Internet will become a viable distribution mechanism for motion pictures depends on advances of several key technologies such as broadband Internet connection, digital file compression, encryption and streaming media. Whatever path this will take, the motion picture industry will be a highly dynamic sector and a fascinating test field on how technological innovations disrupt existing industry structures.

Notes
1. Disintermediation is defined as the elimination or reduction of the middle layers in the value chain.
2. This research has been conducted in the United States; hence most of the examples are drawn from the US motion picture industry. While this may be biased, it seems that the research issues studied in this paper
may be relevant to movie industries in other countries as well.


4. Source: Jupiter Research, as reported in MPAA 2001.

References