Sports over IP: Dynamics and Perspectives

by

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Abstract

Technological advances are allowing the use of the Internet Protocol and the Internet infrastructure mainly built by cable and telecom operators for broadcasting purposes in the U.S. This disruption raises a business issue for the existing value chain, as new entrants are upsetting the existing value chain for video delivery. This thesis will focus on the implications of online video delivery for Sports content in the United States. The general question that is addressed in this thesis is:

How would a shift toward Internet-based delivery systems influence the current value chain for Sports broadcasting?

Case studies will first show that the broadcasting industry is prone to disruption, and that online video delivery has the potential to upset the existing value chain, and the business models associated with it.

The question can be then divided into three sub-categories, which deal with the technical issues, regulatory needs, and business model changes that Sports over IP may cause – which are explored in separate chapters in the second part of this thesis.

In the last part of the thesis, a system dynamics model is used to study the technological and regulatory conditions under which the market will tip towards predominance of broadcasters by content owners in the post-disruption value chain. Building the model with the standard procedure (described in the thesis) will give insights on what the main dynamics are, and how interrelations and feedbacks among those main dynamics can influence the whole system.

Thesis supervisor: Charles H. Fine
Title: Chrysler LFM Professor of Management and Engineering Systems

To Pauline, for her understanding, patience and love.

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This journey has not only been an intellectual one, but also a personal one, far away from my roots. My biggest thanks go to my family; and particularly to my fiancée, Pauline. Two years ago, I had to risk a lot for MIT to happen; yet all I have met when the time came for me to make my decision has been support and encouragement. Words cannot describe how grateful I am to you, Pauline. It is you that allowed me to realize this dream. Thank you. This work contains all the energy that you gave me day after day during those two years. And it is for you.

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Introduction

Over the past two decades, the Internet and web technologies have transformed the entertainment and media industries. The iTunes Music Store, launched in 2003, has become the largest music retailer in the US, while the Amazon Kindle and Google Books are set to fundamentally change the way people access and read books. Those two industries have seen major disruptions, and the locus of value chain control has shifted very quickly.

Likewise, TV is moving onto the Web. However, due to the large investments required by television and TV's close links to the Internet infrastructure itself, the shift toward Internet-based delivery systems seems to be taking place at a significantly lower speed than other media. TV is perhaps the last remaining pillar of the old media business that has not transitioned on the Internet. Yet, for numerous reasons, it seems likely to fall. At this juncture, while the transition of TV to the web is in seeming slow motion, studying the transition process seems timely.

Sports will be the focus of the study, as it has often fostered innovation and technological shifts in the television world, and this "star" type of content does not depend directly from broadcasters.

The thesis will therefore address the following question:

How would a shift toward Internet-based delivery systems influence the current value chain for Sports broadcasting?

More specifically, is the shift toward an Internet-based delivery system desirable for the sports and broadcasting industry as a whole? What will be the impacts on the consumer? Are we looking at another war on Digital rights management and piracy control? How is this change likely to upset the current set of regulations that govern sports content creation on one side and broadcasting on another? What will be the main dynamics at stake, and what are the policy levers likely to be key in this shift?

Relevance

This work is primarily addressed to stakeholders of the sports broadcasting value chain – team owners, league commissioners, producers, broadcasters, carriers, advertisers – as well as policymakers involved in broadcasting and Internet regulation in the United States. However, this study has also a broader impact, and can be taken as a practical case aiming at giving insights in the broader context of the disruption of the broadcasting industry – and the existing entertainment and media complex – by the Internet.

Television – even when narrowed down to broadcasted sports – represents a multi-billion dollar industry, as well as a communication medium accessed by 99% of the U.S. population, for four hours per day on average.[1] The potential shift of sports programming to the Internet could have an important impact socially, economically, and legally. The fact that the Internet is upsetting the whole television industry could have huge repercussions on the economic model of broadcasting, advertising, and the accessibility (both at a technical level and at an economical level) of the broadcasts.

Given the trans-disciplinary nature of the problem – which has ramifications in the technical infrastructure, the business models and the existing regulations – the Technology and Policy setting that will be used for the thesis is compelling. The specific methodology used in this thesis will allow acknowledging for the interdependencies between those different classes of problems, rather than treating them separately.

Structure of the thesis

This thesis can be divided into three parts, which correspond to three different stages of the reflection on Sports over IP.

First, two case studies in chapters 1 & 2 will look respectively at the history of Sports broadcasting and the disruption of the music industry with the development of Internet delivery channels in the last 10 years. These case studies will set the foundations for the analysis, as well as give a little bit of perspective that will be useful for the rest of the study.

Then, chapters 3, 4 & 5 will look more specifically at three separate categories of issues associated with the development of Sports broadcasting over the Web: respectively, the Internet and broadcasting infrastructure and broadband incentive problem, the economic issues associated with the need for new business models, and finally the potential threats associated with the regulatory context in which the

Internet disruption is taking place. Each of these chapters will use specific frameworks and will build on the previous case studies, to try to generate three sets of recommendations for each category of issues.

Finally, in chapters 6, 7 and 8, a System Dynamics model, built on the analysis done in the previous chapters, will be presented and used to unify the work done in the bulk of the analysis of chapters 3, 4 and 5. This model will help understand better the interplay between all the stakeholders, the potential issues that could arise in the future, and the conditions under which the new models associated with the broadcasting of sports on the Web could be successful.

Chapter 1. Sports broadcasting: from over-the-air to the Web

The history of sports on U.S. television is tightly interwoven with the development and success of the major television networks and media empires. While sports played a significant role in the initial development of television in the United States, they have been following the evolution of television from its beginning, driving innovation and historically being controlled by the predominant players on the market at any given time. Sports indeed acted as a catalyst when the cable TV began to overtake over-the-air (OTA) TV during the 1970s, and cable networks have since increasingly been broadcasting major sports events. Today, sports could play again that catalyst role, as the apparition of Web television is disrupting the traditional television business models.

I. 1939-1970: The development of a business model

a. Television perspective

According to pioneering sports television director Harry Coyle, "Television got off the ground because of sports. Today, maybe, sports needs television to survive, but it was just the opposite when it first started."[2] The first televised sporting event was a college baseball game between Columbia and Princeton in 1939, covered by one camera providing a point of view along the third base line. But the first show to actually become a regular sports broadcast was NBC's *Gillette Cavalcade of Sports*, which premiered in 1944 with the *Willie Pep vs. Chalky White Featherweight*

Championship bout. [3]

In their early years, broadcasted sports would not attract enough eyeballs to generate attractive advertising revenues – there were indeed only 190,000 TV sets in use in 1948. Instead, broadcasters were looking toward the future of the over-the-air television, and aired sports as a means of boosting demand for television as a medium. They believed their strategy would eventually pay off in advertising revenues. Sports did indeed draw viewers, and although the stunning acceptance and diffusion of television cannot be attributed solely to sports, the number of sets in use in the U.S. reached 10.5 million by 1950. According to Coyle, "When we (NBC) put on the World Series in 1947, heavyweight fights, the Army-Navy football game, the sales of television sets just spurted."[4]

The central role of sports on early television programs can be explained by different factors. First, sports competitions were readily available to broadcast, contrary to other kinds of programs that required new ideas, actors and studios. Second, technical and economic factors made sports attractive to the developing medium. Early television cameras were heavy and cumbersome and needed bright light to produce even an acceptable picture. Outdoors sports with fixed angles of view, like baseball, complied perfectly with these constraints. This made sports inexpensive to produce, a primary concern when the audience was small and not yet generating large advertising revenues.

The initial broadcast technology, television over-the-air (OTA), used radio waves to send content to the U.S. households. Since radio bandwidth was a scarce and valuable resource, the Federal Communications Commission (FCC) heavily regulated OTA TV broadcasting. In the 1970s, only the 54 to 88 megahertz and 174 to 220 megahertz were available for OTA television broadcasting. Given that a single television network would take 6MHz of bandwidth this would only leave room for 12 analog TV channels. Due to other major barriers to entry – broadcasting television at the national scale required enormous investments that were only affordable for big media companies; three major national TV networks dominated the national market: NBC, ABC and CBS.

b. The fan experience in 1970

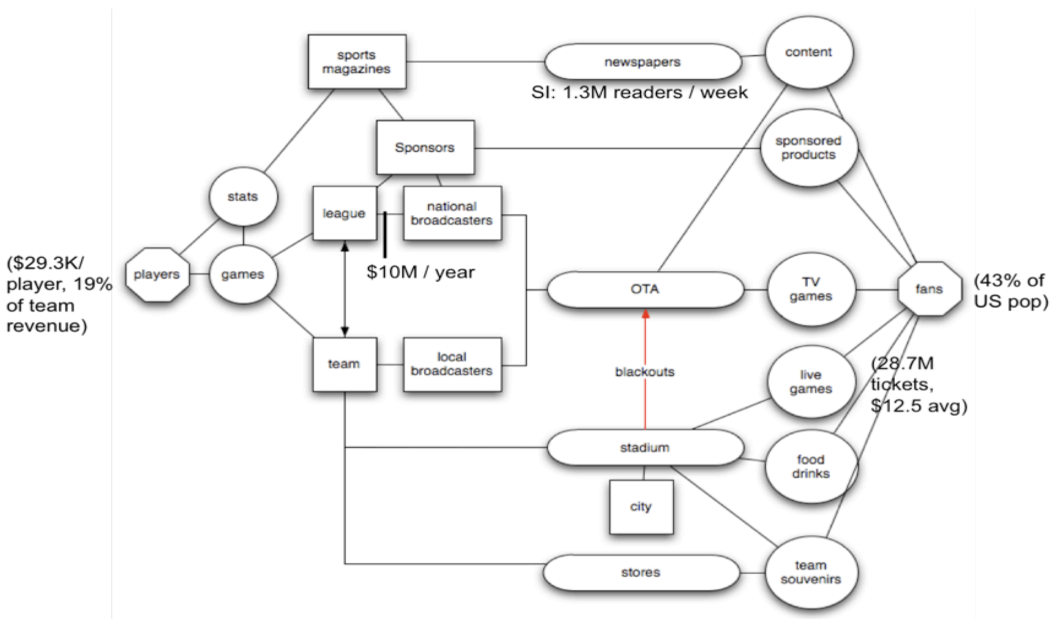

Figure 1-1: Delivery model for Major League Baseball in 1970

The figure above represents the delivery channel (or value chain) for a baseball fan in the early 1970s. At that point, the offering was very well defined, and information and goods would flow in dedicated and exclusive delivery channels. For example, fans would get news feeds from either TV programs or specialized publications. The latter were very popular in 1970: each week, 1.3 million American citizens would read *Sports Illustrated*, the most famous sports magazine in the US. These two media would be partly supported by "sponsors" that would benefit from advertising space to a very specific audience of sports fans.

The choice of watching sports on television versus going to see a live game was still relatively easy for a fan at that point. Tickets were relatively inexpensive, and the value offering of television was inferior to the live experience on almost every level: the TV watcher would feel isolated, the image quality on a standard screen was only passable, and the technology would not allow image processing for enhanced highlights. Furthermore, the TV offering was incomplete, as leagues had implemented very strict blackout policies that guaranteed that games that were not sold out (90% of the tickets sold) prior to kickoff would not be shown on television. This was a way for the leagues to deal with the threat represented by television, as gate revenues were their primary source of revenue – far above advertising revenues or TV broadcasting contracts at that time.

Additionally, fans that chose to see a live game would have to bear little more than the price of the tickets. Food, drinks and souvenirs accounted for a small portion of the total expenses. The Fan Cost Index – a measure of the cost of attending a game for a typical U.S. family was still low at that time, with ticket expenses representing the lion's share of the cost.[5]

II. 1970-1985: The acceleration and the development of cable networks

a. Television overview

Between 1970 and 1985, broadcasted sports increased their role as central piece in the television offering, and experienced impressive growth. In 1970, the networks paid $50 million to broadcast the National Football League (NFL), $2 million for the National Basketball Association (NBA) and $18 million for Major League Baseball (MLB). In 1985 those figures had risen to $450 million, $45 million and $160 million respectively.[6] Just as sports had played a central role in the development of over-the-air television in the previous decades, the development of major broadcasting networks and the development of alternative modes of content delivery produced this ten-fold increase in 15 years.

As television coverage quality improved, the supply and demand for broadcasted sports was increased and diversified. The development of cable and satellite networks during the 1970s provided new broadcasting spaces that welcomed the increased content. Indeed, while bandwidth and air time were scarce resources in the dominant over-the-air networks, cable networks allowed the creation of numerous inexpensive additional channels. WGN, WTBS, and HBO, were among the first cable channels to broadcast national sports events. ESPN, the first cable channel to be completely dedicated to sports, was created in 1979. By 1986, it was reaching 37 million subscribers.[7]

As a reaction to cable TV's successes, the legacy television networks saw the broadcasting of big time sports as the hallmark of institutional supremacy in broadcasting. CBS, NBC and ABC bid increasingly large amounts of money to maintain control over the broadcasting rights for major sports leagues, while video recording (the VCR), newly empowered independent stations, and cable providers presented new challenges. Rising fees for rights to major sporting events were not, in themselves, a problem for the networks. Since they still retained the vast majority of the U.S. viewing audience, and hence, a dominant share of advertising revenues, their margins were sufficiently high so that they could afford these increasing fees, while the cable and independent channels often could not.

To remain aggressive and to make the most of their expensive contracts with the major sports leagues, the networks began broadcasting more sports. But spots on sports shows would have been easier to sell had there been fewer of them on the market. The three networks together showed 1,500 hours of sports in 1985, double what they programmed in 1960. With about 8 minutes of commercials an hour, the addition of even relatively few hours of programming had a noticeable effect on the supply-and-demand balance of the commercial spot market, driving advertising prices down to a significant degree.

b. The fan experience in 1985

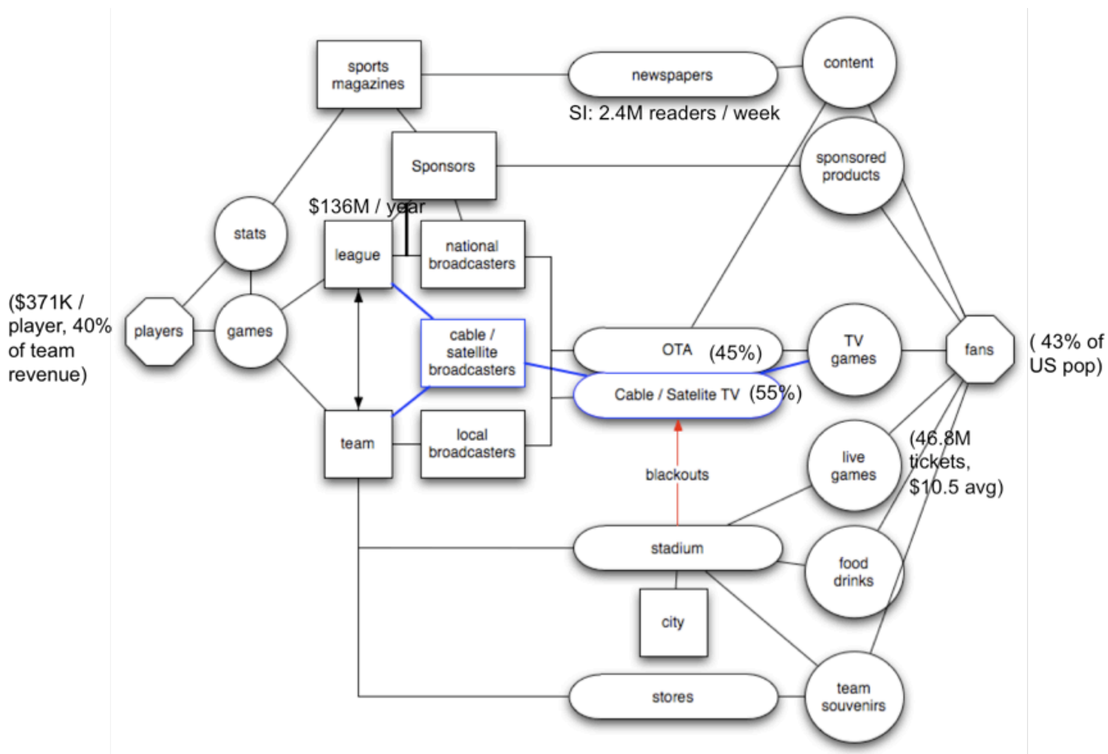

Figure 1-2: Delivery model for Major League Baseball in 1985

By 1985, the seeds of disruption for television delivery of sports were well entrenched. While the OTA TV audience size had remained fairly constant in 15 years, cable and satellite networks had more subscribers than OTA by 1985. However, as cable networks business models were still evolving and their audience was still growing, the vast majority of top-quality sports content was still on OTA broadcast TV.

Other traditional media such as newspapers were still growing, and *Sports Illustrated* is a good example of this growth. The #1 sports magazine's readership almost doubled in the 15 years between 1970 and 1985, partly thanks to the broader variety of sports content on TV.[8]

Another phenomenon that began to change the balance of power in the sports value chain was the change in the player reservation system. The most dramatic upheaval occurred in Major League Baseball (MLB). Historically MLB players had been subject to the reserve clause, which was interpreted to its strictest, as granting a team the perpetual option on the player's service. In a series of labor market victories beginning in the wake of the *Flood v. Kuhn* decision in 1972 and continuing through the rest of the century, the baseball players' contract conditions greatly improved, as they won the right to free agency (i.e. to bargain with any team for their services) after six years of service, as well as escalating pension contributions, salary arbitration, individual contract negotiations with agent representatives, reductions in maximum salary cuts, and other benefits.

No longer were players shackled to one team forever, subject to the whims of one owner for salary and status. With freedom to bargain with any and all teams, salaries rose dramatically. The average salary skyrocketed from $45,000 in 1975 to $289,000 in 1983. While this transformation did not affect the fan experience directly, it had multiple repercussions. The growing share of the payroll in team's budgets created a need for more revenue, and created a complex dynamic which drove a rapid sustained growth in the value of the broadcasting contracts between the league or the teams and TV channels, as well as pressure to maintain high attendance in stadiums while increasing the fan base, and, indirectly, an increase in the price of the tickets.

Similarly, players' salaries in football increased dramatically during the 1970s and 1980s, reflecting strong growth in gate and TV revenues for the league, as well as player successes in courts in the 1970s. The NFL Players Association has however been relatively less successful than the other players associations, for reasons such as the short player careers and the prevalence of team play over individual success.[9]

III. 1985-2005: The explosion of the offering and the advent of Internet

a. Television overview

Since 1985, the clockspeed of broadcasted sports has accelerated. There are more hours of televised sports today than ever before. Sports continue to draw a large total audience, but it is an audience fragmented among many available choices. Despite the NFL Super Bowl's continually growing audience and increases in the price of a 30 second advertising spot ($700,000 in 1990, $2,100,000 in 200 and $3,000,000 in 2009), it remains a television anomaly, unique as a television and cultural event. Otherwise, ratings and number of viewers for individual television sports programs in the US have seen a continuous decline since 1970, as exemplified below in Figure 3 for the MLB All-Star games.[10]

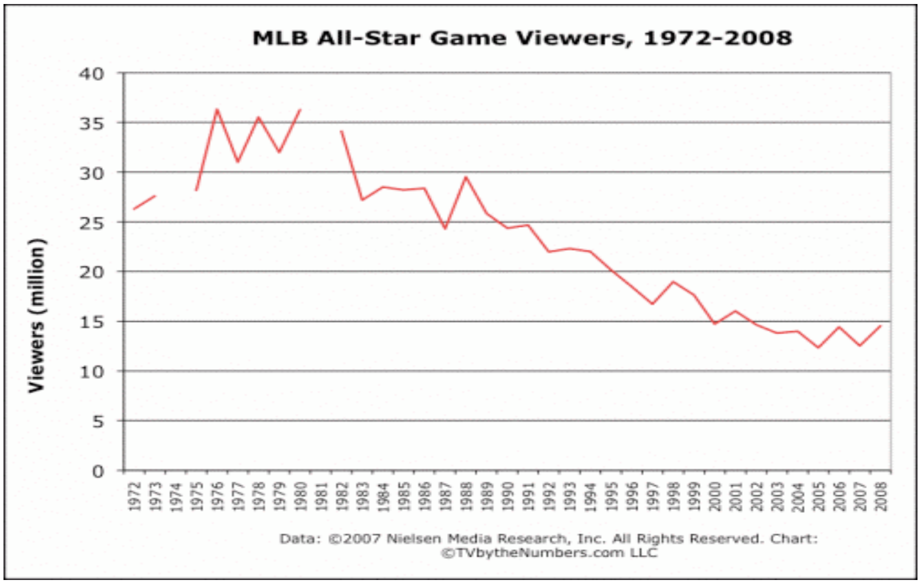

Figure 1-3: number of unique viewers for the MLB All-Star Game, from 1972-2008

This does not necessarily mean that the population is losing interest in sports on television. Rather, as new cable channels continued to appear, and more and more sports are broadcast online, the television audience has become even more divided, splitting eyeballs and revenues among a wide range of offerings. To make up for falling revenues per hour on all its programming as they began to lose audience, the legacy networks began to raise the price of advertising time on sports shows to cover the huge rights fees contractually owed to the sports leagues.

This dynamic, initiated in the 1970s, has significantly changed the balance of power in sports broadcasting. The huge rights fees that national networks were ready to pay to keep control of this premium content in the 1980s have become high enough to represent a burden. In the meantime, the landscape became much more favorable for cable networks. By 1986, cable and satellite broadcasting networks had reached

60% penetration in the US market. Sports content became affordable for cable networks as subscription revenues grew over time, ensuring another revenue stream on top of the traditional advertising revenues. Furthermore, sports programming was cheaper to buy and air than other types of shows, especially first-run programming for cable channels and local broadcasters.

This new landscape created even more opportunities to expand the cable TV offering. ESPN, for example, launched ESPN2 in 1993, ESPN Plus in 1995, and ESPNU (a channel dedicated to college and university sports) in 2005. More recently, sports leagues themselves have taken this opportunity to create their own cable channels (the NFL network was launched in November 2003, the NHL network in October 2007 and the MLB network in January 2009)

In addition, Internet advances, broadband availability, and online video streaming have not spared sports content. While broadcasting used to require huge initial investments in infrastructure and production capabilities, the increasing availability of broadband Internet is changing this trend. Much like music, news and other media, the sports new media participants – content owners, online platforms, end-users and even players themselves – are empowered by the shift of sports programming to the Internet.

Leagues, that already started to produce their own content with dedicated cable networks, are now starting to deliver video on the Web as well. Sports content has gone mobile, too. MobiTV, the leading mobile television service in the United States today, with over 5 million users, offers a mobile version of ESPN. Content has been adapted to fit a cell phone screen, and the mobile channel allows subscribers to watch their favorite teams on-the-go.

Pirated sports content distribution is also on the rise. Recent technologies are empowering the end users, giving them tools to rebroadcast content seamlessly on the Web. While this solution is only appealing to relatively tech-savvy consumers, it could gain momentum just like peer-to-peer (P2P) sharing did in the case of music.

While these services are still in their infancy (MLB.TV started 7 years ago and has around 1 million subscribers), they are perturbing the television landscape, adding variety, opening up the traditionally closed delivery networks, and threatening the existing balance of powers among the leagues, the networks and the carriers.

These new paradigms and the business models associated with them will be studied in detail in Chapter 4 of this thesis.

b. the fan experience

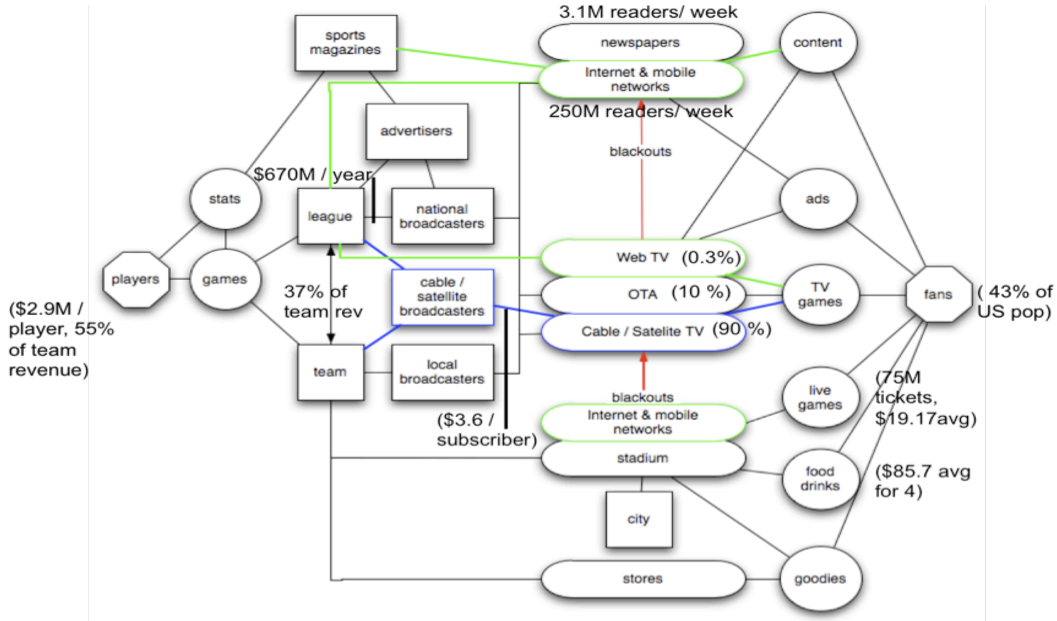

Figure 1-4: Delivery model for Major League Baseball in 2005

The Fan Cost Index for live sports performances has risen steeply since 1985, to a point where live games are out of reach for the least advantaged fans. The average price of going to a baseball game for a family of four has risen from $79 in 1990 to $164 in 2005. Attendance in the stadium, however, has held steady, creating a rich source of additional revenue for teams and leagues.

One result of the Internet–centric activity in sports has been a change in the sports news delivery channel. While sports fans used to read specialized magazines (e.g., *Sports Illustrated)*, read the newspapers, or watch TV shows to check the scores or see highlights of their favorite teams, the development of Internet has allowed content providers and content aggregators to put this content online, thus making it available any place, any time. Websites such as ESPN.com, NFL.com or MLB.com are among the most popular of these sites. ESPN.com now accounts for 0.08% of the global page views on the World Wide Web, and has more than 22 million unique visitors. [11] Those websites have grown to act as multi-faceted portals that offer everything that a fan wants. MLB.com for example is a data repository (features scoreboards, standings, rosters, schedules, portal to team websites…) that supports community life via fan forums, and also offers premium content (e.g. players interviews, "behind the scene" clips…). It even serves as an e-commerce portal to buy tickets, T shirts, caps, etc.

In the past ten years, new online and mobile services have emerged in addition to the traditional TV experience. While these services were aimed initially at complementing the live and TV experiences, and presumably did not seek to disrupt these well-established and profitable industries, they planted the seeds for a potential new major disruption in sports broadcasting.

Conclusion

While sports co-evoluted synergistically with the television broadcasting networks in the early history of the medium, the current and future states of the genre look quite different. There are more televised sports today than ever before and they continue to draw a large total audience, but the audience is fragmented among many choices. ABC, NBC and CBS with their advertising-only revenue streams are at a competitive disadvantage to cable networks that have both subscription revenue and advertising revenue available to them. Therefore, sports on television is less likely to appear on a national network, and the development of new broadcasting media, especially via the Internet, will likely only accelerate this shift.

As we will acknowledge in the next chapter, Internet has a tremendous disruptive potential, and the first uses of Internet in the sports broadcasting area– that will be discussed in more details in chapters 3,4 and 5 – suggest that a disruption in the value chain for sportscasting is likely to take place, both at the technical and business levels. But before looking at the underlying issues of this potential disruption in more depth, let us study briefly how the Internet has already disrupted the distribution value chain in another part of the entertainment and media industry: music.

Chapter 2. Music over IP: how the Internet has already disrupted other sectors of entertainment and media.

This chapter will describe how the seeds of the disruption of the music industry were planted, and the radical changes that this industry has known with the use of Internet as a new broadcasting and retail channel. The aim here is not to try to look back and learn from the mistakes that were made, in order to come up with a set of "ideal policies" that would solve the problem. The models that have proven successful for the music industry more than ten years ago may not be very useful in the case of Sports. Indeed, we should not neglect the fundamental differences between how those two types of content are produced and consumed, nor should we forget that today's vision regarding the Internet, what it is capable of, and how it can be used is very different from what it was a decade ago. As we will see, the main focus in the case of music was piracy, and the radical change in the value chain dynamics the industry has known came as a consequence of the fight on piracy. For Sports content, the problems seem to arise from a potential upheaval of the value chain, and piracy seems to be merely one consequence – although potentially important – of this dramatic shift.

While the drivers of change seem different, sports media seems nonetheless to be following a disruption that is similar to what happened with music in the 1990s. More precisely, new Internet-based, open channels are disrupting the legacy distribution channels, such as cable television or over-the-air television. Just like the mp3 and Napster redefined the way music was produced, distributed and consumed, the early experiments of Sports over IP are demonstrating new distribution channels and new ways of watching sports. Therefore, looking at what happened in the music industry as a case study will allow us to pinpoint issues that are likely to arise in context of sports broadcasting, and could help us identify the dynamics that will drive those changes.

In order to stay aligned with the rest of the thesis, this study will focus on the U.S. market, and will primarily focus on the "mainstream" market, which is represented here by the four major music labels (Universal Music, Sony Music, Warner Music and EMI) that retain rights on 70% of the music worldwide.[12]

I. A brief history of the transition to "Music over IP"

In the 1990s, the compact disc (CD) was the main channel used by artists and labels to distribute music content. The CD had been introduced in the market in 1982[13] and was a mature technology. While this support had been considered as a disruption to the audiotape when it hit the market, it did not change dramatically the way music was distributed. Just like they used to do in the 1980s, music labels would regularly release new albums from their in-house artists containing around ten songs. The marketing and shipping processes were very similar to what was done for the audiotapes – only the support was different.

In fact, the next real disruption to this powerful and robust distribution model did not come from the media labels themselves, but from a variety of other technological innovations that empowered the consumer during the 1990s and led to online file sharing. Advances in audio software technology along with the rapid increase in computer power and storage capacity allowed end-users to digitally rip and compress the audio files contained in their CDs. The MPEG-1 Audio Layer 3 (MP3) technology, released in 1994, acted as a key enabler for file sharing.[14] MP3 reduced the size of an audio file by more than a factor ten, without considerable loss of quality for the listener, making it possible to download an average-sized (3 megabytes) audio file in less that 15 minutes with a basic 1997 Internet connection using a 56Kbps modem.

This technological leap, in conjunction with the rapid adoption of the Internet in US households and the development of networks in U.S. colleges and universities, led to the development of online file sharing communities. While centralized downloading websites like MP3.com were popular at first, Shawn Fanning's peer-to-peer (P2P) software, Napster, released in the fall of 1999, quickly changed the way users would share files, and led to a rapid increase in traffic, both in number of users and number of downloads per user. Files could now be exchanged directly between users rather than passing through a centralized intermediary, while a centralized index of available content gave users an efficient way of finding music.

The P2P network proved efficient enough to represent real threat and attract the ire of the major music labels and the Recording Industry Association of America (RIAA.) A suit for "contributory and vicarious copyright infringement" under the Digital Millennium Copyright Act (DMCA) was filed within weeks after Napster's launch.

The online service was ultimately struck down in 2001 by the United States Court of Appeal for the Ninth Circuit, which found that "Napster users infringe at least two of the copyright holders' exclusive rights: the rights of reproduction, § 106(1); and distribution, § 106(3) (…) The court found that the owners of Napster could control the infringing behavior of users, and therefore had a duty to do so." [15] Napster was shut down a few months after the decision, as it was unable to comply with the ruling. In the meantime, legal action from the RIAA had encouraged innovation in two opposing directions.

a. The development of illegal online file sharing

Post-Napster, P2P networks simply got better at circumventing authority or exploiting regulatory loopholes. By decentralizing all functionality and eliminating the centralized index of available content that had caused Napster's demise, P2P services like KaZaA and Grokster eliminated potential points of legal attack. When the RIAA and the Motion Picture Industry sued KaZaA and Grokster in 2001, the defendants argued that their services were not liable for illegal activity that occurred on their networks because they did not manage a centralized directory. Indeed, under the Sony safe-harbor principle[16] that was set by the Supreme Court in the 1980s: "…the sale of copying equipment, like the sale of other articles of commerce, does not constitute contributory infringement if the product is widely used for legitimate, unobjectionable purposes. Indeed, it need merely be capable of substantial non-infringing uses."

In 2005, the Supreme Court ruled against Grokster, finding that evidence of non-infringing use was not sufficient, and that the way the software was designed was encouraging piracy too obviously.[17] It was estimated that more than 90% of the files shared on the network were downloaded illegally. Grokster, KazaA and many other P2P file-sharing services were shut down quickly after this decision.

EDonkey2000, an P2P application developed by MetaMachine, was among the numerous file-sharing services that were closed after the Supreme Court decision. While the software is not distributed anymore, the file repository, using the eDonkey network, which was by design kept by the users, continues to exist and has been growing until today. Furthermore, the vast majority of eDonkey downloaders have simply switched to eMule, the open-source alternative to eDonkey, which continues to be developed without being targeted by the RIAA. The eDonkey network is estimated to total more than 4 million users and 4 billion files shared.

In light of the increasing subtlety of file-sharing systems, which worked around more and more potential points of copyright infringement attack, the RIAA adopted a strategy of prosecuting individual end-users.[18] Most lawsuit targets chose to settle their cases for amounts ranging between $3,000 and $11,000. By October 2007, the RIAA had filed more than 30,000 suits against single users.[19]

This behavior created a lot of animosity on the end-user side. Many commentators deemed this practice as “highly unproductive”, arguing that singling out thousands of end-users would not solve RIAA’s problem. The Electronic Frontier Foundation

(EFF) was particularly vocal about these issues[20] and put forward a number of initiatives to try to leverage new technologies and business models to provide a legal, comparable alternative to illegal P2P networks.

b. New business models and players emerge, Apple iTunes as a winner

Despite discouragement by the major music labels, consumers liked the new distribution channels, encouraging more business models that tried to take advantage of the MP3 format. These initiatives were taken by MP3 player manufacturers (Apple being the most famous example), online retailers (Amazon.com), and ex-"pirates" (Shawn Fanning came back with a new iteration of Napster)

Two main business models were competing at that time. Services like RealMedia's Rhapsody, created in 2001, offered unlimited on-demand streaming to a large library of music for a monthly flat fee. At first, access to the songs was very limited as the file format was proprietary and the company was using a Digital Rights Management (DRM) system to prevent piracy.

Other services allowed users to download music legally from large online repositories, and charged the customer a small fee for each download. The first and most successful example of this model has been Apple's iTunes Music store. The popularity of Apple's iPod music player, combined with Apple's success in contracting with the labels for content made available on the user-friendly iTunes store and music player, gave Apple a huge lead in online music distribution. Again, a proprietary DRM called FairPlay was used on every music file sold by the iTunes music store to prevent piracy. FairPlay limited the number of legal copies that could be made of a file, or the number of authorized devices that could read a certain track.[21]

It is worth noting that most of the players that launched a digital music service in the early 2000s had some degree of expertise in software development. These new players each took advantage of their existing position and complementary assets (e.g. the customer base in the case of Apple) to quickly launch these services. To get music labels to sign trade agreements, Digital Rights Management Systems were created. Although most, if not all, DRM systems have been cracked, the primary goal of these newer legitimate services is to provide a convenient way to legally obtain digital music files at a reasonable price, while offering superior quality content. These market-based solutions presume that given the choice, users will choose a legal option if it's easy to use and the price is right. [22]

II. Post-disruption developments: 2000-2010

a. A new balance of powers

Several developments have changed the face of the online music delivery market since these early days. Overall, the evolution of music sales in the past decade shows that the paradigm shift to digital music delivery has provided an opportunity for new entrants, and has ended the prominence of music labels.

As years have passed, it becomes clear that Apple has been very successful at leveraging the icon status reached by the iPod, which represented 72% of the market for portable mp3 devices in 2006.[23] Compared to other digital music store, the iTunes Music Store provided a more streamlined content supply channel to the device as it was part of the integrated "iTunes + iPod" experience. In effect, the easiest way to fill an iPod with digital music was through the iTunes Music Store – and in particular, the only way to fill it with authorized online music, was through the iTunes Music Store. From 2002 onwards, the iTunes Music Store has in fact been the first online music retailer in the U.S. According to a recent study by NPD MusicWatch[24], iTunes has continued to solidify its lead in the digital music arena, as consumer downloads from iTunes represented 69 percent of the digital music market in the first half of 2009. AmazonMP3, a service launched in 2007, was second with only 8 percent of the market share.

Digital music sales are making up an increasing share of U.S. music sales. According to the RIAA's 2008 Year-End Shipment Statistics[25], 68% of the music sold in 2008 was on a physical medium (e.g. a CD), while 32% was sold digitally. In 2007, these numbers were respectively 77% and 23%. In fact, although it sells only digital music, Apple iTunes was the number one music retailer in the U.S. in 2008, with 25 percent of all music units sold. Walmart was in second position with 14% of the market share.

While the digital disruption has been beneficial for some, other legacy players have seen their power greatly reduced. The major music labels, which used to exert a lot of market power on the distribution channels before 1990, have been weakened by the development of piracy and the emergence of Apple iTunes as the dominant platform for digital music delivery. And while the online market for music delivery is growing steadily, the revenue it brings to music labels does not make up for the plummeting CD sales,[26] that still represent today the bulk of music labels' revenue. Hence, labels are in a difficult and potentially unsustainable financial situation. EMI, for example, has seen its revenue decline from $2.8 billion to $2.3 billion in 2008, continuing the trend that started in 2005.[27]

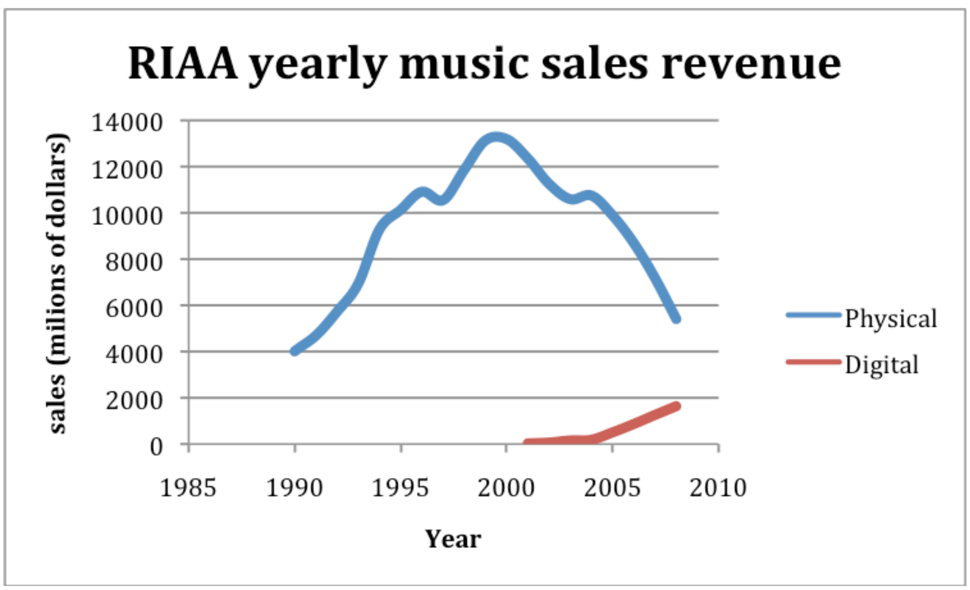

Figure 2-1: RIAA yearly music sales revenue for physical and digital goods[28]

In hindsight, one can raise the question of whether music labels could or should have acted differently when the MP3 format began to emerge and online sharing appeared. Indeed, it seems that rather than being caused by an identifiable aggressive player, the content owners' loss of power was caused by a succession of related events.

Looking at how slowly the market for digital sales was developing, music labels prioritized the fight against piracy, which was perceived as a much bigger revenue issue than the growing digital music market at the beginning of the 21st century.

Developing an online platform for music delivery was also a potentially dangerous way to go for music labels. First, labels had little to no experience in digital music distribution. This new delivery model required expertise in software design and networks, two areas that most labels were not related with. In the meantime, the basis of file-sharing software and MP3 retailing sites was growing quickly. As competition was fierce during the early days of digital music distribution, labels adopted a "wait-and-see" strategy and agreed to license their music rights to several players (including Apple iTunes and Rhapsody), while keeping their focus on fights over piracy. The belief that very few customers would pay for digital music as long as it was available on P2P networks was strong, and this belief may be part of the reason why music labels agreed to license their rights to digital retailers. Because the distribution costs were close to zero, music labels were able to pressure distribution channels to reap the same share of the revenue on a digital copy of a song as on a CD. It is estimated[29] that in both cases, 70% of the revenue is given back to labels and artists.[30]

Estimated Profit Per Song: Base-Case Scenario

Retail price	$0.99
- Wholesale cost	$0.69
- network fees	$0.05
- Transaction fees	$0.10
- Operating expenses	$0.05
Operating profit per song	$0.10
Operating margin	**10%**

Source: Pacific Crest Securities estimates

Table 2-1: Apple's estimated revenue share for a $0.99 song sold on iTunes. The item "Wholesale cost" represents the amount transferred back to music labels.

$0.17	Musicians' unions
$0.80	Packaging/manufacturing
$0.82	Publishing royalties
$0.80	Retail profit
$0.90	Distribution
$1.60	Artists' royalties
$1.70	Label profit
$2.40	Marketing/promotion
$2.91	Label overhead
$12.10	**Total transferred to labels and artists**
$3.89	**Retail overhead**

Table 2-2: Breakdown of the cost of a typical major-label release for a new album with a list price of $15.99

The labels' downfall was also due to their inability to embrace the new online music paradigm. Instead, content owners chose to resist the trend toward digital music, eventually just diminishing their presence and credibility on the online scene. This point seems critical since it is the difference in volumes between CD sales and online sales that drive the labels' revenues down.

Finally, the Internet as a radically new delivery channel has changed the way end users consume and value music. In the 1990s, music labels thought of music tracks as the product or the "commodity", and music sales were supporting the whole music industry. Nowadays, fans perceive that value comes more from the services associated with music than from music itself, and as such, have changed their consumption habits. This evolution of perception has certainly been facilitated by the empowerment of the end-user, but has left the content owners with a difficult equation to solve: how should they change their business model, as their old business model is not transferrable to the Internet, and value is now increasingly captured by new players in the value chain?

b. Recent Issues

The fact that new entrants gained increased market power and captured more and more value in the value chain has created tensions between music labels and distributors.

As we have already seen, DRM was among the major points of contention. On February 6, 2007, Steve Jobs, CEO of Apple Inc., published an open letter entitled “Thoughts on Music” [31], asking the four major music labels to sell their music without DRM. According to Jobs, Apple did not want to use DRM but was forced by the four major musical labels with whom Apple negotiates contracts for iTunes.

Many commentators criticized Apple's approach to DRM. While openly criticizing DRM, Apple had been actively threatening or suing anybody trying to open their own DRM or make it interoperable. Critics claimed that this was not because Apple was afraid of illegal copies but because it gave them an advantage in their market position as a leader in both electronic music sales and in music players, reinforcing each other due to the FairPlay DRM.

In January 2009, Apple announced that the music sold on the iTunes Music Store would be totally DRM-free. To get agreement from the music labels, Apple had to give up its "every song for $0.99" policy and offer three different price points, depending on the royalties demanded by the music labels for each track.

This apparent gain of market power for the labels reveals more about the new mechanics that are at play here. When Apple launched its service in 2002, the use of DRM was a tool to convince labels to embrace services such as iTunes as a potential alternative to illegal downloading. Recently, DRM was deemed as irrelevant because the burden it put on customers and innovators far outreached the benefit that labels could get from them.[32] By removing DRM from its online music catalogue, Apple creates positive incentives for artists and customers to use the iTunes platform, as lock-in to proprietary formats is no longer a threat. Of course, stimulating the market for mp3 will stimulate the market for mp3 players as well, the main revenue stream for Apple in the music market.

Piracy is still a troubling issue for the RIAA, the music labels, and some artists, particularly in light of the new generation of file-sharing systems, using the BitTorrent protocol. Instead of directly downloading the target file, a BitTorrent downloader processes small files called "torrents." These torrents contain metadata about the files to be shared and about the computer that coordinates the file distribution – the tracker. In order to download a file with this system, users must first obtain a torrent file for it, and connect to the specified tracker, which tells them from which other peers to download the pieces of the file.

There has been much controversy over the use of torrents for file sharing. While BitTorrent seems to be mostly used to share big files, it is one of the RIAA's main targets, as it is estimated that more than a billion songs are downloaded monthly via BitTorrent, mostly illegally.[33]

Since BitTorrent metafiles do not store copyrighted data, it has been claimed that BitTorrent trackers, which only store and track the metafiles, must therefore be legal even if sharing the data in question would be considered a violation of copyright. BitTorrent advocates also suggest that, unlike Grokster or Napster, BitTorrent is not well suited to users seeking to share copyrighted material without authorization. First, BitTorrent itself does not offer a search facility to find files by name. A user must find the initial torrent file by other means, such as a web search. Second, unlike recent iterations of P2P software, BitTorrent makes no attempt to conceal the host ultimately responsible for facilitating the sharing: a person who wishes to make a file available must run a tracker on a specific host and distribute the tracker address in the torrent file.

Since it is now far easier to track down individuals, music labels have now adopted a new, less aggressive strategy to fight piracy. Instead of suing individual users for damages like they did before, the RIAA has now secured agreement with several Internet service providers, which agreed to "unplug" users sharing copyright-protected files over peer-to-peer networks in case of repeated infringement, in accordance to the End User Service Agreement.[34]

Conclusion

While Internet has disrupted the music industry more than 10 years ago, legacy content owners seem to still be looking for answers and sustainable business models, as Internet seems to have changed the way music is consumed and perceived as a good. Entrants have managed to create new revenue opportunities, and legacy players such as music labels have seen their revenue model plummet.

As Internet is quickly gaining in capacity and the technology begins to enable Internet-based video delivery networks, video media moguls begin to be concerned by this new, potentially disruptive, delivery channel.

It is worth noting that in fact, the music industry has long been fighting the piracy threat. From the early debates on the use of licensed music on radio, to the numerous controversies about tape recorders, and more recently CD writers, music labels and producers have always sought to protect their content, with both stringent regulations and secure storage supports. This long history does not apply to the Sports industry, and while piracy is going to be an increasing concern for Sports content, other questions are raised by this dramatic shift.

"Video over IP" is developing at a time where all the stakeholders are aware of the upcoming disruption – thanks to what was learned ten years ago as music was disrupted. Even if the results of the disruption are extremely uncertain, most players in the sports broadcasting industry are historically closer to Internet delivery channels, and thus legacy players are embedded much more deeply in the early trials of “Sports over IP” initiatives.

Piracy may still be a big issue for Sports over IP if copycats catch on. Be because of the awareness of content owners, broadcasters and content aggregators, it seems that the controversies for Sports over IP will not be mainly centered on piracy, but much more on innovative services, control of the value chain, and value capture mechanisms.

Chapter 3. Technical Challenges associated with the development of Web TV

As we have witnessed in the last chapter, the Internet has brought openness in formerly centralized and vertical entertainment industries. The music industry is not an exception, and dramatic changes are operating in the newspapers and the book industry as well. Yet, television is just beginning to see the premises of an Internet disruption. This chapter will first show that the Web TV market is ripe to welcome more than just user-generated content, as users change their habits and the technology allows new producers to broadcast high-definition streams over the Web. The second part of this chapter will then examine the technological conditions under which “Sports over IP” could become a reality.

I. Distinction between Web TV and IPTV

The terms “Web TV”, “online video” and “IPTV” often have ambiguous meanings. Some parts the literature don’t clearly make a distinction between Web TV and IPTV, and some use the term “IPTV” where others talk about “Web TV”. These definitions are not necessarily widely accepted, as the range of the technologies and standards available make it difficult to draw a clear line between what belongs to “Web TV” and to “IPTV”.

For the sake of clarity, in this thesis, “IPTV” will refer to delivery models that use a proprietary network to deliver digital video using the Internet Protocol. What defines specifically IPTV is that the Internet service provider acts as a gatekeeper and has control over the channels that are delivered to the customer, often through the use of a set-top-box. The business model and the value chain dynamics that exist behind IPTV services are thus very similar to those of cable and digital broadcast satellite services. Verizon FiOS is one example of IPTV service that is currently offered. Verizon, just like Comcast with its cable offering, brings Internet and television to the customer, in exchange of a monthly subscription fee. While some content is available on-demand, Verizon acts as an aggregator, just like cable or satellite providers do.

Contrary to IPTV services, “Web TV” or “online video” services refer to video streams brought to the end-user via the Internet Protocol, but that are not aggregated nor controlled by the Internet Service Provider (ISP.) Web TV packets, even though they contain video content, are treated like any other packet that is transiting on the internet – although the protocol used to transmit them might be different – and as such, are subject to the same advantages and limitations than the rest of the Web traffic. The business models associated with those Web TV services vary, but often don’t directly involve the ISP, which is used solely for data carriage. Some of those services, like Google’s YouTube, are free to consumers and ad-supported, while users of MLB.TV have to pay monthly subscription fees directly to the MLB to gain access to the content.

This chapter, and the rest of the thesis, considers IPTV services as part of the legacy model that has been developed in the 1970s with the development of cable and digital broadcast satellite. The business model supporting the IPTV technology is really close to the cable and satellite offerings, as the carrier has the same aggregating and gatekeeping role than cable and satellite broadcasters have.

On the contrary, Web TV is at the center of the new disruptive video delivery models, where among other things, that aggregator and gatekeeper role of the carrier is questioned. The customer experience in this second case is closer to today's consumer-based Internet experience.

II. Development of Web TV

a. History of Web TV

Interestingly enough, Web TV's first iterations were inspired from the broadcast TV model: producers would release videos on a regular basis, and their website would be supported by ads. The first Web TV show, *The Spot*, appeared in 1995. This website television drama was inspired from a contemporary television drama. The Spot was an episodic fiction website, that aimed at taking advantage of the new interactive possibilities that the Web had to offer. Viewers could post to the site and email the cast to offer advice and became part of the storyline. The writers of the show would indeed use the audience's opinion to shift the plot lines around. From a business standpoint, thespot.com was also among the first web sites financed by advertising banners and product placements. At its height, the site received over 100,000 hits a day, a tremendous response for its time. Other early web series, featuring small videos each week, came later to populate the Web.

After the dot-com bubble, and as broadband bandwidth began to increase, new uses for Web TV emerged. User-generated content invaded the Web, and important players such as YouTube and Dailymotion appeared in the mid 2000s. Those new players completely changed the Web TV paradigm. In this new context, viewers began consuming short, low quality on-demand videos with no background, rather than shows that were closer to what traditional TV already offered. This new concept attracted an increasing number of viewers: YouTube had less than 60,000 visitors shortly after its creation in August 2005, and was serving 20 million a year later.[35]

b. Development of Web TV nowadays

As pointed in the first chapter of the thesis, more and more video that could be only found in the closed proprietary distribution networks of the cable companies are appearing on the Web. Various new Web TV services have been launched in the past ten years (Hulu, Joost, Blip.TV, MLB.TV) and the tendency is to the increase in the Web TV offering.

These new offerings originate from a dramatic increase in consumption of online video. While Web TV still accounts for a very small part of the U.S. video consumption (Americans spend overall forty times more time watching traditional TV than watching Web TV), the rate of growth of the online viewership is far greater than the rate of growth for traditional television, both in terms of time spent, as in terms of number of users. This is shown in the tables below.[36]

Overall Usage Number of Users 2+ (in 000's) – Monthly Reach				
	3Q09	2Q09	3Q08	% Diff Yr to Yr
Watching TV in the home°	282,957	284,396	282,289	+0.2%
Watching Timeshifted TV°	84,920	82,297	67,656	+25.5%
Using the Internet**	190,481	191,035	160,070	+19.0%
Watching Video on Internet**	138,162	133,962	120,343	+14.8%
Using a Mobile Phone^	237,411	233,722	225,392	+5%
Mobile Subscribers Watching Video on a Mobile Phone^	15,744	15,267	10,260	+53%

Source: The Nielsen Company

Table 3-1: Usage of television and Web TV services in 2008-2009

Monthly Time Spent in Hours:Minutes Per User 2+					
	3Q09	2Q09	3Q08	% Diff Yr to Yr (3Q09 to 3Q08)	Absolute Diff Yr to Yr (3Q09 to 3Q08)
Watching TV in the home*	129:16	141:03	129:45	-0.4%	-0:29
Watching Timeshifted TV*	7:12	7:16	5:56	+21.1%	+1:14
Using the Internet**	27:32	26:15	27:18	+0.9%	+0:14
Watching Video on Internet**	3:24	3:11	2:31	+34.9%	+0:53
Mobile Subscribers Watching Video on a Mobile Phone^	3:15	3:15	3:37	-10.0%	-0:22

Source: The Nielsen Company. Based on Total Users of each Media.
Editor's Note: TV viewing patterns in the U.S. tend to be seasonal, with TV usage higher in the winter months and lower in the summer months, leading to a decline in quarter to quarter usage.

Table 3-2: Monthly time spent using television and Web TV services in 2008-2009

More than 140 million people in the U.S. have watched online video, which represents over 10 billion video clips from US locations alone. Overall, 72.8 percent of the total US Internet audience has viewed online video. This figure suggests that Web TV is being adopted by a specific subset of the population that has both access and a marked interest in being connected to the Internet. While penetration of Web TV services is still greatly inferior to penetration of television in the U.S. (which is very close to 100%)[37], they still represent a thriving market and a serious contender to traditional broadcast and cable-owned models.

The following table presents the main destination sites for online video consumption. While Google's YouTube appears as a clear leader, more recent online video providers such as Hulu or CBS are beginning to reach a significant number of users as well.[38]

Property	**Unique Viewers (000)**	**Average Videos per Viewer**
Total Internet	*147,322*	*100.7*
Google Sites	101,870	62.5
Fox Interactive Media	62,109	8.9
Yahoo! Sites	41,859	8.9
Microsoft Sites	30,042	8.9
AOL LLC	27,198	6.8
HULU.COM	24,448	10.2
CBS Corporation	24,215	4.2
Viacom Digital	24,126	11.9
Turner Network	22,979	8.5
Disney Online	13,435	10.5

Table 3-3: Top U.S. Online Video Properties* by Unique Viewers as of January 2009

Sports broadcasting is only a small subset of this market, but services like MLB.TV have seen growth in a similar fashion than DailyMotion or Hulu. There is therefore a market for online video delivery, that seems to be ripe to welcome more and more high quality content, that was traditionally delivered by over-the-air or cable broadcasts.

However, there are problems associated with the scaling up of such services, in terms of network and bandwidth management. In this next part, we will first examine the current over-the-top streaming technology and point out the key differences with the way cable broadcasting works. The second part of this study will look at emerging technologies that allow for better Web TV streaming, and the infrastructure that will be needed for these technologies to be efficient.

III. What do we need to achieve Sports over IP ?

When dealing with the issue of broadcasting Sports over IP, the main issues appear to be more hardware-based than software-based. Indeed, there are currently several efficient tools to compress and stream video feed using the Internet Protocol. On one hand, Adobe and Microsoft, with their respective Flash and Sliverlight suites, have developed tools for producers and viewers, that prove to scale very well with growing numbers of viewers. YouTube, which is using the Flash player, now has more than 120 million viewers in the U.S.[39] and is a tangible proof that the streaming technologies can scale at a mass-market level. On the other hand, the existence of MLB.TV, exhibited in chapter 1, already demonstrates that those streaming technologies are mature enough to provide high-definition streams to end-users over the Internet.

However, the increasing demand of online video, shown earlier in this chapter, has raised the concern of Internet Service Providers across the country, as the existing infrastructure is more and more solicited to answer to the growing demand. The rest of the chapter will look at the premises for these concerns, and the potential solutions that could be implemented to alleviate those.

a. Current technology: why is Internet so much different than cable TV?

Give the limited amount of space that is available to treat the topic, the study will only address concerns associated with cable television and Internet delivered by cable. Cable has been chosen as it has a 61% market share in the U.S.[40] for television services, and is used as an Internet service provider by 30% of Internet users in the US, providing roughly 50% of the broadband Internet in the country.[41] While the issues arising with the use of a telecom-based DSL technology are different, the reader will be able to find similarities with the example provided below.

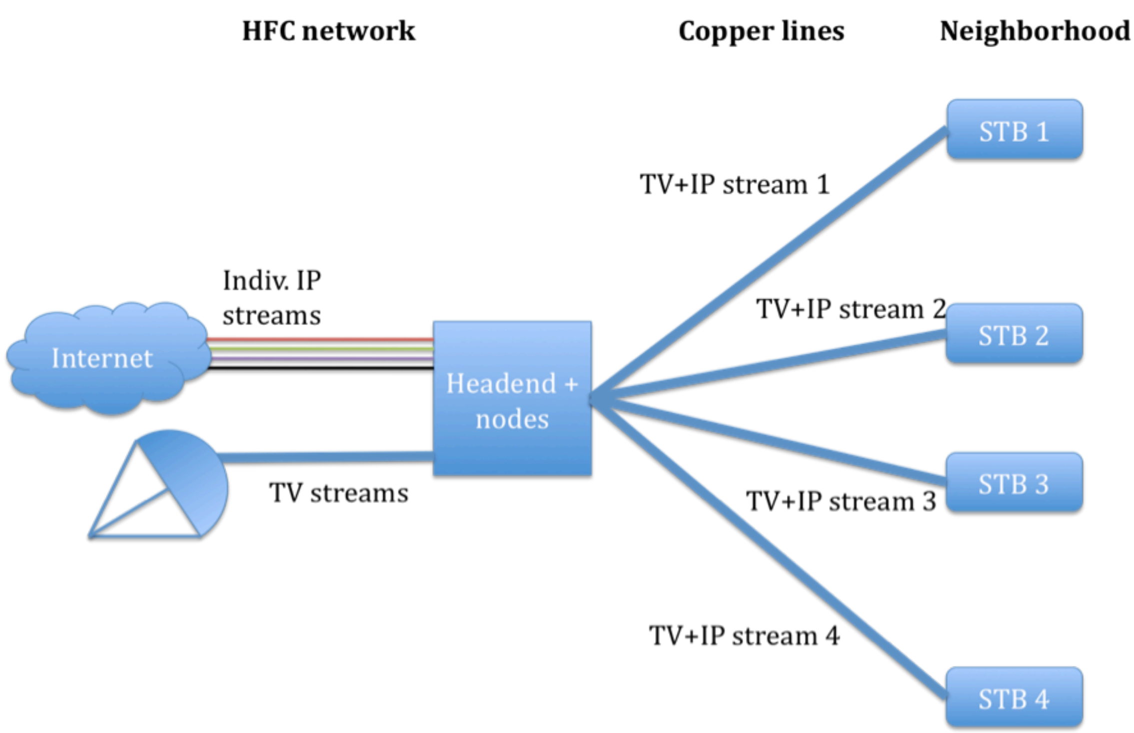

Figure 3-1: Delivery network for cable television and Internet

The figure above describes how cable delivery networks work, at a very high level. Since the upgrades of the major cable analog networks and the switch to digital cable, cable operators can use their hybrid-fiber and coaxial (HFC) network to carry data and TV channels from their respective sources to the headend, and from the headends to various nodes. At the headend, or the final node of the network (depending of the population of the area that is served), the Cable Modem Termination System (CMTS) will convert the IP data streams carried from the Internet for each user served by the headend or node into a signal that can be carried to the end-user through the copper lines, on top of the TV signal.

The majority of each user's bandwidth is dedicated to television. Estimates vary between operators and sources, but one can assume that a user's IP stream takes no more than a fourth of the available bandwidth on its cable connection.

This system has essentially been designed to carry TV signals and has been adapted in the 1990s to allow Internet data to be carried in the same physical pipes as television. Thus, while it brings efficiently a high number of TV channels to a large number of users on the television side, it supports Web TV very poorly. This comes from the fact that all Television channels are made available at each headend or node, and only one to three of them are actually transmitted to each user, taking a fixed amount of bandwidth on the customer-end of the network. Internet data, however, is treated differently, and is only allowed on the remaining bandwidth for each node. Since a large number of users connected to the same CMTS are sharing the same remaining bandwidth, each individual IP stream is competing for bandwidth with the other ones. The current paradigm allow for heavy users that watch online videos and use demanding peer-to-peer file sharing networks, whose consumption habits are balanced by the vast majority of user that has simple needs. Data released by network management companies[42] show that 10 percent of subscribers consume 80 percent of bandwidth, while 80 percent of subscribers use less than 10 percent of bandwidth. While file sharing on peer-to-peer networks seems to be an important factor in this distribution, video viewing is identified as on of the other major components of these consumption trends, and one of the most likely to change abruptly.

While this paradigm of bandwidth sharing seems to hold now, problems could arise if a significant share of these low users suddenly changed their habits and watched online video.

b. Current implementations of Web TV: the unicast-streaming model

The unicast-streaming model establishes a point-to-point interaction between an individual user and a video server, often via a common protocol such as the Hyper-text Transfer Protocol (HTTP) and the Transfer Control Protocol (TCP)[43] Once the connection is established between the user (or client) and the server, the client will begin downloading part or the integrality of the video file, depending on the application used. Because of the protocol used, the video stream will be sent over the Internet as independent packets, and treated as such by the Internet service provider's routers or CMTS.

While this design is effective for video on-demand services like YouTube, it could prove very inefficient for live services like MLB.TV, where several users could be downloading the same stream at the same time. Given the point-to-point nature of the interaction with the server, each packet is only addressed to a unique user, regardless of whether the exact same packet has been sent to another close user. In the worse case scenario, all the users connected to the same node could be watching the same video stream at the same time, yet one individual stream would be sent to each user, and would likely lead to network congestion. Another weakness of that design is that HTTP and TCP feature a lot of confirmation requests around packets, to make sure that none of them has been lost. While this is necessary to guarantee reliable delivery of a stream of data for most of the Web traffic, it makes the data transfer rate volatile and dependent on server-client latency as well as packet loss.

Content Delivery Networks (CDN), such as Akamai, attempt to provide a higher quality streaming experience by reducing the delivery distance and increasing the availability of streams to the consumer. Instead of establishing a connection to the server hosting the video streams, each user will establish a connection to a dedicated server that is physically closer to the client's location. However, these CDN architectures do not solve congestion issues that arise at a the level of the node

– e.g. the system is not more efficient when two users connected to the same node watch the same stream.

To mitigate the drawbacks of HTTP/TCP, other protocols have been developed. The most common low-level protocol to stream data in real time is the User Datagram Protocol (UDP)[44], notably used in most of Voice over IP applications. By its design, UDP is capable of delivering messages at more consistent speeds than HTTP/TCP, but is less reliable as UDP does not check whether packets have been received in a timely manner or at all.

The RTP and RTCP protocols, more recent than UDP, have been designed specifically with online video in mind. These protocols, working together, provide several features (e.g. compensation of the variability in latency, detection of out of sequence arrival in data) that ensure a smoother viewing experience. But more importantly, RTP and UDP support data transfer to multiple destinations through multicast.[45] As we will see in the next part, this specific technology is key in the development of Sports over IP.

c. Tomorrow's needs: why multicasting is critical in the case of SpoIP

There are technical solutions that can take advantage of the prevalence of live experience in Sports broadcasting. Contrary to unicast, IP multicast achieves one-to-many communication over an IP-based network. Multicast uses network infrastructure more efficiently than unicast by requiring the source to send the stream (in this case, the packets) only once, even if it needs to be delivered to a large number of receivers.

In the case of Sports, multicasting has many advantages. Since most of the value is in the instant and the live broadcasting, one can expect that multicasting would allow for a more efficient use of the Internet bandwidth, as many users watching the same game live on Web TV would be sharing only a unique IP stream, as opposed to the equivalent of one stream per user for unicasting. Furthermore, multicasting scales to a larger receiver population by not requiring prior knowledge of who or how many receivers there are.

Multicasting does not require fundamental changes in the core infrastructure of the existing network – rather a more systematic adoption of protocols that support it and routers that allow multicast are needed.[46] However, as demand for online video will grow, new protocols will have to be developed, and a larger infrastructure allowing for more bandwidth will have to be created. Thus, the burden of developing multicasting solutions seems to be placed mostly on the shoulders of the carriers. As the carriers don't have a direct interest in developing Web TV services, and the Web TV landscape seems to be composed of multiple, relatively small players, a problem arises: how can we motivate capital expenditure that will allow for more Web TV traffic ?

IV. The broadband incentive problem

While the benefits of multicasting are clear in the case of Sports broadcasting for example, it is unclear whether the carriers will find the operational and capital expenditures required by the demand for more bandwidth and multicasting worth what they could get from them.

Because of the flat rates that have been offered to US Internet users to promote broadband adoption, cable carriers have currently limited options regarding traffic management, as going back to pricing models that are adapted to consumption patterns seem to meet consumer resistance. The current business model makes sense as long as low users value availability and convenience, and agree to tacitly pay for more than the bandwidth they are really consuming, while a small percentage of users consume much more than what they are currently paying for. To control heavy users, cable companies have started voluntarily throttling traffic for heavy users during peak hours, or limiting the amount of data that an individual user is allowed to download every month.

While developing more efficient delivery technologies such as multicasting, and increasing available bandwidth to end users would be partly in line with the cable carriers' strategy of providing "TV everywhere"[47], improving the infrastructure would benefit many other players, including the cable companies' competitors on the production side. We have here an incentive problems: while some of the content that would be going through this new infrastructure would be controlled by carriers, a lot of it would also be other producers "free-riding". As the burden of the additional cost cannot be transferred totally to end users, carriers would rather have content that they can control flow over these pipes, or at least would like to be compensated for that extra traffic and all those sunk costs incurred. [48]

Even if multicasting proves cheap to implement, the carriers are likely to allow it only if it serves their interests. To address this incentive problem, several measures could be taken.

- If multicasting proves to provide tangible benefits that by far go beyond the carrier's specific interests, the FCC could have to intervene to enforce the enabling of multicasting standards (precedents ? Premises for this ?) The government has recently clearly stated its intent to bring broadband to the masses, and as such is heavily subsidizing the development of the cable infrastructure in the U.S, especially in rural areas.[49] As such, the regulator would arguably be in its own right when demanding that cable carriers develop technologies that increase the overall efficiency of the network, even if it does not directly serve the carriers.

- Along those lines, the carriers could be required to free up some of the bandwidth currently allocated to cable TV channels to allow more IP-based traffic.

- There are other alternatives that promote more freedom for the content providers and the carriers. Although the FCC has historically watched what was being carried over the cable infrastructure very closely (must carry, etc…), one could see a more free-market approach for over-the-top content.

Then, producers could start remunerating carriers for allowing better flow of content. This has already happened in the United Kingdom, where the BBC is encouraging ISPs to adopt multicast-addressable services in their networks by providing BBC Radio at higher quality than is available via their unicast-addressed services.

Conclusion

There is a market for online video, which is developing faster and faster each year (with 2009 being an inflexion point.) While current technologies exist to stream HDTV over IP, there is a growing concern that demand could grow much faster than capacity, completely hampering Internet traffic as it works today. While there are ways to overcome those difficulties – especially in the context of Sports content, thanks to multicasting - there is an incentive problem, as the burden of the costs will rely heavily on the Internet service providers or carriers, which will have a much harder time capturing all the value invested in that infrastructure.

Chapter 4. Early implementations and challenges of Sports over IP

In this chapter, we will describe in further details the early implementations or projects of Sports webcasting. First, we will show how the concept of broadcasting sports over IP is a disruption, by using Clay Christensen's criteria[50]. Then, we will propose a classification of the early examples of "Sports over IP", focusing on value capture and control over the value chain. Three major scenarios will be identified: in each of them control shifts in turn to the advantage of the content owner, the broadcaster and finally the end customer. The viability from a business point of view and the potential impact on the existing value chain will then be studied in details for each scenario.

For the sake of clarity, and to simplify the modeling work that will follow in this thesis, the categories chosen and the examples taken will reflect only part of the reality. Describing in depth all the interdependencies between the stakeholders in those early examples could be the work of a master's thesis on its own, but it is not the purpose of this work. The reader should keep in mind that the reality is actually more complex than what will be described. The primary aim of this part is to describe the different goals of each stakeholders, and the means that each of them is using to fulfill them.

I. Value chain dynamics for traditional Sports broadcasting

a. Description of the traditional value chain for Sports broadcasting

To understand better how the disruptions can be brought in the area of sports broadcasting, let us first look at the current organization of the value chain[51] for video delivery. The following figure represents the simplified content value chain for sports broadcasting that will be presented below. Video content and/or copyrights are flowing from left to right, whereas subscription dollars are flowing from right to left.

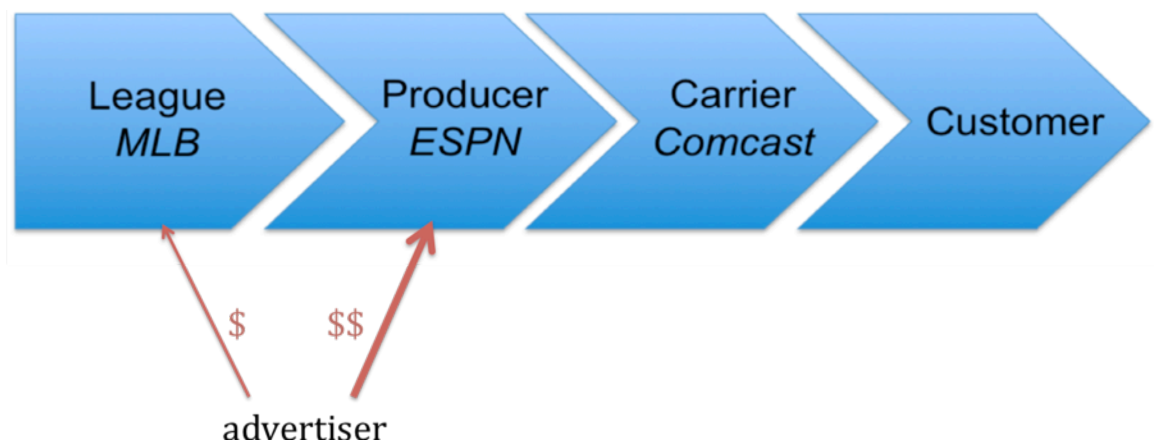

Figure 4-1: A simplified value chain for sports broadcasting

The first link of the value chain is the content owner. In the US, sports games are considered as "original works of authorship fixed in a tangible medium of expression", and as such are protected by Title 17 of the U.S. Code.[52] Each league or team is then free to formulate its own policy regarding copyrights. However, as broadcasting rights are a primary source of revenue for leagues and teams, those copyright clauses are often very stringent. The MLB, for example, prohibits "any rebroadcast, retransmission, or account of a game, without the express written consent of Major League Baseball".[53]

Most of the video content that is broadcasted over-the-air on cable networks is not produced by the league itself, but rather by the TV networks, which take advantage of their expertise, equipment (studios, HD cameras) and complementary assets (high added-value commentators, brand name for example) to add value to the raw product that a sports game is, and make it more attractive for the viewer. This constitutes the second link in the value chain: the production step. Producers also often act as “content aggregators”: the games themselves will be embedded in a specific programming on those channels (reviews, interviews, comments…), increasing the value of the game itself. As stated earlier, and in the first chapter of this thesis, TV channels are usually ready to give up large amounts of money to get the rights to produce sports content. In return, they can get important returns on this investment under the form of advertising dollars – and, in the case of premium satellite or cable channels, subscription revenues.

The third link in the value chain is called here the “carrier”. Historically, content was brought to US homes over the air, and national or local TV channels would produce and carry the content on the airwaves at the same time. However, with the development of cable and satellite and the blossoming of cable channels, carriage became distinct of production. As seen in chapter 3, carriage or video or Internet content is an investment-heavy activity that only a handful of firms provide on a national scale in the US.

At the end of the value chain is the end user. While historically, the end user does not play a role in the distribution of content and simply consumes it, we will see that Internet has significantly empowered the end-user, to the point that it could be considered part of the value chain. End-users are also a primary source of revenue for subscription-based cable channels. In 2008, cable-sports channels earned more than $9.2 billion of about $22.9 billion in basic-cable TV subscription fees, according to SNL Kagan.[54]

This description would not be complete without advertisers. Advertisers are not part of the value chain per se, as they do not play any role in modifying or bringing the content to the end user. However, as they are the main source of revenue for many players in the value chain, especially producers, they should be taken account of in this analysis of the value chain dynamics.

b. Non-disruptive dynamics in the value chain: everybody wants to be a producer

As showed in the first chapter of the thesis, the value chain presented above is ever evolving, and adapts itself to the technologies and regulations in vigor.

Since the apparition of cable and satellite and the exponential growth that major sports leagues have known in the US since then, sports have become an increasingly appealing type of content for producers. With audiences diluted across more and more channels and different entertainment media, national league sports appear as a relatively reliable source of revenue from advertisers. Sports audiences have two main advantages for advertisers: their attendance is consistent, and they have unique demographics. Studies have indeed showed that sports were mainly watched by men; most of them belong to the 18-35 age range, a very attractive segment for advertisers.[55] As such, it is not uncommon to find long-term partnerships between advertisers or sponsors and local teams or leagues. Broadcasting sports is therefore a rather cheap and reliable way to attract advertisers.

On top of this, the mass of money poured into sports advertising has kept increasing in the past decades – making a move towards production for sports content even more appealing. For example, the price of a 30 second commercial for the Super Bowl has increased from $47,000 in 1967 to $600,000 in 1981, to $2,500,000 in 2006[56]. For 2008, TNS Media Intelligence estimates that advertisers spent $10.6

billion for commercials in sports programming across U.S. broadcast networks, cable networks and local TV stations.[57]

These factors have led to the recent creation of many new satellite and cable channels dedicated to sports. While historically, production was assured by national channels that carried their signal themselves, we will see here that many players of the value chain are moving toward the center of the value chain, to try to get a share of the colossal amounts of money that are distributed by advertisers for sports content. This results in a current increase in competition at the production layer of the value chain, thus giving more bargaining power to both ends of the value chain: content owners and carriers / end users.

Today, ESPN is the perfect example of a TV channel that produces content, but uses a dedicated carrier to bring this content to the home. ESPN's strategy focuses on national events and deals with sports leagues rather than local teams. As of September 2008, there were, 97.3 million subscribers to ESPN, 63.2 million to ESPN classic and 67.4 million to ESPN News.[58]

The most direct competitor to ESPN is Fox Sports Network (FSN.) Unlike Disney's Sports network, FSN's strategy is to acquire the broadcast rights to major sports teams in their regional market, which can then be promoted against nationally broadcast games on ESPN that have no local interest. Nowadays, 24 local cable channels are affiliated or owned by FSN, covering a very large majority of the US broadcast markets.

However, as described above, new players have recently ventured in production of sports content. Comcast, which is historically a cable carrier, has launched its own sports networks: Versus and Speed, respectively in 1995 and 1996. Besides the antitrust issues that were caused by this move,[59] the creation of these networks has introduced complexities the landscape, and created more competition between content aggregators.

In the years 2000, more cable and satellite TV networks were created, this time by the major sports leagues themselves. The leagues have been careful for their entry into the broadcasting world: new channels such as the NFL network or the MLB network are in direct competition with legacy producers like ESPN or Versus, and those producers are still nowadays a major source of revenue for the leagues. As such, those new networks only broadcast a fraction of the season, so that sports fans don't have too strong incentives to switch their watching habits. Other leagues also accepted financial participation from legacy carriers and producers (A third of the MLB network is jointly owned by Comcast, DirecTV, time Warner and Cox communications.)

However, these new channels contribute to further audience dilution. This move from the content owners can also be seen as a first discreet step toward a more league-centric model for broadcasting.

The following table, which is not comprehensive, gives a quick overview of the complexity and the variety that exists in the offering for sports channels on cable television.

Name	Owner	Notes
CBS College Sports Network	CBS Corporation	formerly CSTV
ESPN	Disney/Hearst Corporation	
ESPN2		
ESPN Plus		A service that syndicates college sports to local broadcast and regional cable stations.
ESPN Classic		formerly Classic Sports Network; sometimes used as an overflow for ESPN and ESPN2
ESPNews		24 hour sports news
ESPNU		college sports
ESPN Deportes		Spanish Language sports network
Fox College Sports	News Corporation	
Fox Sports Network		
Fuel TV		
MLB Network	Major League Baseball	launched January 1, 2009
NBA TV	National Basketball Association	launched March 17, 1999
NFL Network	National Football League	launched November 4, 2003
NHL Network	National Hockey League	launched October 1, 2007
Versus	Comcast	formerly Outdoor Life Network/OLN. Launched in 1995

Table 4-1: List of principal cable TV channels available as of January 2010.

II. Why Sports over IP is a disruption to the traditional cable TV model

In his *Innovator's dilemma*, Clay Christensen defines "disruptive technologies" as cheap, easy-to-build and easy-to-use products, which are generally of lesser quality than the mainframe products from the leading companies.[60] By targeting low-margin markets, and small groups of customers, entrants grow up on markets that are not big enough for larger companies. Once they have done so, and the quality of the product matches what the mainstream market demands, they become able to set up a new standard for the industry.

What can be worrying for incumbents is that great firms are good at improving the technology on which their "star products" are based, but face major difficulties when it comes to adopt a new technology.

In the case of Sports over IP, the disruptive technology is web broadcasting. While it does not threaten directly content owners, Internet broadcasting can be heavily disruptive for the producers and carriers, as the rules and complementary assets that were built during the era of cable and satellite television will not necessarily stand on the Internet.[61]

Furthermore, new online services like MLB.TV or pirate television on Justin.tv fit quite well Christensen's description of cheap, lesser quality products that characterize those technologies with a high potential of disruption.

Of course, cable networks and carriers are more informed that Christensen's archetype of the "incumbent firm". The history of Internet and its development in the US has been closely observed and controlled by cable companies, who deliver access to Internet to 14% of the American citizens today.[62] Furthermore, media moguls have seen what happened to the music industry in the 1990s, as described in chapter 2 of this thesis, and are well aware of the disruptive nature of web video. Yet, "Sports over IP" still represents a threat to those rigid, slow-moving incumbents. It seems that producers and carriers have, more than anything else, a business model problem. Indeed, legacy carriers and producers will be threatened by this disruption as long as there is no clear solution as how obtain a revenue stream online that is as large and as sustainable as the cable TV revenue stream.

To better understand how disruptive technologies work, it is useful to think in terms of S-curves. In Christensen's marketing and innovation S-curve model, the number of users and the quality delivered by every technology and product will go through a "S-curve" during its lifetime. Qualitatively, this pattern can be justified as follows. First, the new products experiences a slow ramp-up will be slow as the technology emerges and starts gaining ground. If successful, the product will soon be maturing and reaching the masses, increasing rapidly its market share, decreasing its price, and increasing the quality delivered by a great deal. At the end of the product lifetime, metrics such as number of users and quality delivered will plateau up, either because of technical limitations or because the next generation of the product will be slowly taking its place.

Disruptive technologies are characteristic in that their initial quality is in many regards lower than the existing mainstream product. However, they have the potential to perform better than the existing technology, because of a better design, of the use of new technologies, by offering ancillary services, etc… In terms of S-curves, disruptive technologies begin below their mainstream counterparts, but have the potential to end up higher than the already mature mainstream technology, very quickly. This is illustrated by the following figure:

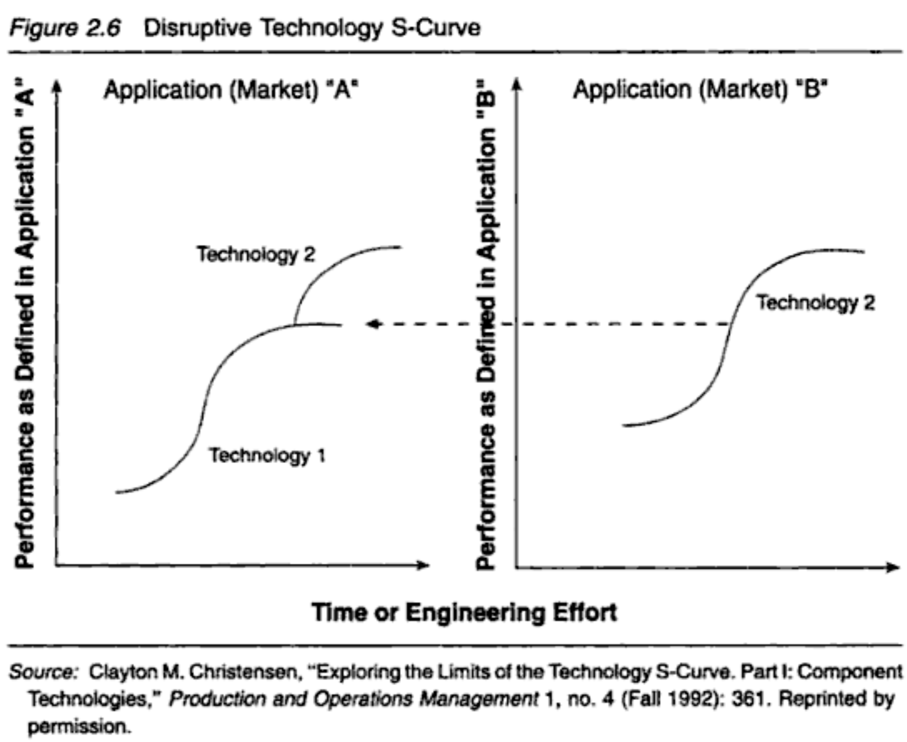

Figure 4-2: Disruptive Technology S-Curve[63]

In this part, the "S-curves" framework will be used to examine the past evolution of the industry, and Internet's potential for disruption. The three main criteria that were held for this study are the number of viewers per event, number of events available per dollar spent by a fan, and quality of the content. The comparison will be made mainly between a traditional cable sports tier and MLB.TV – the first stand-alone Web TV service – but it can be generalized to all sports leagues and future web services. Indeed, the disruptive nature of MLB.TV is tightly tied to the open nature of the Internet and takes advantage of the cheap, quasi infinite broadcasting space that is offered by this new medium, on contrary to the investment-heavy and constrained (in terms of number of channels, airing time…) nature of cable networks.

a. Viewers per event

The first important metric for sports' leagues and broadcasters is the maximum number of people that will be able to watch a certain event. Indeed, the size and consistency of the fan base will have a direct impact on the league and the broadcasters' advertising revenues. Therefore, technologies that enable them to reach more and more people are key.

Before televised broadcasting was invented, sports fans had to attend to the games themselves if they wanted to see their favorite team or athlete. Therefore, the number of viewers per event was constrained by the size of the stadium – we will take 50,000 as a baseline.

The number of people that can watch a game did not rise dramatically until television was invented. At that point, sports actually contributed to speed up adoption of the TV set, and the numbers of set in use in the U.S. rose from 190,000 in 1948 to 10.5 million in 1950, to more than 60 million in 1960. During the 1960s and the 1970s, development of cable and satellite broadcasting systems contributed to increase even more the potential audience, and the market penetration kept increasing to almost reach its "physical limit" as almost anybody in the U.S. can now watch the Superbowl or subscribe to a cable sports tier – the OECD reports that cable services are available to 96% of the US population.[64]

The potentially disrupting technology, Internet broadcasting of sports, is not widespread yet (MLB.TV has only 500,000 subscribers in the U.S.) However, broadband Internet already has a 63% penetration, and the potential to reach the vast majority of the U.S. population… as well as the rest of the world, without the content owner (e.g. the MLB) having to make specific deals with traditional broadcasting companies.

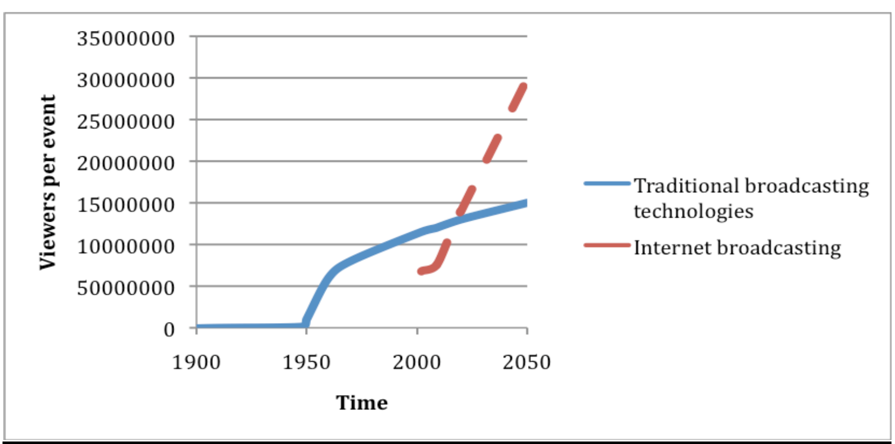

Figure 4-3: Viewers per event S-curve

b. Events available per dollar spent by a fan

Fans want to make the best of their money, and granting access to more content for a lower price has always been a priority for leagues and broadcasters. At the beginning of the 20th century, a ticket to see a Red Sox game cost about $1 (which represents about $25 today in terms purchasing power). If we take inflation into account, we can then argue that the absence of broadcasting technology left the fans with 0.04 events per 2009 dollar. A monthly subscription to a cable Sports package costs around $30-50 on top of a regular cable subscription, and gave customers access to up to 6,000 hours of programming (now 20,000 hours of programming). This corresponds respectively to 25 and 60 events per dollar spent (one gets a new sports event every 6 hours on average on a cable network).

A subscription to MLB.TV gives the customer access to the 162 games played in a season, for $130, thus representing 1.25 events per dollar for a fan. It is important to note that this service is still in its infancy, and thus benefits from very few economies of scale. As we have seen in Chapter 3, the Internet disruption partly lies in the fact that unlike traditional cable, satellite and over-the-air network, there is no constraint as how much content is available at any point on the web. While bandwidth can still be an issue, the concept of airtime and constraints on number of channels are obsolete in webcasting. Therefore, once the webcasting technology is mastered, we can assume that more and more content owners and producers will move their content online, without being constrained by television schedule constraints. This can pave the way to a decrease in price for web content, and an increase in the number of events offered.

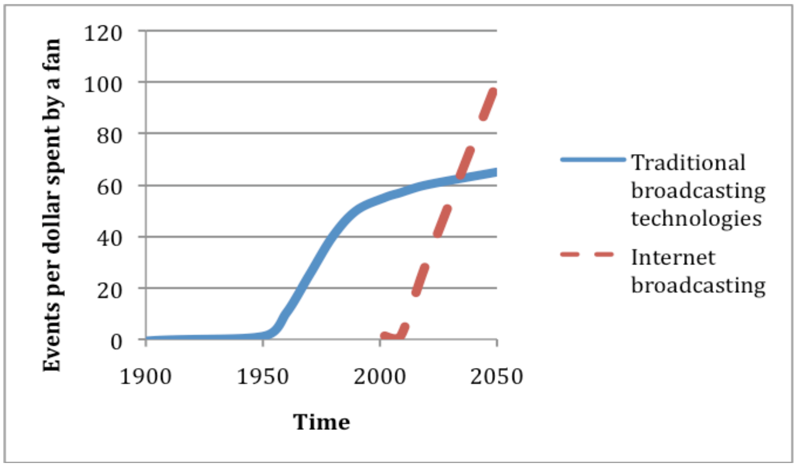

Figure 4-4: Events per dollar spent S-curve

c. Quality

We refer to quality from a fan experience point of view: the better the quality, the more a given spectator will get to see and learn in one game. It is a difficult variable to measure or to qualify, but the evolution of fan experience can help us draw S-curves here. In stadiums, although the emotional energy of the crowd can have significant value, quality is variable and depends on the seat you get, and the only other indications are displayed on the scoreboard. Television increased quality greatly by adding commentators, replays and close-ups. Other incremental innovations appeared in the past decades, such as HD.

Internet broadcasting brings much more potential to the table: even though services like MLB.TV had connectivity issues and image quality issues when it started in 2002, it has been catching up rapidly with television, and now offers HD streams with Internet-exclusive added features such as mosaic views (users can watch up to 4 games at the same time), or real-time widgets displaying data about players and performances. The possibilities to add interactive metadata are of course much more large than this: other early experiments add for example a social component to the TV experience, in the form of a Facebook or Twitter feed in a corner of the screen.

We should note that this kind of innovations is not out of reach for legacy TV, cable and satellite channels. Internet-enabled set-top-boxes and television sets could allow fur such features on a television screen, with a classical cable subscription. However, broadcasting on the Internet makes it much easier for the end-user to personalize its viewing space, and enhance the viewing experience. Furthermore, all content will be readily available online, as soon as it is created. In that regard, there will always be a limited number of choices in the feeds that will be brought through a set-top-box, as they will be selected by the operator first – unless cable companies open the set-top box to third-party applications providers.

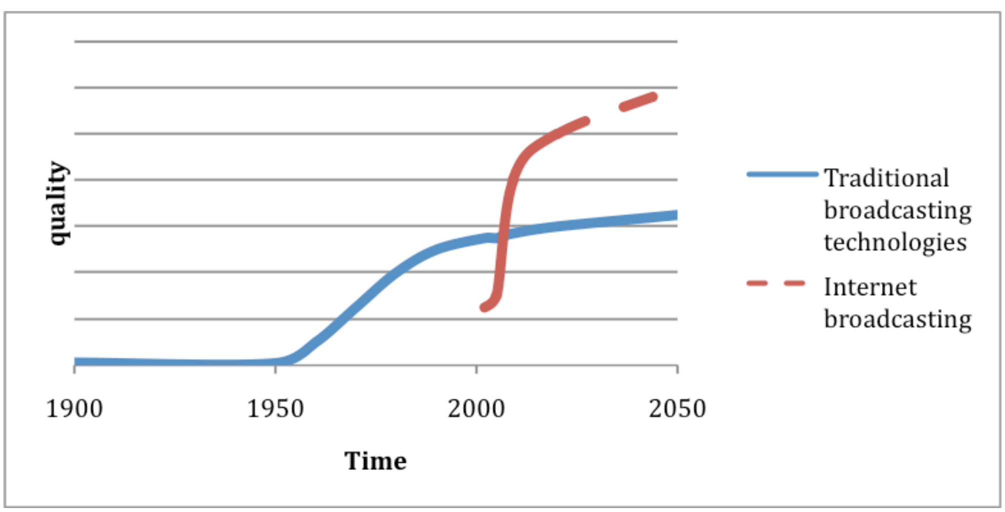

Figure 4-5: Quality S-curve

III. 3 different business models

In this part, we will describe briefly the first examples of disruptions to the existing over-the-air and cable delivery models. As each example tends to favor one particular player in the value chain, those early examples have be classified in three categories, where successively the broadcaster, the carrier and the end user is advantaged. Using the complementary asset framework[65], we will then briefly assess the viability of each of those models.

a. Business Model #1: Content is king (the MLB.TV example)

One of the first sports initiatives taken on the Internet did not originate from a television network, but from Major League Baseball itself. MLB.TV was launched in 2002, and offered users live out-of-market content as well as a comprehensive repository of the season's past games for a monthly subscription fee. Fearing that this move would upset its television partners who provide a large share of the league's revenue, the MLB has been very careful in implementing this service. The pricing (about $20 per month) and programming make it complementary and not directly competitive with a cable sports tier subscription – only appealing to fans looking for an enhanced experience or for those living outside the U.S. And, the MLB keeps very stringent blackout rules on its Internet channel.

Complementary assets

The MLB has also launched a mobile version of its MLB.TV online service, which is now available on iPhones. This is a first step toward the development of complementary assets. Indeed, while other mobile services, like MobiTV, require adaptation of the content to stream on cellphones, MLB.TV sends an extremely similar stream to PCs and laptops – only the size of the image and the added features are different. In that sense, the MLB is the first player to truly leverage the benefits of broadcasting over the Internet to multiple "screens".

The MLB benefits from other strong complementary assets to start with. Some are very specific, like the existing regulation that allows the MLB to behave as a monopoly[66], or its strong brand image. These two factors already guarantee MLB bargaining power and make it a force to be reckoned with. With the creation of the MLB network, the MLB has also built expertise in content production and delivery. Now that assets like bandwidth or airtime, which were tightly held by producers and carriers, are becoming more widely available on the Internet, the MLB seems to be in a favorable position if it wants to adopt an aggressive strategy.

b. Business Model #2: Broadcaster is King (TV Everywhere)

"TV everywhere" is one among many projects launched by cable companies, which aim at rebroadcasting content online while securing traditional cable fees from subscribers. The basic idea between this service would be to "give away" content online to customers already subscribing to cable television packages. This strategy, formulated by cable companies, is another step toward customer lock-in, as end-users would become reliant on one operator for both their television and Internet service. While this kind of service bundling has been allowed in the 1996 Telecommunications Act, this paper argues that the existing equilibrium in cable delivery markets is not desirable from a customer point of view. However, this model would secure the monthly subscription revenues and encourage customers to adopt its cable provider as Internet provider as well, while also creating an opportunity for online advertising revenues.

This new model creates a tension between legacy producers and carriers. Indeed, most carriers have now created their own cable sports network (Versus in the case of Comcast) and plan to use this new online platform as a way to promote their own programming.

Complementary assets

As we have seen earlier, carriers own a number of complementary assets that are becoming less tightly held. In a sense, Internet is just an extreme version of cable: while cable allowed for hundreds of channels to broadcast at the same time, the Internet is literally allowing for as many broadcasting channels as there are people willing to broadcast. Broadcasting on the Internet is much easier as on TV, as it is not regulated by the FCC, does not force a specific video standard (like NTSC or PAL), nor does it require one to “bid for bandwidth”.

On the upside, legacy producers and carriers have a long history of relations with advertisers, and have extensive expertise at aggregating content, and generating revenue from delivery. Some of them, like ESPN, also have a very strong brand.

Because of these complementary assets, one can question whether the MLB will be able to bypass the legacy producers or broadcasters. Indeed, from a business point of view, the legacy producers and broadcasters have a natural ability to make the "advertising pie" as big as possible, for their benefit and the benefit of content owners – in this case, the leagues. However, if those legacy players do not manage to leverage sufficient advertising revenues from the legacy distribution channels, and the overall "advertising pie" decreases, we could very well see content owners like the MLB try to leverage their own distribution platforms and only use ISPs as a "dumb pipe", to get a bigger share of this smaller pie.

c. Business Model # 3: Customer is King (the rising piracy threat)

Just like in the case of music, innovators have found new ways to circumvent league blackout policies, or to avoid the costly subscriptions for premium cable content. Self-broadcasting websites such as justin.tv allow individuals to create their own Web TV channel, and broadcast whatever they want on it – may it be legal or not. Due to the high number of channels and the difficulty to track the origin of the content that is being broadcasted, it has proven difficult to stop individuals that created Internet channels in the sole purpose of rebroadcasting a premium cable TV channel such as the NFL network. Furthermore, the existing legislation[67] protects justin.tv owners against liability suits. Other individuals have also taken advantage of new place-shifting technologies such as the Slingbox to rebroadcast market-specific content on the Internet, so that people living in Boston could watch the New York Yankees games too, for example.

Complementary assets

This third dominant model has very few complementary assets that make it viable in the long run. More than everything else, what makes this solution attractive for the masses is the fact that the end customer captures all the value. Thus, if content owners and carriers do not acknowledge this threat and work together to stop piracy, it may cripple their own growth – just like it did in the case of music.

Conclusions and recommendations

The relative size of the audience for Internet streaming (MLB.TV has a little above 1 million subscribers) shows that the technology has only reached early adopters so far. These adopters seem to be sports fans that are willing to pay a premium to benefit from the additional features offered online (mobility, quantity and variety of content, etc.) or live abroad and would not be able to watch baseball otherwise. The early majority of sports fans that Internet streaming would target next is already subscribing to a cable sports tier and would switch only for a better service with lower price. If Internet broadcasting were to “cross the chasm” and seek attention from this segment, several improvements would need to be brought:

- Uptime should be close to 100%. When it comes to broadcasting, consumers perceive Internet downtime more negatively than other distribution channels. Additionally, customer service outlets (phone, email, chat) would be required.

- The price of the service (which is extremely variable from one offering to another, depending on the league and the level of quality offered) would have to be lowered. The broadcaster (e.g. the league, a third-party developer) would have to develop a viable business model, for this would be interpreted as an aggressive move against cable broadcasters and would jeopardize the potential existing agreements and revenue streams from cable TV.

The following figure redraws the existing value chain, as described in the first part of this paper, and shows how the three early examples described above attempt to disrupt the existing order by taking control over new functions:

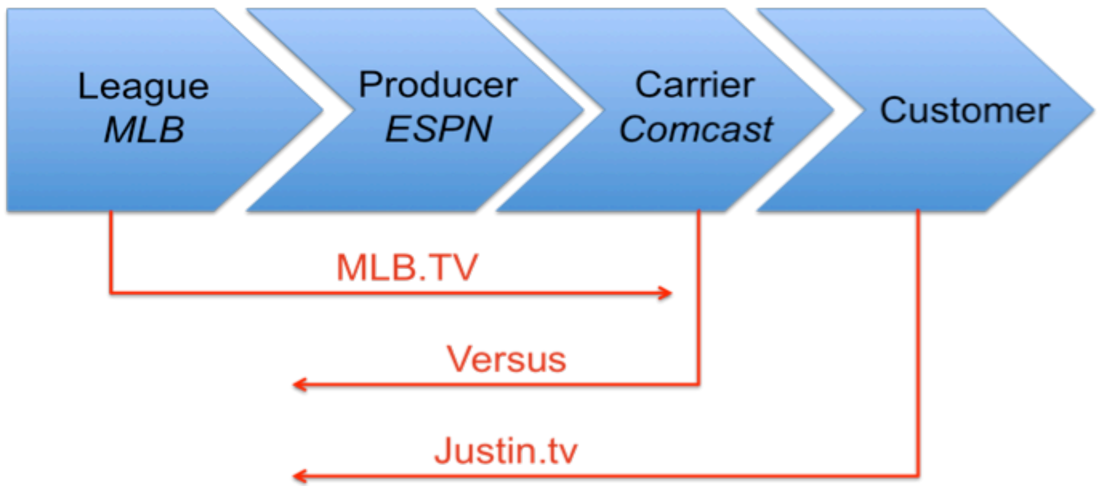

Figure 4-6: New value chain for Sports broadcasting

Overall, it is impossible to predict which model will prevail. However, one can note that cable producers and content aggregators (such as ESPN), which seem to be able to outbid legacy national broadcaster thanks to their double revenue stream, are in a tight spot today. Their complementary assets, such as production expertise, are becoming more widely available thanks to the open design of the Internet, and capturing value by aggregating content may be a difficult way to go in the future. Content owners, on the other hand, still have to prove that they could be capable of generating large amount of revenue on their own, without having to rely on specific content aggregators. Finally, while the piracy threat is not very important today; content owners, producers and carriers will need to work together to eliminate regulatory loopholes that may allow it to dominate in the future.

Chapter 5. Sports broadcasting: regulatory challenges and opportunities of IP-based delivery systems

As showed in the first chapter of this thesis, sports broadcasting have historically driven high revenues, and have even fostered technical innovation, such as the expansion of cable networks, or broadcasted TV itself.[68] This type of content is regulated very specifically, and has been broadly sought after in the past decades. Now is the time to look at the existing regulation, and the potential future antitrust issues that may arise from the emerging Web TV model.

This chapter will first examine the regulatory setting in which the shift to "Sports over IP" is taking place. We will first see that the history of broadcasting regulation, particularly that of cable, is inadequate for sports and has failed to create a competitive market for delivery of premium content. Furthermore, regulation of sports content delivery itself is relying on assumptions that are no longer valid nowadays. What we have here are two separate industries where natural monopolies take place, and which interact in distribution of sports content. While the law provides an acceptable set of regulations for cable broadcasting and sports leagues taken separately, the existing legislation is no longer adequate to tackle market failures that arise when those two industries interact; particularly in the case of distribution of sports content.

The second part of the chapter will examine how the fundamental shift of sportscasting over the Internet could either accentuate this failure or, alternately, foster competition without need for further regulation. Examining the three different potential scenarios that were presented in the last chapter, we will then set forth a basis for regulation in this new context of sportscasting over the Internet.

I. Premises for regulating Sports broadcasting

According to Senator John McCain[69], Major League Baseball (MLB) and the National Football League (NFL) league championships have reached the status of "traditions" which have "always been available to all Americans". In this first part, I will argue that sports content, over the years, has become what could be considered a public good, and that in agreement with McCain's statement, which reflects a view shared by both Republicans and Democrats, sports should be considered as a public good. This argument provides a rationale for regulating Sports broadcasting and helps identify the regulatory capture[70] issues that characterizes sports broadcasting nowadays, where benefits reaped by a handful of leagues and access providers, and costs are borne by legions of fans, to the point where access to sports content broadcasting is "determined by an income test."[2]

Sports leagues appear to be "natural monopolies". As the failed attempt in 1974-1975 to create a "World Football League" as a direct competitor of the NFL showed us[71], several market failures lead to the existence of natural monopolies in sports content generation. Besides the obvious economies of scale and scope that existing leagues benefit from, teams of the four major US sports leagues have built solid fan audiences that are attached to their local colors and players. Furthermore, there are strong network effects when it comes to the player base. Good players attract competition from other good players, along with higher salaries. A new league would have to attract many iconic players outside the existing structure in order to provide exciting games and grow its share of the fan audience. Such a battle on players salary would probably lower the quality of games in both leagues and drive prices up, as star players, a scarce resource, would use their bargaining power to get the most out of their contracts.

While sports were a modest business in the 1960s, leagues are now profit-driven entities benefiting from market power. One could argue that baseball, or hockey for that matter, is just one among many forms of entertainment, subject to competition with the movie or the video game industry. While this argument is defensible to a certain extent, sports leagues are doing a very good job at maintaining a large dedicated fan base (through the promotion of college sports for example) and are producing a very specific type of content that cannot be replaced easily. Indeed, studies have shown that the demand for broadcasted sports content has been fairly inelastic[72].

The argument that leagues are natural monopolies has been the main motivation for regulating sports content generation and broadcasting (see parts II and III). However, a second argument based on more political and cultural grounds has pushed regulators to look closer at sports content diffusion: the view that sports content should be considered as a common good.

This view is closely related to the history of sports broadcasting. Sports played a major part in the early development of television networks[73], and were available on ad-supported, free public channels during the 50s and the 60s. Thanks partly to the protection provided by the Sports Broadcasting Act of 1961 (see part III), leagues have grown steadily. They were able to promote themselves, and grow their fan audience. The NFL itself has evolved from a position of financial struggle in 1960 to become a multi-billion dollar entity, whose ever-increasing TV deals are only on par with its player's ever-increasing salaries. However, since sports have been ubiquitous in free over-the-air broadcasting, they are now considered as part of the American culture, as Senator McCain pointed out.

According to Olson, collective goods "go to everyone in some group of category if they are provided at all."[74] Here, the relevant category is the ensemble of US citizens that own a television. The size of this group, and its heterogeneity of points of view in the matter of sports broadcasting make it particularly hard to coordinate a collective action. Thus, not only are there strong incentives to free-ride for sports fans, but even if a lobbying group was to be formed to tackle this issue and fight broadcasters and content owners, it would most likely carry a marginal opinion view on the topic and would be unable to pull its weight against the media giants. Hence, there is a need for the regulator to compensate for this market failure.

The very high number of actions that were attempted in Congress to make sports available to the public shows the importance of this collective action issue, and the difficulty for groups of citizens to act on this topic. Although it granted sports leagues the privilege of operating beyond the scope of antitrust scrutiny (see part III), Congress has maintained a healthy skepticism of the leagues and their potential to bypass the over-the-air broadcast networks in search of pay-per-view television riches. Over the past three decades, Democrats and Republicans, which have attempted to restrain the move of sports programming away from mass-market broadcast television, a process known as “siphoning”, have introduced several bills in both the House and Senate.[75] Still recently, Representative Edward J. Markey characterized professional sports “as unique and important parts of both the nation's culture and the cohesiveness of local communities.” Calling events such as the Super Bowl and the World Series "shared national events," Markey suggested the leagues should at least repay the fans "with free access to those games". While such iconic examples are used in congressional debates, the same arguments can apply to regular game seasons.

II. How cable regulation history led to imperfect competition

Cable broadcasting and sports leagues have both been far from exempted of regulation in the past decades. However, a close look at the history of regulation in these areas sets light on loopholes that have been partly responsible for the market failure that exists nowadays.

First, I will show that the move to deregulate cable in general has not fostered competition as expected, resulting in a very concentrated market where cable broadcasters exert market power. This finding is reinforced by the fact that sports content is most of the time offered in “expanded” tiers of content, as opposed to the basic cable packages whose price and content are watched more closely by the regulators.

a. Cable regulation

The regulation of the rates charged by cable companies is one of the major areas of dispute between the industry and the government. Before 1984, the FCC believed that it was not mandated to regulate cable, and therefore local franchising authorities regulated the rates charged by franchisees. The 1984 Cable Communications Policy Act[76], which was designed to promote competition and allow competitive market forces to determine rates, deregulated rates for almost all franchisees. Industry representatives that had pushed for the deregulation had argued that competition from satellite delivery systems and other new broadcasting technologies would keep rates reasonable.

The Cable Act of 1984 had two main provisions that gave more leeway to cable broadcasters. First, it removed the rate restrictions for basic cable TV service in areas where operators faced “effective competition” from other media; and second, it restricted the ability of local franchise authorities to deny renewals to firms when their contracts expired.[77]

The FCC defined “effective competition” as the availability of three or more, unduplicated, over-the-air television channels—for example, ABC, CBS and NBC—in the cable system’s market area. Based on this definition, about 97 percent of all cable systems were free from rate regulation by December 29, 1986, the effective date of deregulation.

Not surprisingly, competition did not occur after deregulation, and average monthly cable rates increased far faster than the rate of inflation (see Figure 1 on page 10.) The other argument brought by the cable industry – that deregulation and competition would bring more diversity in the cable and satellite offering – did not prove compelling either. During the 1984-1992 period, the average cable subscriber received only six additional channels, and competition from other operators was almost non-existent. In 1991, only 53 of the more than 9,600 cable systems in the United States had a direct competitor in their service area.

During that period of time, the number of cable companies offering more than one tier of basic service increased sharply—from 17 percent to 41 percent.[78] Typically, cable companies began offering a basic package—just the major networks and one or two distant channels—and an "expanded" tier than included the rest of the commonly viewed cable channels, like CNN or ESPN. The change was a reaction to proposed legislation in the early 1990s that would have reregulated only the lowest-priced tier of basic service. In fact, the final legislation that was passed and signed in 1992 did just that.

The 1992 Cable Act provided a new regulatory framework, authorizing local governments to regulate programming, equipment, and service rates charged by companies in areas where there is no competition. Basic rates could be regulated but only under prescribed circumstances that indicate a lack of competition in the area. According to figures gathered by the FCC in 1994, the new regulations led to average rate reductions of more than eight percent. The 1992 Cable Act eliminated many of the barriers to competition that existed before. Most important, it abolished the exclusive franchise agreement, which had been a powerful monopolistic tool.

The 1996 Telecommunications Act signaled a return to the pre-1992 act philosophy, as the FCC was again directed to deregulate the cable television industry. The industry, which lobbied hard for the changes, contended that deregulation would produce more competition and lower prices. In addition, cable operators saw an opportunity to move into the areas of broadband Internet service and local phone service. This outcome is a perfect example of regulatory capture, as Stigler[79] describes it. Indeed, in this case, cable companies have a strong interest in deregulation and potential gains in market power. On the customer side, the additional financial burden is spread among many consumers, hard to measure, and differs from market to market, making a lobbyist counteraction unlikely.

b. Evidence of market power

What has happened in the past decade is fairly close to what critics to the 1996 Telecommunications Act feared: less competition, high prices, and the consolidation of cable services into the hands of a few powerful companies. Today, the cable industry is more concentrated than ever. The number of cable systems in the US has been halved since 1996, and the 5 top companies are controlling more than 80% of the market - which totals 63.1 million customers (see Table below.)[80]

Rank	MSO	Basic Video Subscribers
1	Comcast Corporation	24,104,000
2	Time Warner Cable, Inc.	13,105,000
3	Cox Communications, Inc.	5,320,300
4	Charter Communications, Inc.	5,013,700
5	Cablevision Systems Corporation	3,102,000
6	Bright House Networks LLC	2,303,200
7	Mediacom Communications Corporation	1,297,000
8	Suddenlink Communications	1,266,400
9	Insight Communications Company, Inc.	723,700
10	CableOne, Inc.	705,400

Table 5-1: Weighted average cable Price and the CPI

The FCC has watched over the imperfect competition in the broadcasting industry very closely since 1992, as mandated in the Cable Act. Annual reports that report cable prices and assess "the status of competition in the market for the delivery of video programming" are indeed a way for Congress to ensure that proper competition is taking place.

Examining these annual reports can give us precious insights as to whether and how cable providers behave as local monopolies and use their market power.

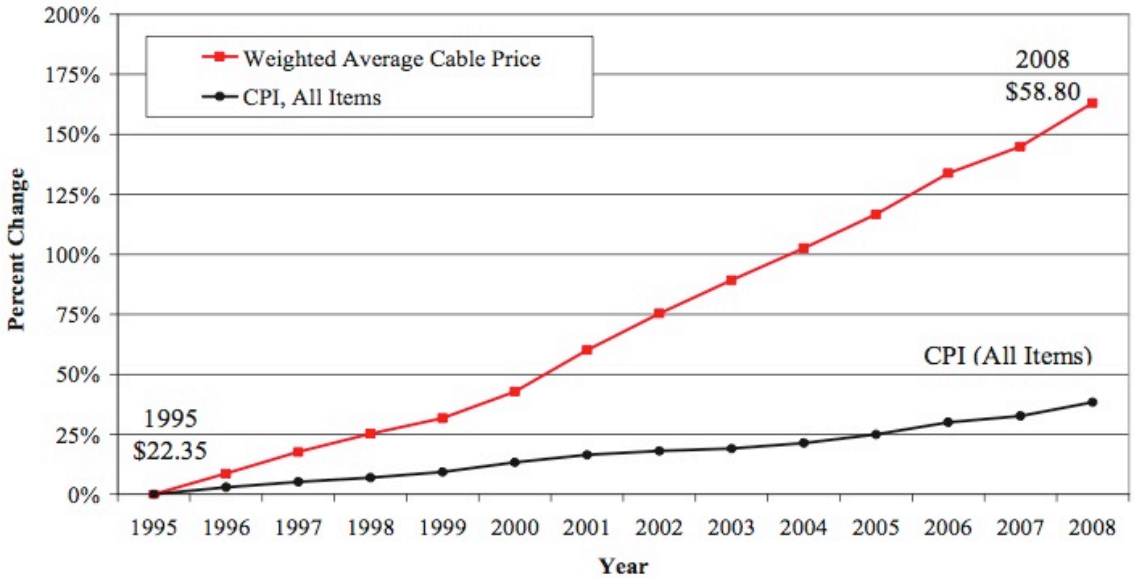

Figure 5-1: Weighted average cable Price and the CPI

The figure above presents the evolution of the subscription prices to cable.[81] This weighted average takes into account the fact that, nowadays, the majority of the population subscribes to an upper tier of content, not necessarily the basic package. In 13 years' time, the price of cable subscriptions has increased by 163%, more than four times the Customer Price Index (CPI in the figure). Of course, one could argue that this increase in price came with better quality and variety of content, it shows nonetheless a sign of market power by the cable providers, who are able to drive the market toward more consumption and greater margins.

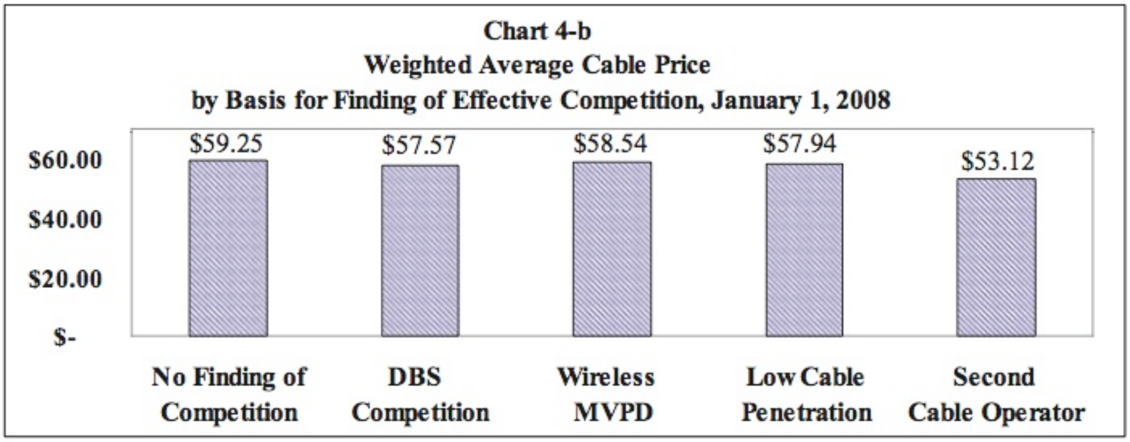

Figure 5-2: Weighted Average Cable Price by Basis for Finding Effective Competition

The figure above is another way to show that cable providers effectively benefit from market power and use it, and defeats the assumption made by Congress in its 1996 Telecommunication Act that Digital Broadcast Satellite (DBS) and other technologies would provide efficient competition to cable. Indeed, cable providers charge about the same price in areas where there is no competition, and areas where competition comes from alternative technologies such as DBS. However, in markets where another cable operator competes, weighted average cable prices drop suddenly by 10%. This phenomenon can partly be explained by the additional costs incurred when subscribing to a satellite system, and the difference in offerings between cable and DBS. This data suggests that technology itself is a differentiator, and that one can find true competition only in markets where two cable companies are competing against each other.

Even though there are no clear signs of monopolization from cable broadcasters, barriers to entry are high, and the current legislation that aims at using competition to let the market regulate itself seems to be failing. As we will see in the next section, the issue of ever-increasing prices is even worse in the context of Sports broadcasting, as regulators have historically paid little attention to pricing and offerings in upper tiers of content.

Of course, we cannot only blame monopoly power for the dramatic increase in cable prices. In the next part of this paper, I will argue that content owners are partly responsible for this price escalation. In particular, sports leagues have been benefiting from particularly clement antitrust regulation and have secured a monopoly position in their respective market that allow them to drive broadcasting rights up.

III. The protection offered by the Sports Broadcasting Act is no longer adequate in today's broadcasting landscape

In this part, I will show that the Sports Broadcasting Act of 1961 has created a dramatic advantage for sports leagues, granting them market power in contracting with broadcasters, and securing their position as natural monopolies in their respective markets. While this piece of legislation was necessary fifty years ago to protect the cultural legacy that sports leagues represent, it has created an imbalance between broadcasters and the leagues, which own scarce and sought-after content that can be considered as a common good.

Like many other pieces of legislation, the history of the Sports Broadcasting Act began in courts. In an effort to bring a greater quantity of televised football games into the homes of Americans, the NFL tried to negotiate an exclusive television contract with CBS. A federal court, however, ruled that this "exclusive" contract with CBS violated the antitrust laws by effectively eliminating competition among the member clubs of the NFL. Fearing for the financial future of the NFL and the possibility of limited football on television, Congress quickly responded with the Sports Broadcasting Act of 1961.[82] The Sports Broadcasting Act essentially affords professional sports leagues the status of a "single entity" and allows professional baseball, football, basketball, and hockey to sell their pooled rights for "sponsored telecasting" without being subject to antitrust violations. The passage of this Act has proven extremely beneficial to the success of the major league sports. By allowing the teams to pool their broadcasting rights and share revenues, Congress enabled the professional sports leagues to expand and prosper. In effect, all the teams were able to demand more money per broadcast. Teams in smaller markets were able to receive shared revenues with teams in larger markets, which in some instances assured the financial feasibility of struggling teams.

What was viewed as vital for sports leagues in 1961 has paved the way for the development of the leagues' market power, to the point where the protection that was accorded to them more than four decades ago is so deeply anchored in the US culture that it is being used as a bargaining tool by the leagues. One can then question whether the Sports Broadcasting Act is still relevant nowadays, especially when the technology allows the leagues themselves to create their own broadcasting channels.

It is important to note, however, that the Sports Broadcasting Act expressly uses the term "sponsored telecasting." To prevent siphoning of sports content out of free over-the-air broadcasting, Congress specifically intended that the Act only apply to "free telecasting of professional sports and does not cover subscription-based T.V."[83] This did not seem to stop leagues to act the same way when dealing with cable networks such as ESPN, for which cable broadcasters can charge more than $3 per month per viewer. In comparison, HBO charges less than a dollar per viewer per month. In fact, many of the broadcasting deals that are contracted nowadays by sports leagues are exclusive, and made only available on higher tiers of cable content to attract customers to those “less regulated grounds” see previous part.) NFL’s Monday Night Football, for example, has moved from ABC – where it has been broadcasted for 36 years – to ESPN in 2005. There seems to be an enforcement issue here, as Sports leagues are effectively acting as a monopoly and securing highly valuable exclusive deals with several cable networks.

Evidence of market power

The evidence of the leagues’ increasing market power is everywhere. Sports content produced by the four major American sports leagues is scarce, and the number of potential broadcasters is increasing. Therefore, even though ratings are falling for sports content, television networks are paying more and more for the broadcasting rights (see figure below)[84].

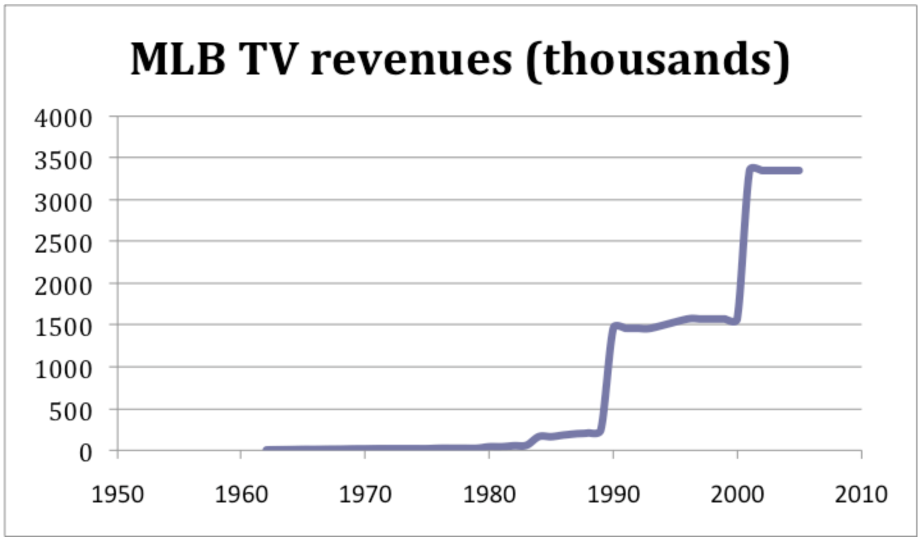

Figure 5-3: Annual television revenues or the Major League Baseball

This phenomenon ties into the empowerment of sports cable networks. Indeed, while bidding for such costly content, traditional broadcast channels are at a disadvantage. While they are only ad-supported, cable channels benefit from better deals with advertisers as their audience is more homogeneous. On top of this, the additional revenue stream coming from the subscriptions make cable giants such as ESPN the only ones able to bid for premium sports content.

This picture could probably be acceptable and dealt with easily, if it was not for the recent moves initiated by the leagues. In order to expand their offerings even more, and get a share of the enormous amounts of money spent in advertising during sports events, the leagues have created their own cable networks.

The issue here is not that leagues are competing with cable networks. But a natural monopoly that has been protected as such by the regulator is now trying to vertically integrate, thus increasing pressure on the cable networks and broadcasters. Indeed, the leagues are benefiting from a huge competing advantage: their cable networks do not have any to pay for any broadcasting rights. This pressure seems to be in turn transferred to the consumers, which contributes to create what Senator McCain calls “an income test” for Sports viewing.

IV. The shift to IP-based delivery systems is an opportunity to create new competition

Due to the low percentage of the population that watches television on the Web, and the type of content that is mainly consumed online, Internet broadcasting has not been regulated yet. The FCC seems to be more concerned about obscenity and security nowadays, and to date the only major piece of legislation that deals with online video content is the Digital Millennium Copyright Act (DMCA) of 1998.[85]

Yet, consumers’ behaviors are changing, and studies are showing that more and more people are watching television online.[86] While this phenomenon is only visible in the younger generations, Internet broadcasting seems to offer the possibility of place-shifting and time-shifting, both of which are valued highly by customers. Now that the market for Internet broadcasting seems to grow, it is hard to predict which dominant design will prevail. Are cable broadcasters going to retain their market share thanks to the move to "TV everywhere" services? Will each league successfully develop an online video service, effectively becoming its own broadcaster? Is another player like ESPN going to come up with a compelling online video platform for all sports?

The regulator will certainly welcome this technological shift as good news, since it seems, for now, to be fostering competition and innovation. It is likely that after several seasons of competition, a natural "winner" will take a predominant position in the market. The regulator will play two different roles. First, during the competition phase, it will have to look closely for anticompetitive behavior. Indeed, what is at stake here is the multi-billion dollar empire built by the major sports leagues, currently served by equally powerful broadcasters. As congressional debates remind us, they are a part of the American culture. Second, Congress will have to produce adequate regulation to fill the legal loophole in which Sports broadcasting resides now.

One can already identify some of the risks that could lead to vertical integration. Each potential dominant design described in the last chapter raises its own set of issues, and I will now briefly address these.

a. Broadcaster is king

"TV everywhere" and other services that aim at rebroadcasting content online while securing traditional cable fees from subscribers would not change dramatically the existing order. On the contrary, this strategy formulated by cable companies is another step toward customer lock-in, as end-users would become reliant on one operator for both their television and Internet service. While this kind of service bundling has been allowed in the 1996 Telecommunications Act, we will argue that the existing equilibrium in cable delivery markets is not desirable from a customer point of view. Indeed, the same mechanics that result in regulatory capture today would still be effective in that scenario.

In order to fight this outcome that would only increase the cable companies' market power, the regulator will have to redefine what "effective competition" is, going further than what it did in the 1996 Telecommunications Act. This task will not be easy to achieve, as the pool of services offered by broadcasters and the number of devices on which those services will be received will most likely grow quickly. However, we can point out here that as showed in part II, competition is much more fierce between two firms providing the same technology (e.g. cable) than between different technologies (e.g. cable and DBS). The regulator should therefore try to promote competition inside given dominant technologies, rather than between different ones.

Congress has already expressed its intention to make Internet an "open and interconnected" place, where "consumers are entitled to competition among network providers, application and service providers, and content providers."[87] The regulator's position, toward network neutrality and the free flow of data, will most certainly discourage carriers from hampering competition by, for example, slowing down traffic coming from MLB.TV, on the premises that those HD video feeds are taking a lot of bandwidth.

b. Content is king

If the leagues go further down the path they have begun to explore by creating their cable networks – and, in the case of the MLB, an online video platform; one might see the major sports leagues becoming their own broadcaster, thus competing with online and traditional cable and over-the-air broadcasters. The regulator should look at this kind of vertical integration very closely, however. Indeed, sports leagues are still benefiting from the protection of the Sports Broadcasting Act of 1961. While denial of access from the content would be too obvious and severely sanctioned, it would be tempting for the leagues, in order to reap more of the colossal advertising dollars, to overprice their sports content in order to increase their revenue or rule out competition from other broadcasters.

There are several different policy answers to this threat. First and foremost, the regulator could choose to amend the Sports Broadcasting Act. Indeed the state of sports broadcasting has changed since 1961, and sports content created by major leagues is now seen by an increasing number of channels as valuable and scarce content, and the fact that many different broadcasters are seeking grants the leagues some market power already. However, this solution would only address partly the issue of the leagues as their own broadcasters. By eliminating the regulatory failure, we would only go back to the initial market failure of having leagues acting as monopolies, and one can question whether the leagues' competitive advantage would really be reduced.

The second solution, that appears to be addressing competition more effectively, would be to keep the Sports Broadcasting Act as it is today, but enforce a total disintegration of the “content creation” and the “broadcasting” part for the MLB and other leagues. In that case, leagues as content producers would still benefit from some antitrust protection, while competition on the broadcasting side would be fostered. This view is close to the solution that is offered by Kearney and Merrill.[88]

The issue of the leagues’ market power needs urgent attention. The Supreme Court is currently reviewing the *American needle vs. NFL* case[89], and has to decide whether NFL (and by any extent, a sports league) should be only considered as a single entity or not. This decision could have an enormous impact on broadcasting as well, as this debated overlaps with the current protection offered by the Sports Broadcasting Act.

Conclusion

It is an interesting time to look at the evolution of the regulation on Sports broadcasting. With the advent of Internet, leagues, broadcasters and regulators are at a critical point in broadcasting history. While regulation of Sports leagues and cable broadcasting has not addressed adequately the issue of sports broadcasting, letting market power and revenue skyrocket for both broadcasters and sports leagues, a new order is about to be established. As Internet is believed to be the broadcasting medium for the future, competition is entering this new, technology-driven area. While Internet broadcasting has not been extensively regulated yet, the "effective competition" that is likely to be created seems to go along the lines of the current broader legislation. However, because of the important position of the players involved in Sports broadcasting over IP, namely, the sports leagues and the historical cable carriers, the regulator will have to look for specific anticompetitive behavior, and adapt the existing regulation that affects them if necessary.

Chapter 6. The System Dynamics Standard Method

I. Problem statement

In the first part of this thesis, we have described how the broadcasting of Sports via the Internet Protocol could disrupt the existing value chain, as the case studies showed us how cable television has already disrupted this industry in the 1970s, and how other part of the larger entertainment and media industries have seen dramatic changes with the empowerment of the user and the apparition of new communication channels brought by the Web.

The general question, then, that is addressed in this thesis, is:

How would a shift toward Internet-based delivery systems influence the current value chain for Sports broadcasting?

This question can be divided in three sub-categories, which deal with the technical issues, regulatory needs, and business model changes that Sports over IP cause – which have been explored separate chapters in the second part of this thesis.

To address this question and provide insights and policy recommendations, a system dynamics model has been built. In this chapter, we will first justify why the use of system dynamics is adequate in addressing the problem stated above, and we will then give a rapid overview of the standard method used to build the model. The next chapter will present the model for Sports over IP in further details, and the last chapter of the thesis will bring forward insights and policy recommendations that emanate from this work.

II. Justification of the use of System Dynamics

System Dynamics is the tool of choice to complete the study that has been initiated in the second part of this thesis for three main reasons.

a. The Sports over IP issue is essentially trans-disciplinary

As shown by the second part of the thesis, any player in the sports broadcasting value chain has to deal with several classes of problems at once, that cannot be easily dissociated: the technical issues raised by an increase in online video demand, the business issues related to profit models for various members of the sports value chain, and the regulatory issues in the sports broadcasting field. In any case, the technical, business and regulatory levels are intertwined in the Sports broadcasting industry. Literature is abundant in each of these three separated fields. Yet, different tools and languages are often used to deal with technical, regulatory or economic issues. System Dynamics allows us to use a common language to treat these three classes of issues together.

b. Feedback loops are prevalent in the problem

The second part of this thesis has exhibited an important interplay between the incumbents of the Sports broadcasting industry, and the new "entrants", which are already part of the value chain. Therefore, a decision of any of these players will necessarily have consequences on their direct competitors, but also indirectly on other parts of the value chain, creating in turn feedback effects for those who made the decision. On a broader scale, the market for sports production itself is rich in self-reinforcing and balancing dynamics, as exhibited in chapter 1.

Therefore, this complex system could give birth to what Sterman calls "policy resistance"[90] effects, and makes System Dynamics a tool of choice to address potential issues that could arise from it.

c. Behavioral factors are inherently part of the model

Whether considering customer adoption of a new technology, competitive behavior in a constrained environment (where players may not act "rationally"), or policy decisions by a government entity, any model looking at Sports over IP will contain numerous behavioral factors. The effects of these factors are hard to foresee and often impossible to measure or predict with any precision. In any case, System Dynamics enables consideration of such effects through the use of sensitivity analysis and/or reality checks. And even if the hypotheses made on these behavioral factors are arguable or even prove to be wrong, the insights gained while building the model can still be valuable.

III. The System Dynamics Standard Method

The "standard method" is a widespread technique used to define a problem and create a model, while gaining useful insights along the way. In this part, we will describe the standard method. However, as this method is widely used, most of the content of this part will be heavily inspired from previous work.[91] [92] This standard method will then be applied in the next chapter to show the steps that led to the creation of the Sports over IP System Dynamic model.

The Standard method is divided into several steps:[93]

1. Problem articulation

The theme of the problem is formulated; the key variables and concepts are identified. System dynamics experts believe that focusing on five or six variables can capture behavior in many of the complex systems we encounter.

2. Formulation of Reference modes

Reference modes are sets of graph showing the development of a problem over time, which help characterizing the problem dynamically. A good example of a simple reference mode is the exponential growth that the major league players' salary has known since the 1970s. This salary could follow the same trend in the future, plateau up after a certain threshold, oscillate or even decrease over the effect of negative feedbacks or new policies. Thinking about those dynamics help narrow down the problem and track dynamics affecting a variable.

3. Formulation of Dynamic Hypotheses and creation of causal loop diagrams

Dynamic hypotheses are sets of assumptions regarding how the problem studied arose. Some causes of the problem will be exogenous to the model (a good example in our case is the Sports Broadcasting Act of 1961, that triggered a reinforcing loop driving the broadcasting rights of Sports up) while other will be captured in the model. From these dynamic hypotheses, a causal loop diagram capturing the main dynamics of the system will emerge.

4. Formulation of a Simulation model

A simulation model is then produced from the causal loop diagram. Links between variables are broken down until each one can be modeled by a mathematic function or a simple arithmetic description Stocks and flows are introduced. This process is iterative and requires heavy communication with experts in the field to validate both the mechanics and the underlying equations.

5. Testing

The model is then compared to reference modes, historical data. The boundaries of each variable are tested, and the sensitivity of the whole system to uncertain parameters is checked.

6. Policy design and Evaluation

While the first five steps of this method can yield useful insights, the policy design and evaluation step aims at using the model to evaluate new rules, strategies and structures that could be tried in the real world, point at synergies or compensatory responses in those policies. A sensitivity analysis can also inform on how robust the policy recommendations are under different scenarios or given uncertainties.

Chapter 7. System Dynamics model for Sports over IP

In this chapter, we will present the model that was built using the standard method presented in the last chapter. First, the hypotheses made and the boundaries of the model will be presented and justified. Then, we will focus on four important loops of the model that play critical roles in the dynamics of the sports market and the adoption of the Web TV technology. The construction of these loops will provide some insights that will be presented along with the insights gained from the results in chapter 8. The complete description of the model can be found in the appendix.

I. Boundaries of the model

For the sake of clarity and simplicity, the system dynamics model has been designed to represent one specific implementation of Sports over IP: it models the competition between the current offering of Baseball on cable and satellite broadcast television, described as the classical value chain for sports broadcasting in chapter 4 and representing the incumbent, and the Web TV service MLB.TV presented in the first chapter of this thesis, representing the entrant. This formulation of the model is a simplification over the three main disruptive architectures identified in chapter 4. While the piracy threat is acknowledged and taken into account separately, the “TV everywhere” service to be offered by producers and carriers has not been separated from the existing cable and satellite offering in the model. This is because in its current form, TV everywhere requires customers to be subscribers of a cable or satellite package; and therefore the competition seems not to take place between MLB.TV and a Web TV service produced by legacy cable broadcasters, but rather between MLB.TV and the existing cable package itself.

There are other limits to using this specific example for the model, rather than a more generic formulation: by using specifically the rules formulated by the MLB, and its specific value chain for sports broadcasting, the model loses a it of its generality; we believe however that the mechanisms described here are general enough so that they can be transposed to other sports leagues. Looking at the scale of a league rather than at a national scale also rules out a certain class of scenarios where content would be aggregated across several sports leagues (in the fashion of what ESPN currently does.) For now, experience has shown that early examples of Web TV sports services are often limited to one league at a time – at least besides TV everywhere packages. Finally, the model makes little distinction between legacy carriers and producers: both of them are a central part of the incumbent value chain, but both feedback effects affect them equally – this may not be true in the real life, as those players have different roles in the value chain, as described in Chapter 4.

However, there are also clear benefits of narrowing down the model to Major League Baseball. First, focusing the model on one specific league and one specific example of Web TV service allows for an easier description of the system and the equations ruling it. Second, it allows us to use historical data (ticket prices, player salaries, broadcasting rights over the years…), available at the level of the league, to validate the descriptions of the model and calibrate parameters. Finally, this more specific and fine-grained description allows us to see more closely the impact of new regulations or shocks of any sorts.

In the first two parts of this thesis, we noted that early users saw MLB.TV more as a complement to the current cable offering than as a real competitor. While this may remain the dominant use for now, as many of these early adopters are willing to pay for both services, MLB.TV is most likely to become a true competitor to the current cable offering and the "TV everywhere" model when this stand-alone service reaches the masses. As our model looks at a 15-20 years prospective time frame, those services have been considered as substitutes rather than complements in the model.

As historical data was available for most of the variables in the first view (see TV rights escalation loop and Cable success loop above), earlier versions of the model (i.e. without implementing any of the Web TV loops) were used to fit historical data over the 1970-2005 period and calibrate the model.

The model simulations run from 2005 (three years after the apparition of MLB.TV) to 2025. As it took roughly 20 years for the cable broadcasting technology to reach high penetration, the same duration was taken for the model. A shorter time span would not have allowed us to see significant changes, and letting the model run for 50 years seems to distant, as most hypotheses that have been made would not likely hold for such a long period.

II. Presentation of the key loops

The model, presented in appendix, is divided in two parts – or "views." The first view deals with supply and demand for video services and live games. Its purpose is to model the upper half of the legacy sports broadcasting value chain as well as the "live sports viewing" value chain. This first view also provides inputs to the second view that looks more closely at the competition among cable and satellite TV, Web TV, and a potential piracy threat. This view provides most of the outcomes of the model. As such, the first two loops that will be presented in this part – TV rights and cable success – have been extracted from the first view, while the last two loops – Web TV adoption and piracy control – come from the second view.

a. TV rights escalation loop

Dynamic hypothesis: The initial shocks that created the escalation of players salaries, and consequently the rapid increase in ticket prices and television broadcasting rights, are exogenous to the model and have been caused by singular events such as the increase in player value in the 1960s and the Sports Broadcasting Act of 1961.

Reference modes: Historical data shows an exponential growth for average players salaries in the MLB and the overall league revenues, that come from gate sales and broadcasting rights – this observation takes inflation into account. The dynamic could stay unchanged for the next 20 years. However, due to the emergence of new business models associated with the broadcasting of Sports, there could be some goal erosion in this loop that would make the reinforcing dynamic plateau off. Except from the players' point of view, this would be the most desirable outcome.

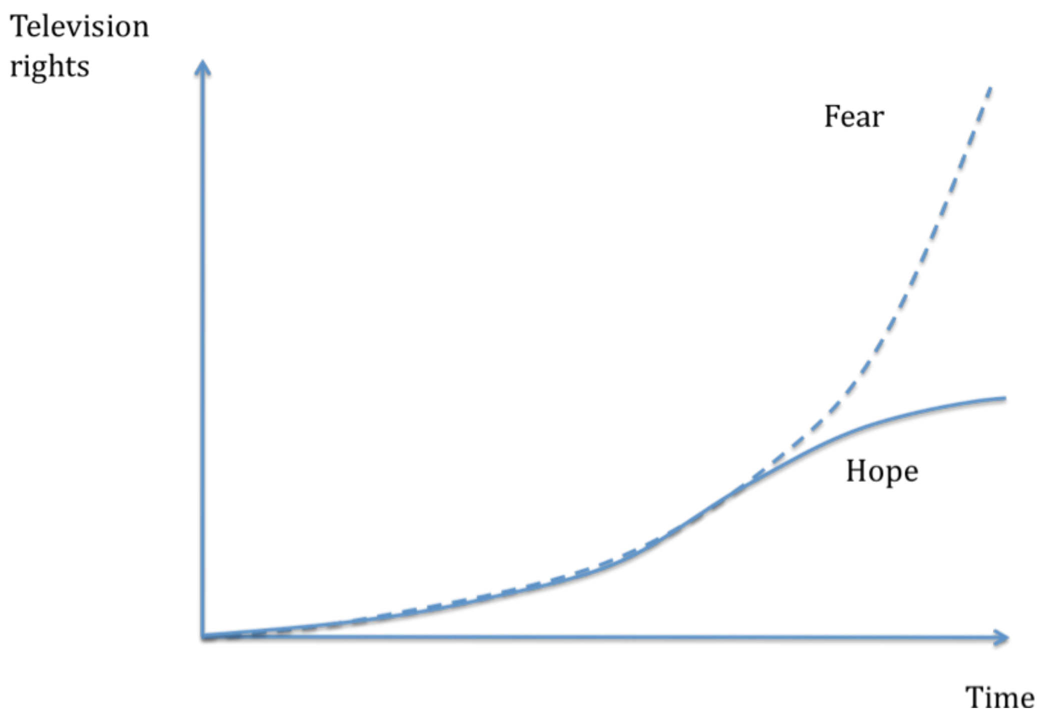

Figure 7-1: Reference modes for Television rights

As league revenues increase from ticket sales and broadcasting rights revenues, the players are able to exert their market power on the teams to get most of the revenue increase into the payroll. This sets a new standard for player salaries for the season, that the leagues need to take into account in their balance sheet, by increasing their average ticket price and their reservation price to sell broadcasting rights to cable networks.

While building this loop, it became clear that leagues would not place the same burden on the cable channels and on the live spectators to compensate for increased expenses. This is why the sensitivities on TV rights and ticket sales have been introduced. Those variables have been calibrated using historical data, and kept constant for the future. Currently, the burden is heavier on the broadcasters, who are also observed to be willing to pay increasingly more than the average consumer, as shown in the first chapter. As the balance of power shifts in the producing parts of the value chain, more and more of the burden could be placed on TV rights rather than ticket sales, as broadcasters lose market power due to increased competition.

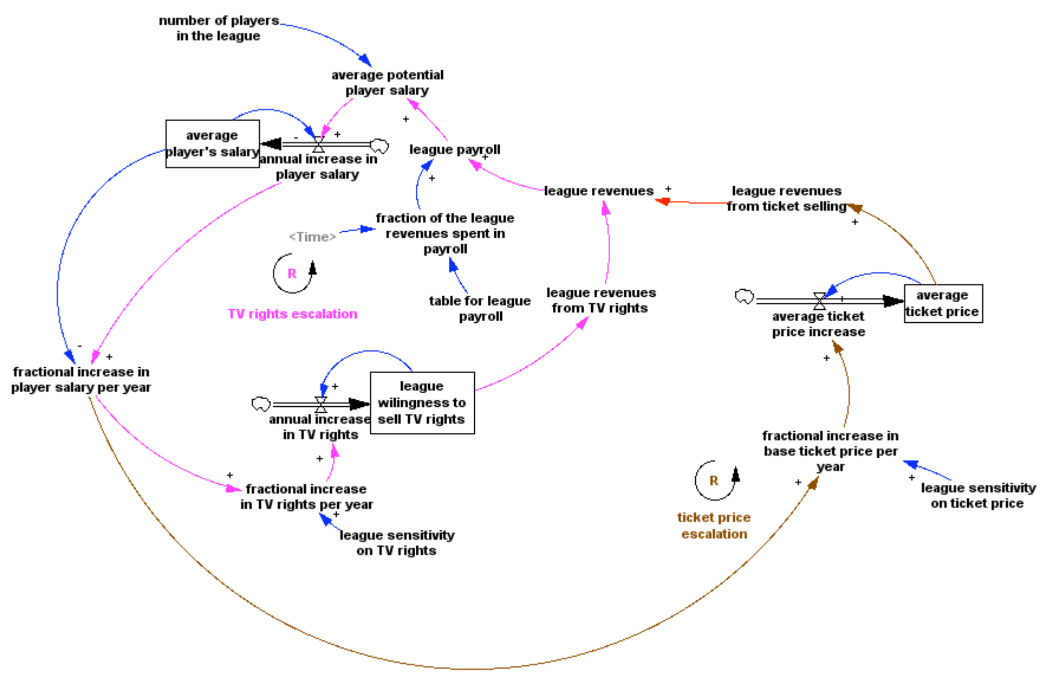

Figure 7-2: The TV rights escalation loop

b. Cable success loop

Dynamic hypothesis: A sustainable audience is what drives advertising revenues for cable programming up, which in turn increases the legacy producers' willingness to pay for the content.

Reference modes: Due to the growing financial success of sports events, the broadcasters' willingness to pay for Sports content has followed the leagues' willingness to sell their content and has gone up. As Web TV services divide the audience, advertisers may be less prone to support Sports programming on cable, leading to a balancing dynamic that could affect the cable producers' willingness to pay for content, affecting the whole system's economy.

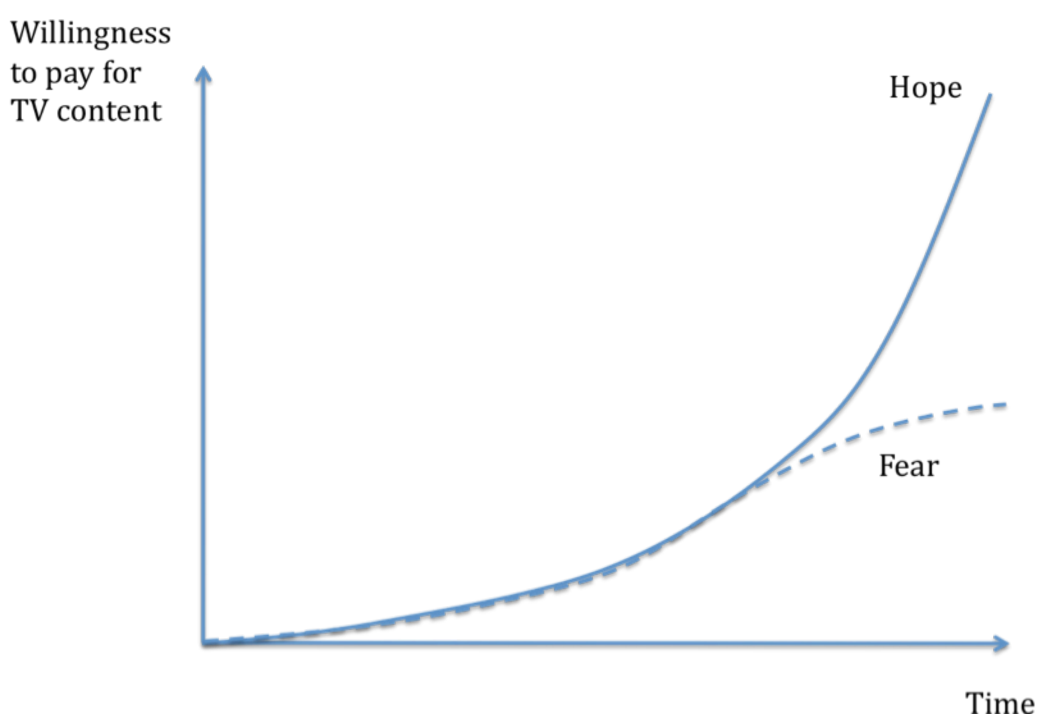

Figure 7-3: Reference modes for willingness to pay for TV content

In the case of the MLB, the broadcasting rights are the result of negotiations between the league and producers and usually last for several seasons. As stated earlier in this work, those broadcasting rights for top sports leagues are sought after by various broadcasters, and lead to bidding wars on the producers' side. We can therefore estimate that the final league revenues from TV rights will be below the league willingness to sell their rights, but higher than the producer's willingness to pay for the content – estimated to the projected advertising revenues for this content. These revenues depend in turn from the installed base for cable viewing.

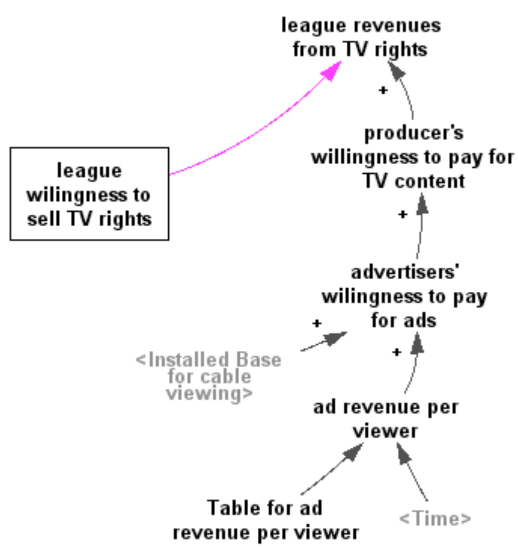

Figure 7-4: The cable success loop

c. Competition between Web TV and cable TV

Dynamic hypothesis: Cable and Digital Broadcast satellite have experienced great growth in the last three decades. Those services can now be considered as mature, especially when looking at the upcoming new entrant, Web TV services. As such, the attractiveness of cable television services is not going to change as much as the attractiveness of Web TV services, whose price and quality are likely to change much more in comparison.

Reference modes: Web TV services such as MLB.TV have experienced growth in the past few years. Depending on the level of attractiveness that this service will be able to attain, and the level of attractiveness that legacy services (here, only cable and broadcast satellite) will be able to maintain, the amplitude and speed of this growth will vary.

What constitutes a desirable or undesirable scenario here greatly depends on the point of view that is adopted: while the hoped-for outcome is clear for advocates of Web TV and cable TV, the position that the regulator should take is less clear: both Web TV and cable TV services are desirable, as the former service drives innovation and, while the latter has been investing heavily in the much needed delivery infrastructure. Fair competition between those services, then, seems to be a desirable goal for the regulator.

In this example, we took the point of view of Web TV advocates.

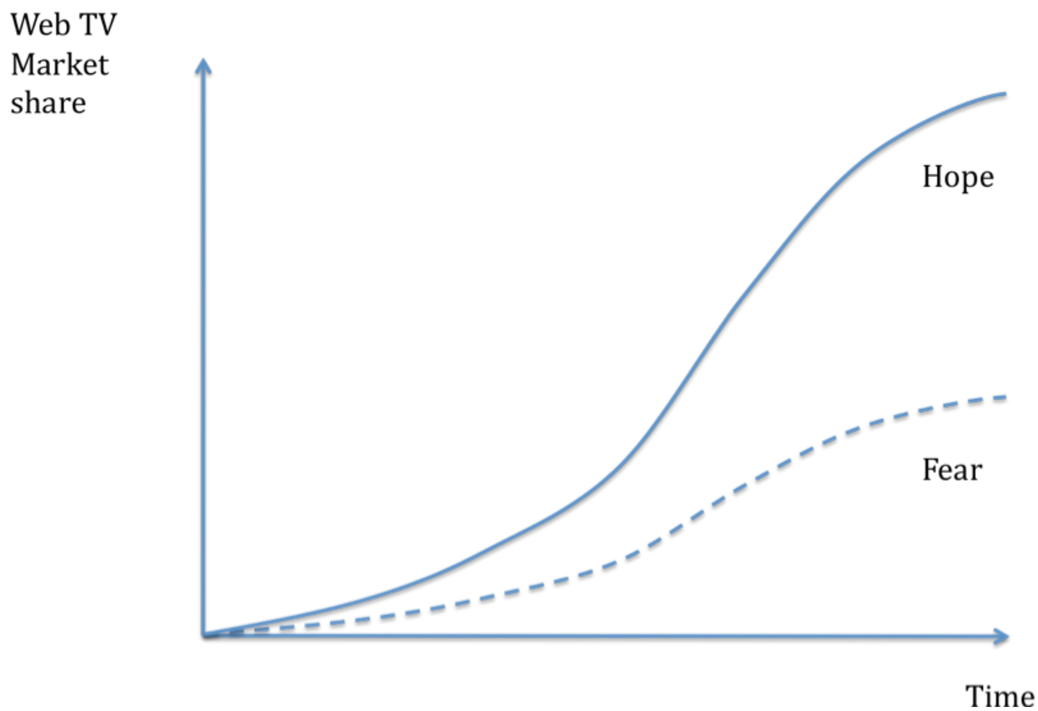

Figure 7-5: Reference modes for Web TV market share

The competition model used for this model is inspired from a classical structure of product adoption.[94] New customers or customers that decided to renew their subscription or switch for another product will then adopt either Web TV or cable and satellite TV, based on the relative attractiveness of each product. Attractiveness has been set as a multiplicative function of what has been identified as the three main criteria of choice for consumers:

- Price
- Quality of content
- Variety of the content

There are several limits to this way of modeling: a consumer's choice is indeed driven by more than these three factors, and switching costs were not taken into account here. But this simple representation allows us to capture the main dynamics for product adoption more transparently; which will be most important for the next part of the work.

In order to be able to compare both services on those three criteria, the variables mentioned above have been normalized and made dimensionless, always greater than zero and smaller than one. Their values are a function of the size of respective installed customer bases for cable and satellite TV and Web TV, thus creating reinforcing or balancing effects on each product's adoption.

To emphasize the fact that cable and satellite TV represent the incumbent, and MLB.TV the entrant, the attractiveness of cable and satellite TV is set initially higher than the attractiveness of Web TV. However, a variable called "Internet innovation" has been introduced in the model, in order to account for the greater potential of the Web TV technology. The specifics of the advantage that Web TV has over Cable TV can be found in the full description of the model, and are building on the analysis done in Chapter 4, part II.

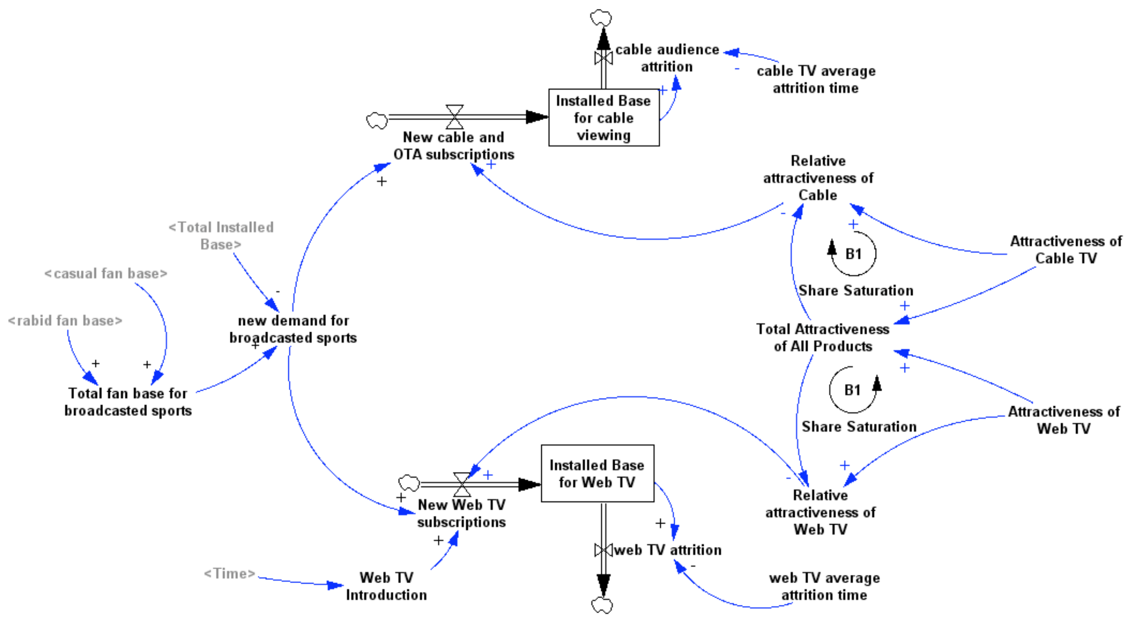

Figure 7-6: The design for competition between cable TV and Web TV

d. Piracy control loop

<u>Dynamic hypothesis:</u> The use of the Internet as a broadcasting channel has allowed for the un-authorized rebroadcasting of many cable sports networks and Web TV services. This is a new, exogenous threat in an industry that was mostly protected from piracy in the past. As such, users that are familiar enough with the Web TV technology could choose to stop subscribing to sports broadcasting services and only watch pirated content. Piracy control tools will be sought to counter the threat of unauthorized rebroadcasting and consumption.

<u>Reference modes:</u> The hope is that piracy control tools will be potent enough and come quickly enough that new ways of pirating Sports content could be dealt with easily, without the pirate user base becoming too important. However, if producers and broadcasters fail to bring a sufficient response to piracy, or if that answer cannot keep at the pace at which pirates innovate, then piracy could become a sizeable issue that could hamper the development of the sports broadcasting market.

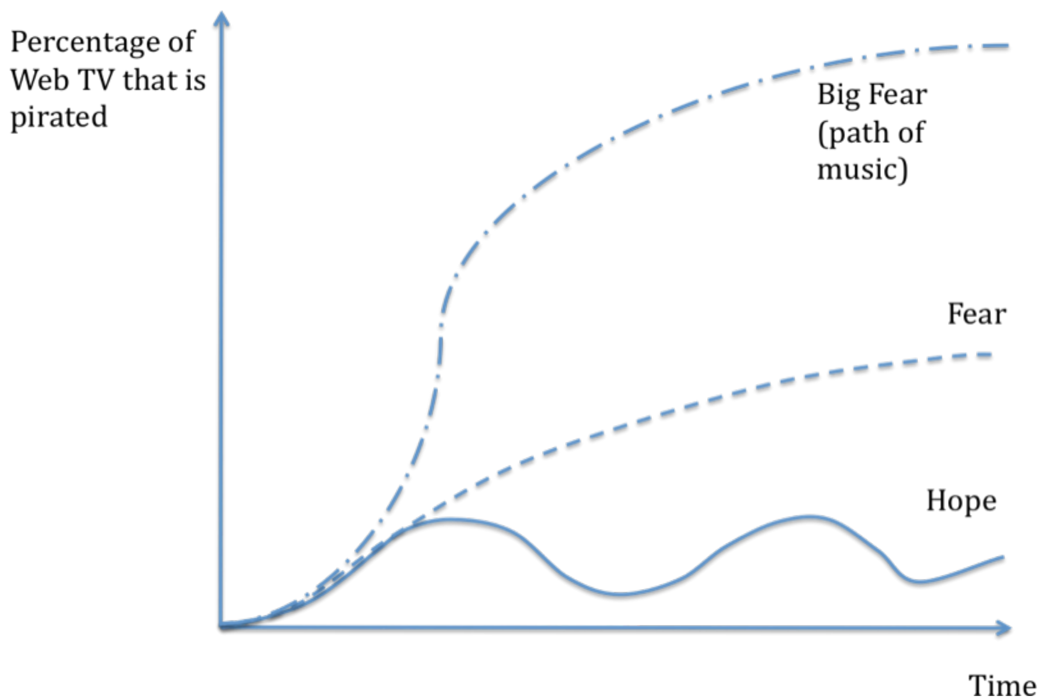

Figure 7-7: Reference modes for Pirate Web TV

As stated above, it was assumed here that piracy viewership could only stem from Web TV viewership; as the level of technical knowledge and the equipment required are high enough that only people that switched to Web TV viewing already are likely to adopt the piracy solution. Since piracy solutions offer almost the entirety of the MLB content online for a slightly lower quality, the size of the pirated-content audience will depend on the price of the cable and Web TV offerings compared to the consumers' reservation price in the model.

There are multiple ways to implement a piracy response loop in the system, and at this point it is difficult to predict what mechanisms will drive piracy control. The modeling approach to piracy is therefore rather simple here: as producers observe a certain level of piracy with a delay, a goal is set regarding the level of piracy control that can be attained. This level is reached with a first order delay. Since data on delays, potential levels of piracy and reservation price in this loop are not widely available, insights will be gained from a sensitivity analysis that will be discussed in the next chapter.

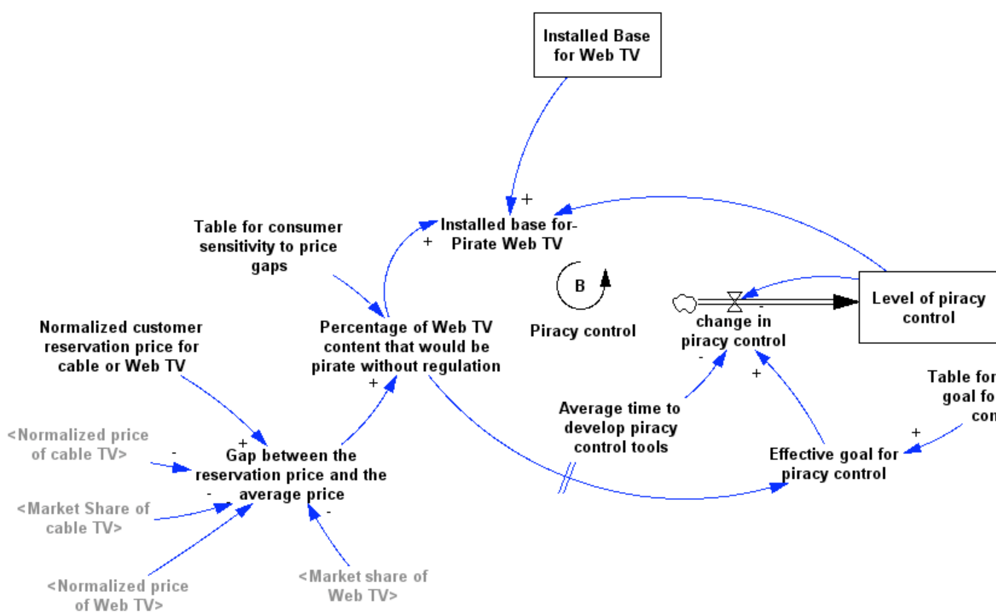

Figure 7-8: The piracy control loop

III. Full System Dynamics Model

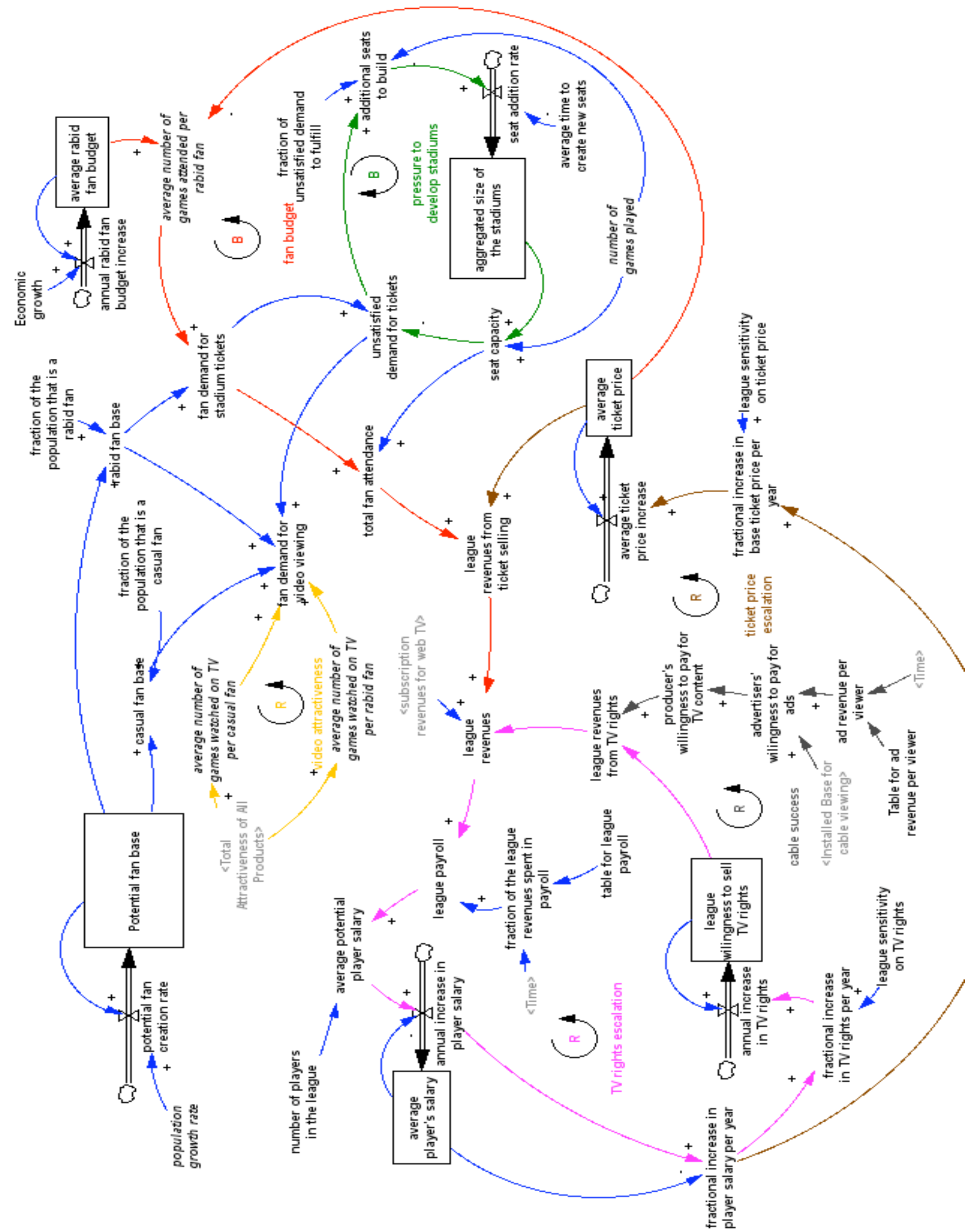

Figure 7-9: Full sports market view

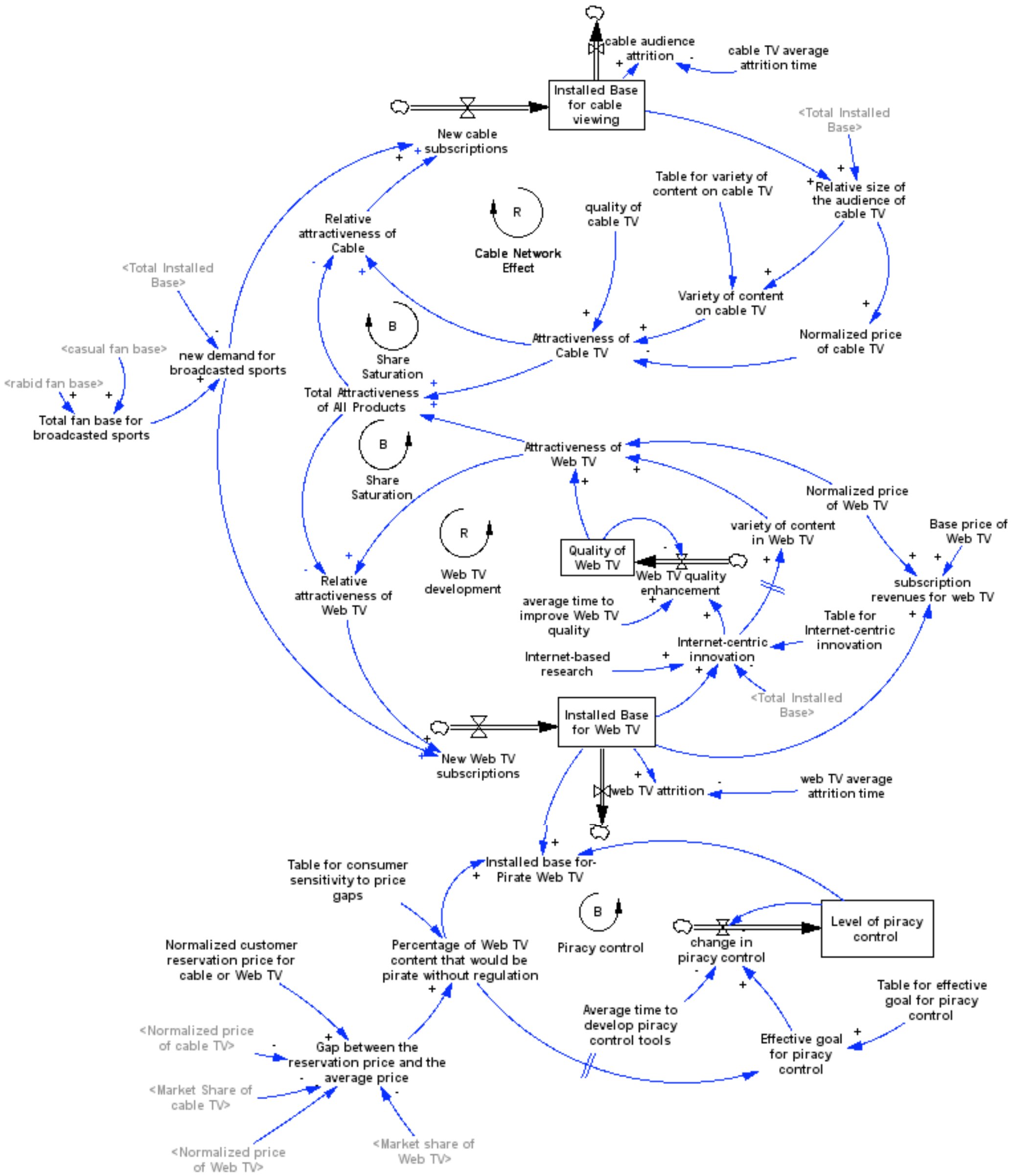

Figure 7-10: Full dynamics of product adoption view

Chapter 8. System Dynamics findings and policy recommendations

Overall, this study has shown that the shift toward Web-based sports broadcasting will likely transform the existing value chain, creating opportunities for new entrants as well as redefining the roles of the producer and carrier. In this chapter, we will use the System Dynamics model to get general insights on how the sports broadcasting value chain could be transformed, to then generate policy recommendation addressed to existing players of the sports broadcasting value chain, as well as policymakers that regulate in the area of Sports, broadcasting and the Internet.

I. System Dynamics Findings

As stated in various stages of the thesis, insights are drawn from two sources. First, from the modeling process and the formulation of a "base scenario" for the System Dynamics model. Second, from various sensitivity analyses that are performed on parameters which values are uncertain or could change due to shifts in policy.

a. Insights from the base case scenario

To fully understand these insights, that come from the modeling process and the design choices associated with the formulation of a plausible base case, it is absolutely crucial to refer to the full version of the model presented in appendix.

Due to lack of space, only the major hypotheses or design choices will be restated here. For this base case scenario, a very effective piracy control system has been chosen, in order to get clearer insights on the dynamics of the current value chain. A sensitivity analysis in the next part of the chapter will address the piracy issue.

1. Due to the demographics of the market, the switch to the most attractive technology will be slower than what the advantage from perceived attractiveness seems to indicate.

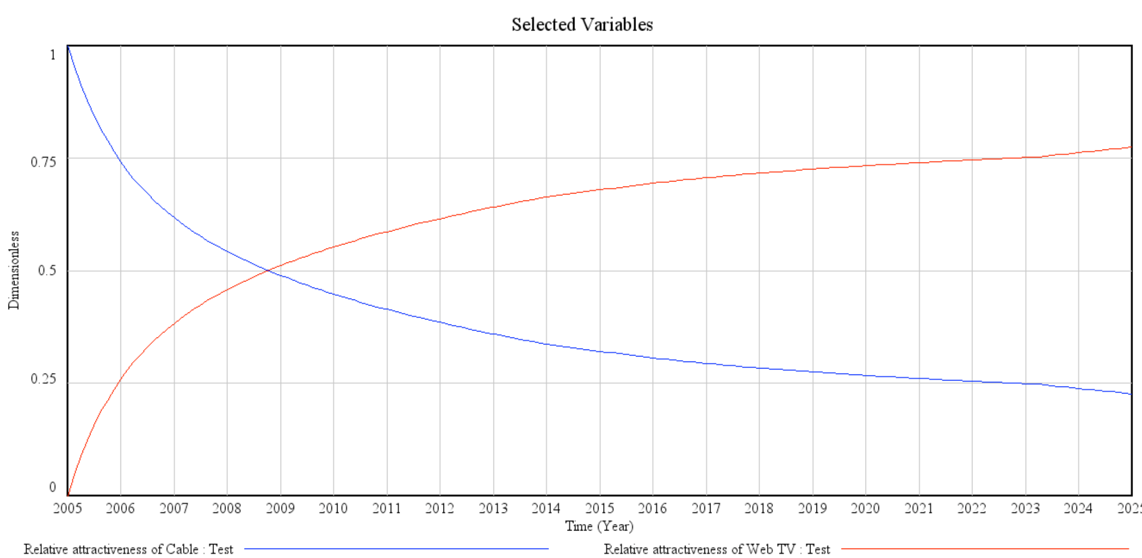

Figure 8-1: Relative attractiveness for cable TV and Web TV (base case)

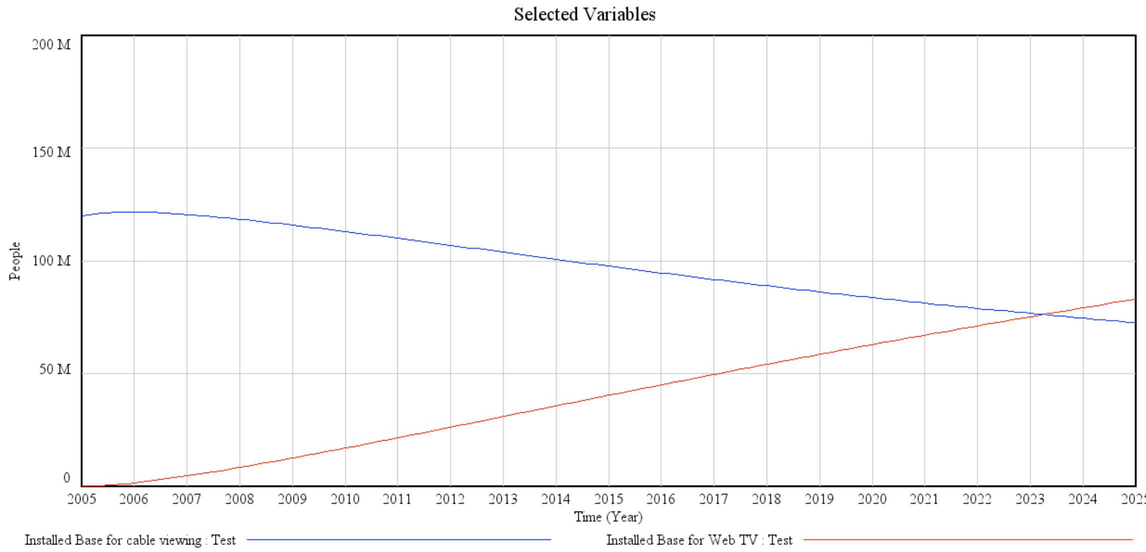

Figure 8-2: Installed base for cable TV and Web TV (base case)

As seen in the figures above, while in the base case, Web TV becomes more attractive than Cable TV between 2010 and 2011, the market tips more than 10 years after that point. This effect can fully be accounted for by the model structure. What really drives the speed of the switch toward the most attractive solution is the customer attrition time for the installed bases. If we take an extreme case and set this time to 1 day, then at each time step both customer bases will be emptied and refilled by new subscription, each market share for new subscriptions being equal to the respective attractiveness of each platform. In that case, if the Web TV technology became more attractive than cable TV as shown in the figure, the switch to Web TV would be much faster than what is presented. This delay is mostly due to the fact that the customer attrition time is not so low, and therefore creates delays in the technological switch.

It is then worth questioning what a good value, or a good value range would be for that customer attrition time. This variable accounts for two effects. First, the change in minds of the existing users – who ask themselves if they want to change their existing subscription from time to time – but also, and more importantly, this variable accounts for the new generations of users that are replacing the older ones. Those new users, which are more tech-savvy, are usually considered as early adopters of new technologies, and therefore an important driver to change.

In the base case, a customer attrition time of 15 has been chosen – as this time is believed to be comprised between 5 and 20 years. Those 15 years basically represent the time that it takes for the next tech-savvy generation to introduce the new technology in the mass market – by using the new product themselves and influencing the trends as lead users.[95] This time is observed to be much longer in the case of television than what it was in the case of music, as sports broadcasting reaches a audience that is on average older than music.

2. Whether it disrupts the value chain for sports broadcasting or not, the switch to Sports over IP should not hurt the sports leagues too much, as long as piracy remains low.

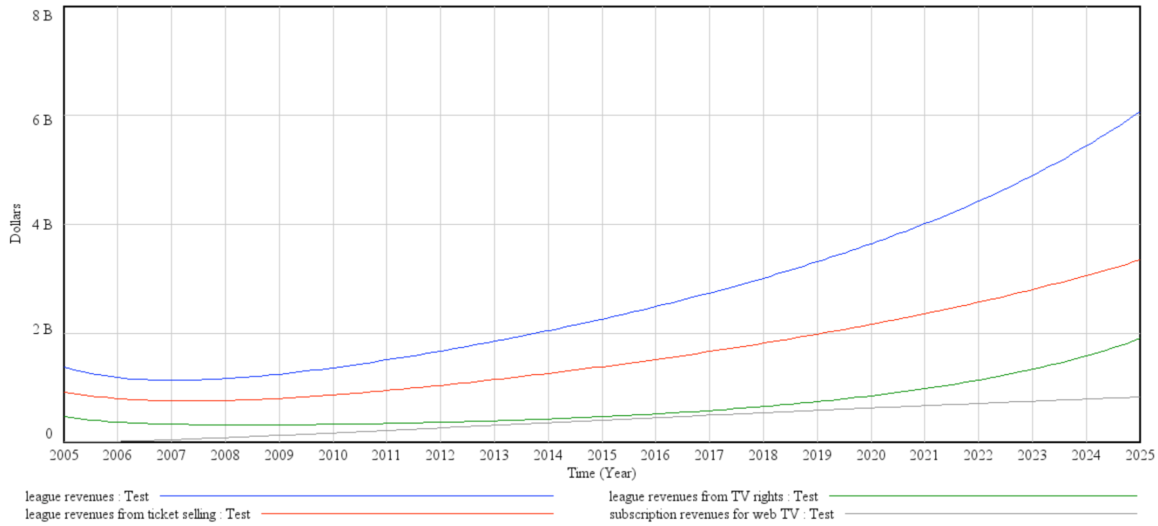

Figure 8-3: Total league revenues and its components (base case)

This insight, again, results from the basic structure of the model. As stated in the first chapter of this thesis, part of what made cable so successful was its dual revenue stream, compared to the sole dependency of legacy broadcasters to advertisers.

Similarly, the MLB, in the model, has three different revenue streams. Furthermore, two of these three streams – revenue from cable broadcasting and revenue from Web broadcasting – come from substitutes, while the third one – ticket revenues – is a function of the fan base, which has been found as consistent. This way, in the current model for MLB, the sports league is always ensured to have at least two strong revenue streams among the three. This revenue structure, combined with the fact that the content owners are the only links in the value chain that are not being endangered, reveals us that leagues are in a comfortable spot. This could play an important role in the entry of the league as a broadcaster and producer, as this consistent revenue stream will allow the league to support new ventures in this area.

It is worth noting that this conclusion relies on the assumption that piracy remains low. The effect of piracy on the financial health of the sports market will be discussed in the next part.

b. Insights from the sensitivity analysis

3. Even if competition lowers prices, piracy may become a problem if content owners do not strive to address it

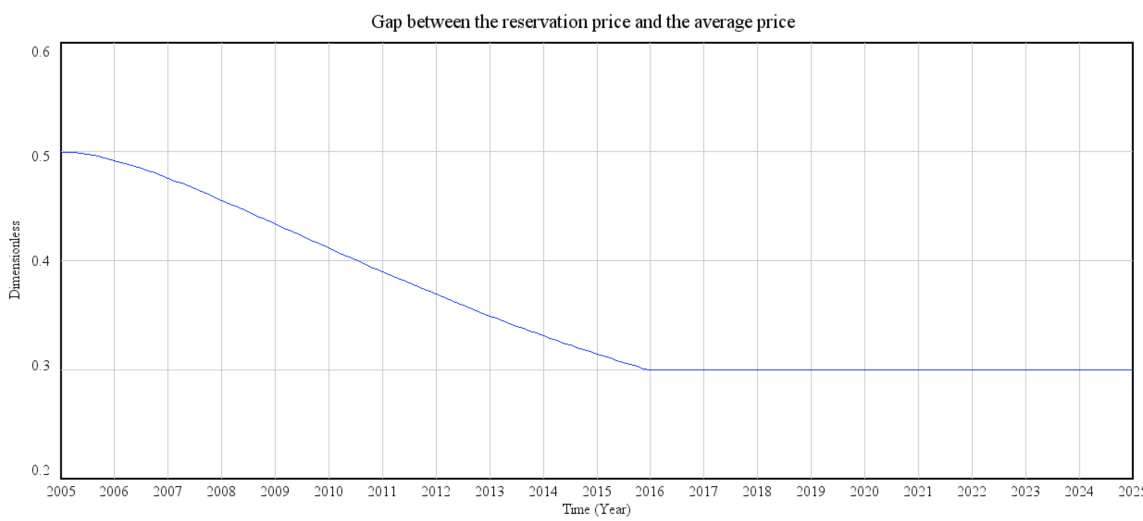

Figure 8-4: Normalized gap between the customer reservation price and the average price of TV content (base case)

The figure above shows that because of the appearance of Web TV and its increasing market share, cable companies are likely to lower their prices in order to increase their attractiveness and stay competitive. As more and more people adopt Web TV –

which is a cheaper alternative – and as the price of cable goes down, the gap between the consumers' reservation price and the average price will shrink.

However, the level of piracy observed is also a function of the fraction of the population that is tech-savvy enough to adopt a pirate solution. In this model, it was assumed that only people that already had switched to Web TV could choose to adopt the pirate solution. While this design choice seems very restrictive, and diverges from what we saw in the music case, it accounts for the fact that, again, a large portion of the population already consumes sports in a very rigid, passive way and that new uses like piracy are mostly introduced by lead users.

This effect will be dominant in the base case, and piracy will grow over time, even though the average price of the medium decreases, as shown in the figure below.

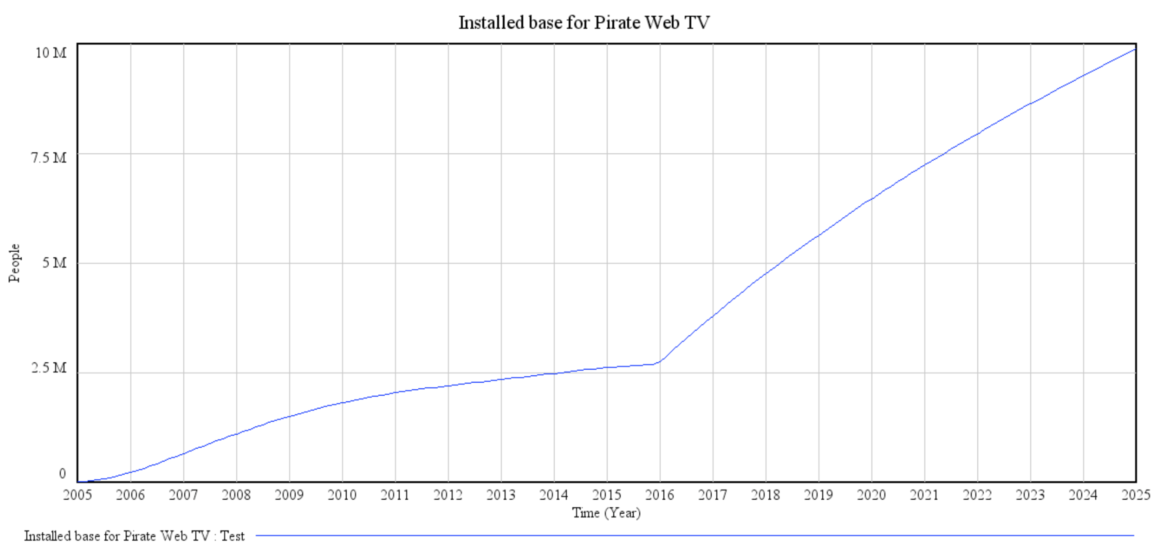

Figure 8-5: Installed base for pirate Web TV (base case)

Two parameters are used in this piracy control loop: the normalized customer's reservation price, and the table for effective goal for piracy control that describes how content owners will respond to different levels of piracy. Since public data for these parameters is not available, they come from mental models and have been calibrated for the base case after interviews. However, since there is great uncertainty about those "states of the world", it is important to conduct sensitivity analyses to understand how misestimating these parameters could change the behavior of the system.

As shown elsewhere[96] in the System Dynamics literature, incumbents often respond to threats (e.g. new entrants, or in our case, piracy) in a different manner, depending on what the level of this threat is. Low levels of threat that represent a small share of the market will be underestimated; and the incumbent will only start devoting adequate resources to counter the threat when it is significant enough to be able to take a large share of the market. The table below shows the implementation of the table for effective goal for piracy control in the base case, and uses this observation: if the piracy threat is low, low levels of resources will be used, and high levels of resources will be used only when the piracy threat gets closer to 100%.

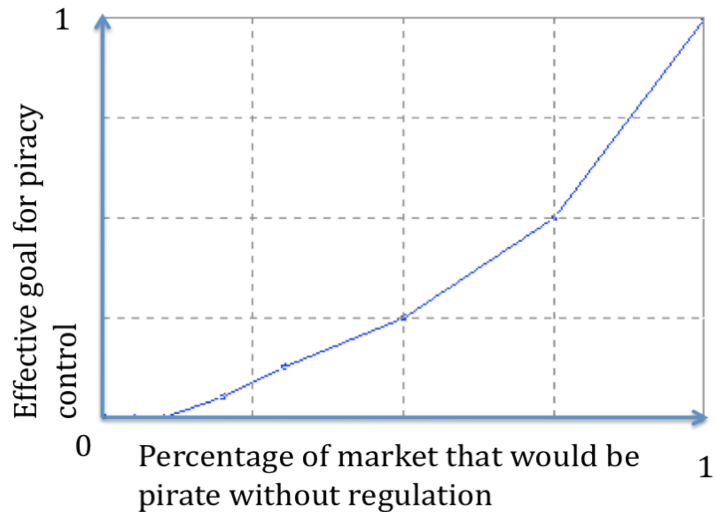

Figure 8-6: Table for effective goal for piracy control (base case)

As we have seen, this kind of lax behavior allows for increased piracy over the course of the 20 years of simulation. Other simulations have been done with different shapes for the effective goal for piracy control – the most extreme case being the one where adequate resources are devoted to the piracy issue at any level, and the table for effective goal for piracy control exhibits a straight line that goes from (0,0) to (1,1). The results are presented below, and lead us to think that the content owner's behavior will have a great effect on the development of piracy.

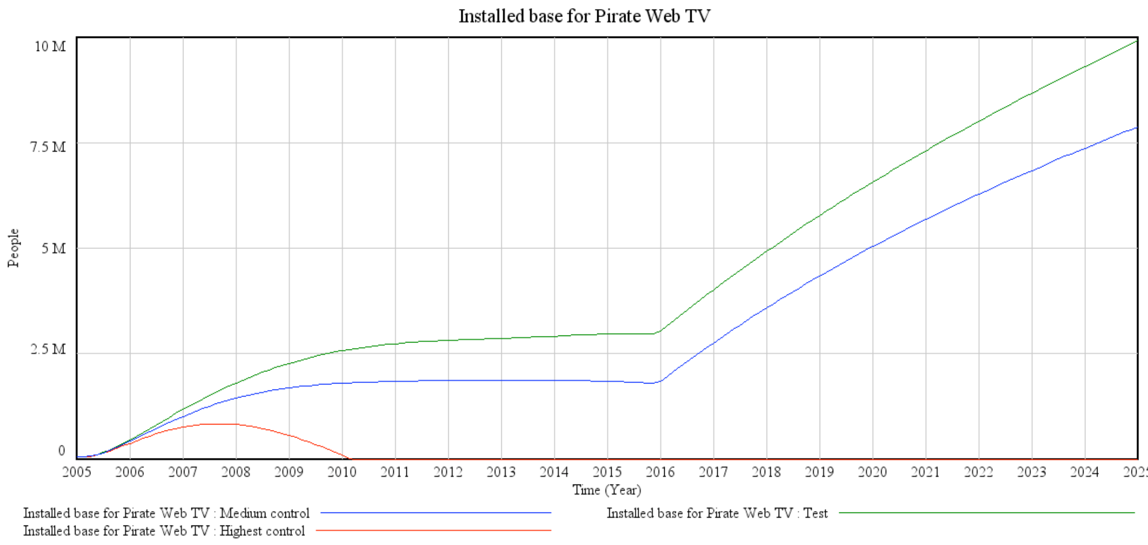

Figure 8-7: Installed base for Pirate Web TV in the case of low, medium and highest possible levels of control from the content owner's part.

The same kind of sensitivity analysis has been done with the second uncertain parameter: the customer reservation price. Results confirm the intuition here: as the reservation price is set higher than the base case, piracy levels increase more slowly; while when the reservation price is set lower than the base case, piracy levels climb up more quickly, to reach dangerous heights.

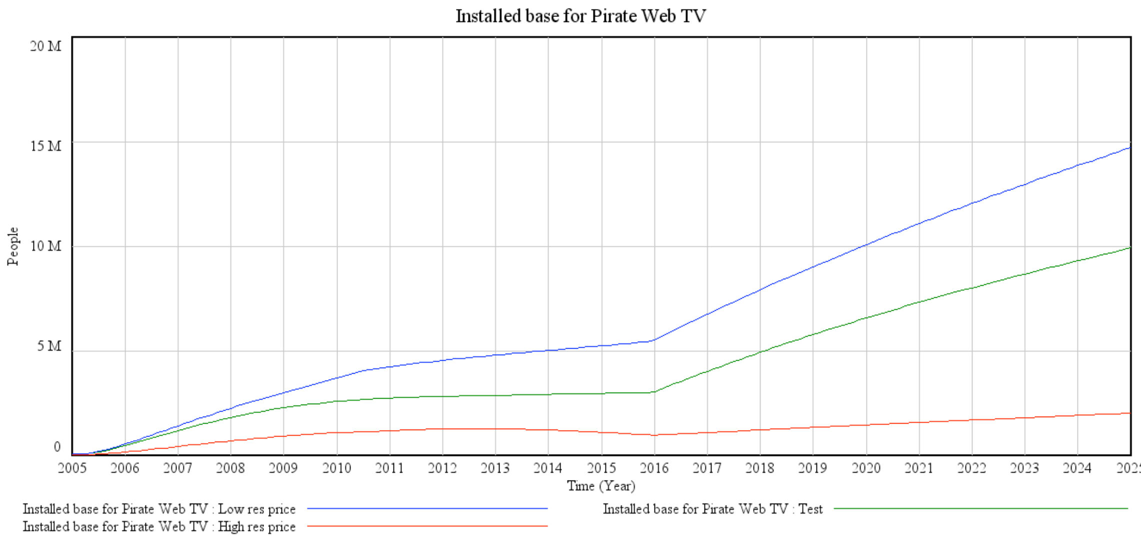

Figure 8-8: Installed base for Pirate Web TV in the case of low, medium and high reservation prices.

4. The new, open value chain represents an opportunity for smaller leagues

While the study of the broadcasting of sports for "small leagues" (e.g. sailing, fencing…) is out of the scope of this thesis, results have shown that some behaviors that are observed in this market due to the Internet disruption can be accounted for in the model. Here, insights are provided as to why Web television and new broadcasting channels represent an opportunity for these small leagues.

The context of a smaller sports league can be emulated in the model, by keeping the same model structure but changing a number of parameters.[97] Here, only the most significant and non-trivial changes will be highlighted.

- Customer attrition for both cable television and Web television was reduced to 10 years instead of 15 years. It was assumed that for small leagues, the consumption models of broadcasted sports were more proactive: as a result of the dominance of big leagues in the cable broadcasting world, media coverage of sports events in these leagues is only partial and scattered. As a consequence, customers would be more easily and quickly aware of new media that would broadcast the content that they seek. One of the most visible effects of this change is an increase in the speed of the shift toward Web TV.

- The initial variety of content on cable TV was set to half the value it had for big leagues. This change reflects the fact that because there are a limited number cable sports network, and an increasing number of hours of sports broadcasted by the big leagues, there is little broadcasting space left for smaller leagues, thus making the amount of content available on small leagues compared to what could be broadcasted on the Web even smaller. This will have an important impact in the evolution for Web TV attractiveness compared to cable TV attractiveness.

- Share of exogenous Internet innovation in the development process. This change reflects the fact that unlike big leagues that have additional resources that can be put into development of new media solution (e.g. MLB Advanced Media, the branch of the MLB that developed MLB.TV), small leagues will have comparatively less leeway to create such initiatives. Thus, advances in quality and quantity of the content that can be broadcasted on a small league's web channel are more likely to come from exogenous development of the Web and readily available broadcasting solutions.

The results of this new simulation for small leagues are shown below.

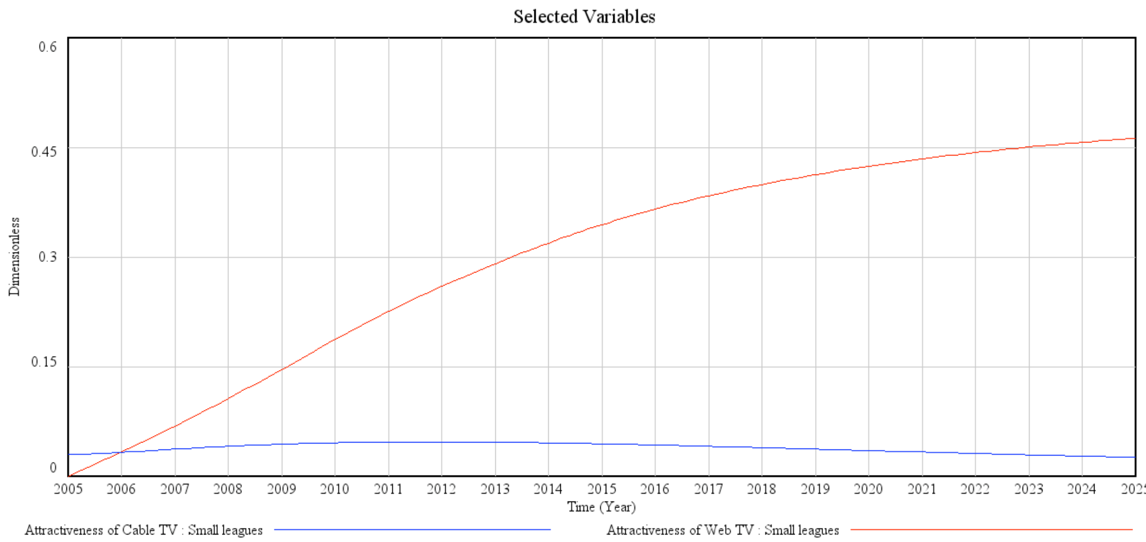

Figure 8-9: Attractiveness of cable TV and Web TV in the case of small leagues

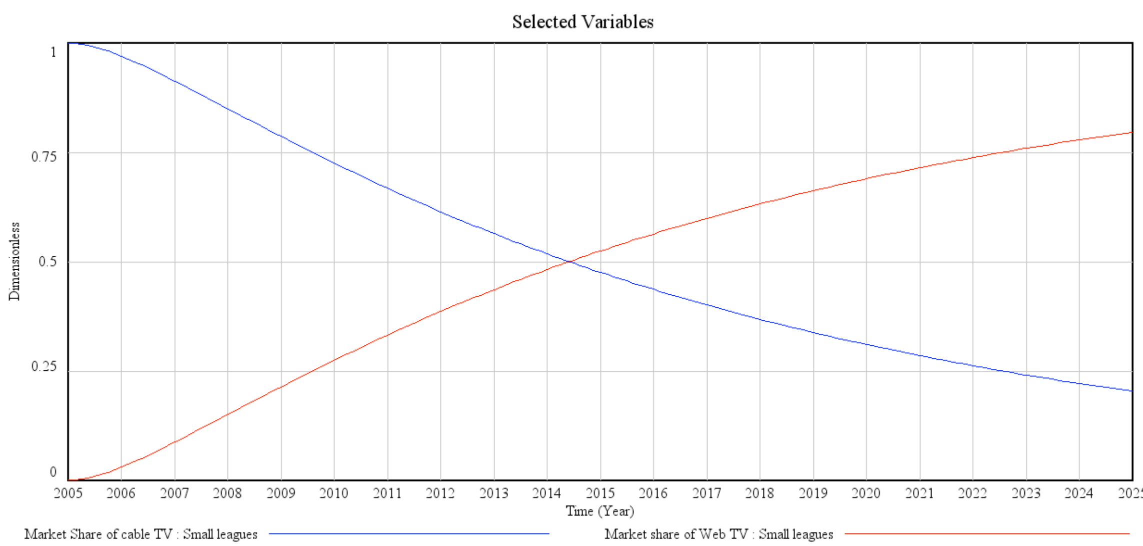

Figure 8-10: Market share of Web TV and cable TV in the case of small leagues

Results show that very shortly after the apparition of the new technology, the attractiveness of the Web TV solution greatly outclasses the traditional cable TV service. It is worth noting that in this case, the attractiveness is mostly driven by the variety of content, as opposed to the base case for big leagues, where quality of content and price seemed to drive the attractiveness.

The model seems to suggest that there is an important window of opportunity for small leagues to be broadcasted online: as the Internet offers virtually an much bigger broadcasting space, with an infinite number of broadcasting channels, small leagues now have a medium with which they can afford to broadcast themselves, even to a reduced audience.

II. Policy recommendations

The qualitative analysis done in chapters 3, 4 and 5, as well as the insights provided by the systems dynamics model allow us to formulate three general policy recommendations, that are addressed at policymakers, but also at players in the industry. The aim of the study, again, was not to predict what the outcome of the Internet disruption would be, but rather to identify pitfalls or dangers associated with this disruption. These recommendations, along with the insights gained during the study, can be used to mitigate these potentially undesirable effects, to create a better, more open and competitive marketplace.

1. The Sports Broadcasting Act needs to be modified at in order to create a more even competitive space in the Sports broadcasting world, as content owners become broadcasters themselves.

As highlighted in Chapter 5, leagues, broadcasters and regulators are at a critical point in broadcasting history. While regulation of Sports leagues and cable broadcasting has not addressed adequately the issue of sports broadcasting, letting market power and revenue skyrocket for both broadcasters and sports leagues, a new order is about to be established. As Internet is believed to be the broadcasting medium for the future, competition is entering this new, technology-driven area. While Internet broadcasting has not been extensively regulated yet, the "effective competition" that is likely to be created seems to go along the lines of the current broader legislation. However, because of the important position of sports leagues in the context of Sports broadcasting over IP, namely, the regulator will have to address the fact that the Sports Broadcasting Act creates an unbalance if the leagues are to compete with legacy producers and carriers to distribute content.

2. Legacy carriers and content owners need to work together to find a solution to the broadband incentive problem. On the same note, policymakers should enforce net neutrality rules to create a more even competitive space.

This recommendation echoes directly the previous one. Enforcing net neutrality rules will ensure that the competitive balance between content owners and infrastructure owners will be preserved. In counterpart to this measures in favor of the cable companies' competitors, the policymakers should strive to have content owners and legacy carriers agree on a new business model, that would not necessarily be based solely on advertising, to compensate for the broadband incentive problem described in Chapter 3. This is the only way to ensure that content will be accessible to the masses at the lowest price possible, while having beneficial spillover in terms of universal access to the Web, etc…

3. Legacy producers and carriers should not try to solely transpose old business model to the online world, but rather redefine their role and look for new partnerships

Once the two forms of regulatory capture stated above have been eliminated, and the competitive balance between cable television, and new Web services operated by legacy broadcasters or new players is ensured, we can start giving recommendations to individual players of the value chain.

Given the results of the analysis and the insights gained from the System Dynamics model, it seems that both ends of the value chain (content owners and customers) are going to be empowered by the development of Sports over IP. On top of these observations, lies the simple fact that these two links of the value chain are independent of the technology used to broadcast sports, and are loyal to each other – which is different than the relations that both content owners and customers can have with producers, as highlighted in chapter 1.

This set of observation puts legacy producers and carriers in a difficult situation. The study shows that they try for now to transpose their current role in the cable broadcasting value chain to the online broadcasting world. However, it seems that this specific business model is hard to reproduce online, where the audience is more fragmented and proactive. This is a danger for legacy producers. Indeed, if legacy broadcasters fail at delivering the same kind of revenue to leagues via Web TV as what they used to deliver with cable TV, the empowered leagues could very well go their own way.

Legacy producers should capitalize on their core competencies and be part of the new alliances may be forged with online players. Indeed, services like MLB.TV may not be able to reach the masses as a stand-alone service, as there may be value in the aggregation of content for certain classes of customers. A the variety of offerings is likely to increase in the online world, legacy producers have to position themselves in an offering that is consistent with their past, but does not deny the fundamental differences inherent to the online world.

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Appendix: Full description of the System Dynamics model used

Note: the stock and flow view of the model can be found at the end of Chapter 6 in the body of the thesis.

(001) ad revenue per viewer=

Table for ad revenue per viewer(Time)

Units: Dollars/person

(002) additional seats to build=

MAX(0,fraction of unsatisfied demand to fulfill*unsatisfied demand for tickets

/number of games played)

Units: Seats

The number of seats to adapt to the increasing demand. I actually took 50% of this value to keep some scarcity

(003) advertisers' wilingness to pay for ads=

Installed Base for cable viewing*ad revenue per viewer

Units: Dollars

Data can be found on the installed base for cable viewing and for the ad revenue that advertisers will provide the producers for each viewer. From there, we can derive the total advertiser's willingness to pay for advertising over a year.

(004) aggregated size of the stadiums= INTEG (

seat addition rate,

375000)

Units: Seats

In 1970, the Rex Sox sold out the vast majority of their games, and attendance reached 20,000 spectators/game. I muliplied this number by the number of teams

(005) annual increase in player salary=

average potential player salary-average player's salary

Units: Dollars/Year

The players will capture all the additional wealth made available by the teams and the league each year. The increase may be negative, which would result in a decrease in the average player salary

(006) annual increase in TV rights=

league wilingness to sell TV rights*fractional increase in TV rights per year

Units: Dollars/Year

(007) annual rabid fan budget increase=

average rabid fan budget*Economic growth

Units: Dollars/Year

We make the assumption that the fan budget follows the same trend than the economy

(008) Attractiveness of Cable TV=

(1-Normalized price of cable TV)*quality of cable TV*Variety of content on cable TV

Units: Dimensionless

Attractiveness is the product of three terms: the surplus that each consumer gets, the quality and the quantity

(009) Attractiveness of Web TV=

(1-Normalized price of Web TV)*Quality of Web TV*variety of content in Web TV

Units: Dimensionless

Attractiveness is the product of three terms: the surplus that each consumer gets, the quality and the quantity

(010) average number of games attended per rabid fan=

average rabid fan budget/average ticket price

Units: Dimensionless

According to Quirk and Fort, each fan has a budget that is devoted to sports ticket. The average number of games attended per fan then just depends on the average price of a ticket

(011) average number of games watched on TV per casual fan=

3*Total Attractiveness of All Products

Units: Dimensionless

(012) average number of games watched on TV per rabid fan=

10*Total Attractiveness of All Products

Units: Dimensionless

(013) average player's salary= INTEG (

annual increase in player salary,

2e+006)

Units: Dollars

Calibrated, based on MLB data

(014) average potential player salary=

league payroll/number of players in the league

Units: Dollars

The average salary of each player in the league is a function of the amount of money that is available for the league players, and of the number of players in that league

(015) average rabid fan budget= INTEG (

annual rabid fan budget increase,

75)

Units: Dollars

The amount of money that a rabid fan is willing to spend on sports tickets. Initial value taken from MLB data

(016) average ticket price= INTEG (

average ticket price increase,

30)

Units: Dollars

Based on MLB data

(017) average ticket price increase=

average ticket price*fractional increase in base ticket price per year

Units: Dollars/Year

(018) average time to create new seats=

5

Units: Years

(019) Average time to develop piracy control tools=

3

Units: Years

(020) average time to improve Web TV quality=

5

Units: Years

(021) Base price of Web TV=

20

Units: Dollars

see chapter 1

(022) cable audience attrition=

Installed Base for cable viewing/cable TV average attrition time

Units: People/Year

(023) cable TV average attrition time=

15

Units: Years

see chapter 8

(024) casual fan base=

fraction of the population that is a casual fan*Potential fan base

Units: People

The casual fans do not watch live games, they only create demand for video viewing

(025) change in piracy control=

(Effective goal for piracy control-Level of piracy control)/Average time to develop piracy control tools

Units: 1/Year

(026) Economic growth=

0.063

Units: Dimensionless

According to Penn World Table, GDP growth in the U.S. has been 6.3% on average during the last decades. We assume that purchasing power is going to increase by 6.3% each year, following the same trend.

(027) Effective goal for piracy control=

Table for effective goal for piracy control(Percentage of Web TV content that would be pirate without regulation

)

Units: Dimensionless

(028) Exponential Growth Rate=

0

Units: 1/Day

The exponential growth rate in the input.

(029) Exponential Growth Time=

0

Units: Day

The time at which the exponential growth in the input begins.

(030) fan demand for stadium tickets=

average number of games attended per rabid fan*rabid fan base

Units: People

The number of seats per year that should be provided to meet the fans' demand.

(031) fan demand for video viewing=

casual fan base*average number of games watched on TV per casual fan+rabid fan base

*average number of games watched on TV per rabid fan

+MAX(unsatisfied demand for tickets,0)

Units: People

(032) FINAL TIME = 2025

Units: Year

The final time for the simulation.

(033) fraction of the league revenues spent in payroll=

table for league payroll(Time)

Units: Dimensionless

The fraction of the league revenues spent in payroll is taken from historical data as a table function. We assume that this fraction will still slowly increase in the next years. Note that the study shows that this dynamic is caused by the tremendous market power that star players have gained with free agency, and as such is exogenous to the model.

(034) fraction of the population that is a casual fan=

0.34

Units: Dimensionless

According to studies, the fraction of the population that watches sports on TV has been constant since the 1970s. We assume that this will not change dramatically in the future

(035) fraction of the population that is a rabid fan=

0.1

Units: Dimensionless

According to studies, the fraction of the population that watches sports live has been constant since the 1970s. We assume that this will not change dramatically in the future

(036) fraction of unsatisfied demand to fulfill=

0.08

Units: Dimensionless

This goal depends on the team. I took the value of 8% for the Red Sox as it seems to fit historical data this way.

(037) fractional increase in base ticket price per year=

league sensitivity on ticket price*fractional increase in player salary per year

Units: 1/Year

To make up for the increase in player's salary, the ticket price should increase in a similar way

(038) fractional increase in player salary per year=

annual increase in player salary/average player's salary

Units: 1/Year

This is the fractional increase in player salary for each year. This is the baseline on which the leagues will set their expectations for TV rights and gate revenues.

(039) fractional increase in TV rights per year=

league sensitivity on TV rights*fractional increase in player salary per year

Units: 1/Year

To make up for the increase in player's salary, the TV rights should increase in a similar way

(040) Gap between the reservation price and the average price=

MAX(0,(Normalized price of cable TV*Market Share of cable TV+Normalized price of Web TV

*Market share of Web TV)-Normalized customer reservation price for cable or Web TV

)

Units: Dimensionless

Measures the gap between the average price for broadcasted sports and the customer reservation price. If this difference is negative, the gap will be set to zero.

(041) Initial Installed Base for Cable TV=

1.2e+008

Units: People

The initial number of product in use.

(042) Initial Installed Base for Web TV=

100000

Units: People

The initial number of product 2 in use.

(043) INITIAL TIME = 2005

Units: Year

The initial time for the simulation.

(044) Input=

1 + STEP(Step Height,Step Time)+

(Pulse Quantity/TIME STEP)*PULSE(Pulse Time,TIME STEP)+

RAMP(Ramp Slope,Ramp Start Time,Ramp End Time)+STEP(1,Exponential Growth Time

)*(EXP(Exponential Growth Rate*Time)-1)+

STEP(1,Sine Start Time)*Sine Amplitude*SIN(2*3.14159*Time/Sine Period)+STEP

(1,Noise Start Time)*RANDOM NORMAL(-4 , 4 , 0 , Noise Standard Deviation

, Noise Seed)

Units: Dimensionless

The test input can be configured to generate a step, pulse, linear ramp, exponential growth, sine wave, and random variation. The initial value of the input is 1 and each test input begins at a particular start time. The magnitudes are expressed as fractions of the initial value.

(045) Installed Base for cable viewing= INTEG (

New cable subscriptions-cable audience attrition,

Initial Installed Base for Cable TV)

Units: People

(046) Installed base for Pirate Web TV=

MAX(0,Installed Base for Web TV*(Percentage of Web TV content that would be pirate without regulation

-Level of piracy control

))

Units: People

(047) Installed Base for Web TV= INTEG (

New Web TV subscriptions-web TV attrition,

Initial Installed Base for Web TV)

Units: People

(048) "Internet-based research"=

0.3

Units: Dimensionless

The part of the Internet-centric innovation that is exogenous to the system (incidental innovations, research grants, etc...)

(049) "Internet-centric innovation"=

"Internet-based research"+"Table for Internet-centric innovation"(Installed Base for Web TV

/Total Installed Base)*(1-"Internet-based research")

Units: Dimensionless

This normalized number measures the impact of internal and exogenous research that will allow for a higher quality and quantity of content broadcasted online

(050) league payroll=

fraction of the league revenues spent in payroll*league revenues

Units: Dollars

(051) league revenues=

league revenues from ticket selling+league revenues from TV rights+subscription revenues for web TV

Units: Dollars

Total team revenues are the sum of revenues from TV contracts, web TV viewers, and gate revenues.

(052) league revenues from ticket selling=

total fan attendance*average ticket price

Units: Dollars

The revenue generated from ticket selling is the actual number of tickets that will be sold, multiplied by the average price of this ticket.

(053) league revenues from TV rights=

(league wilingness to sell TV rights+producer's willingness to pay for TV content

)/2

Units: Dollars

A very simple simulation of the bidding / negociation process that takes place between leagues and producers, the final value of the broadcasting rights that the league will get each year is the average of what the league is demanding and what the producers are willing to bid for initially

(054) league sensitivity on ticket price=

0.5

Units: Dimensionless

This parameter, in conjunction with the league sensitivity on TV rights, determines how much the financial burden of the league is translated to an increase in ticket prices, versus an increase in what the league will ask the TV channels. Fit with historical data suggests that this parameter is equal to 0.5 for the 1970-2005 period.

(055) league sensitivity on TV rights=

1.8

Units: Dimensionless

This parameter, in conjunction with the league sensitivity on ticket price, determines how much the financial burden of the league is translated to an increase in ticket prices, versus an increase in what the league will ask the TV channels. Fit with historical data suggests that this parameter is equal to 2 for the 1970-2005 period.

(056) league wilingness to sell TV rights= INTEG (

annual increase in TV rights,

5e+008)

Units: Dollars

This is the amount of money that the league is willing to sell its TV rights for.

(057) Level of piracy control= INTEG (

change in piracy control,

0)

Units: Dimensionless

The level of piracy control that will be effectively apply to prevent a share of the customers from watching pirate Web TV

(058) Market Share of cable TV=

Installed Base for cable viewing/Total Installed Base

Units: Dimensionless

The fraction of the installed base of products that are cable TV services.

(059) Market share of Web TV=

Installed Base for Web TV/Total Installed Base

Units: Dimensionless

The fraction of the installed base of products that are Web TV services?

(060) New cable subscriptions=

new demand for broadcasted sports * Relative attractiveness of Cable

Units: People/Year

The sales rate is determined by the market share for the given product and the exogenous total demand.

(061) new demand for broadcasted sports=

Total fan base for broadcasted sports-Total Installed Base

Units: People

The number of people that need to subscribe to a new service each year

(062) New Web TV subscriptions=

new demand for broadcasted sports * Relative attractiveness of Web TV

Units: People/Year

The sales rate is determined by the market share for the given product and the exogenous total demand.

(063) Noise Seed=

1000

Units: Dimensionless

Varying the random number seed changes the sequence of realizations for the random variable.

(064) Noise Standard Deviation=

0

Units: Dimensionless

The standard deviation in the random noise. The random fluctuation is drawn from a normal distribution with min and max values of +/- 4. The user can also specify the random number seed to replicate simulations. To generate a different random number sequence, change the random number seed.

(065) Noise Start Time=

0

Units: Day

The time at which the random noise in the input begins.

(066) Normalized customer reservation price for cable or Web TV=

0.2

Units: Dimensionless

The price under which all fans will subscribe to either a cable TV or a Web TV package. If the price of both those packages is higher than the reservation price, a portion of the consumers will decide to adopt the pirate solution.

(067) Normalized price of cable TV=

MAX(Relative size of the audience of cable TV*0.7, 0.5)

Units: Dimensionless

There are heavy fixed installation costs, that cannot make the price of cable TV drop below 0.5 (normalized). As the market share for cable diminishes, prices will be lowered to answer the competition.

(068) Normalized price of Web TV=

0.5

Units: Dimensionless

This price is normalized, and has been taken as equal to the subscription fee component of the price of cable TV

(069) number of games played=

81

Units: Dimensionless

Each baseball season, 162 games are played by a team, half of which are played home.

(070) number of players in the league=

640

Units: Dimensionless

For the MLB, there are currently 16 teams, each of them having 40 players in their roster.

(071) Percentage of Web TV content that would be pirate without regulation=

Table for consumer sensitivity to price gaps(Gap between the reservation price and the average price

)

Units: Dimensionless

(072) population growth rate=

0.012

Units: 1/Year

We assume that the U.S. population is going to grow at the same rate as it did during the past decade. Data taken from the US Census.

(073) Potential fan base= INTEG (

potential fan creation rate,

3e+008)

Units: People

Since the study is limited to the U.S. market, the potential fan base is the U.S. population. This variable is initialized at 300M people, roughly the US population in 2005

(074) potential fan creation rate=

Potential fan base*population growth rate

Units: People/Year

New potential fans come from population growth.

(075) producer's willingness to pay for TV content=

advertisers' wilingness to pay for ads

Units: Dollars

the producer aims at balancing the expenses with the revenues from advertisers: as such, the producer's willingness to pay for TV content is taken equal to the advertiser's willingness to pay

(076) Pulse Quantity=

0

Units: Dimensionless*Day

The quantity added to the input at the pulse time.

(077) Pulse Time=

0

Units: Day

The time at which the pulse increase in the input occurs.

(078) quality of cable TV=

0.5

Units: Dimensionless

As cable TV is considered as a mature technology, its quality remains constant over time.

(079) Quality of Web TV= INTEG (

Web TV quality enhancement,

0.25)

Units: Dimensionless

(080) rabid fan base=

Potential fan base*fraction of the population that is a rabid fan

Units: People

Rabid fans will go to the games if their budget allows them; otherwise they will watch them on TV

(081) Ramp End Time=

1e+009

Units: Day

The end time for the ramp input.

(082) Ramp Slope=

0

Units: 1/Day

The slope of the linear ramp in the input.

(083) Ramp Start Time=

0

Units: Day

The time at which the ramp in the input begins.

(084) Relative attractiveness of Cable=

Attractiveness of Cable TV/Total Attractiveness of All Products

Units: Dimensionless

Market share is determined by the attractiveness of each firm's products relative to the attractiveness of the other firms' products.

(085) Relative attractiveness of Web TV=

Attractiveness of Web TV/Total Attractiveness of All Products

Units: Dimensionless

Market share is determined by the attractiveness of each firm's products relative to the attractiveness of the other firms' products.

(086) Relative size of the audience of cable TV=

Installed Base for cable viewing/Total Installed Base

Units: Dimensionless

(087) SAVEPER =

TIME STEP

Units: Year [0,?]

The frequency with which output is stored.

(088) seat addition rate=

additional seats to build/average time to create new seats

Units: Seats/Year

There is a first order delay in the creation of new seats (building can only be made between seasons, it is not every year, etc...)

(089) seat capacity=

aggregated size of the stadiums*number of games played

Units: Seats

Total number of tickets that will be offered by the team for a year.

(090) Sine Amplitude=

0

Units: Dimensionless

The amplitude of the sine wave in the input.

(091) Sine Period=

10

Units: Day

The period of the sine wave in the input.

(092) Sine Start Time=

0

Units: Day

The time at which the sine wave fluctuation in the input begins.

(093) Step Height=

0

Units: Dimensionless

The height of the step increase in the input.

(094) Step Time=

0

Units: Day

The time at which the step increase in the input occurs.

(095) subscription revenues for web TV=

Normalized price of Web TV*Base price of Web TV*Installed Base for Web TV

Units: Dollars

(096) Table for ad revenue per viewer(

[(1970,0)-(2025,5)],(1970,0.25),(1980,0.5),(1990,1),(2000,3.3),(2010,4),(

2025,4.75))

Units: Dolars/person

Taken from historical data from the Superbowl - the trends follow the same that the Superbowl's games, and the numbers are calibrated so that the revenue per viewer for the season matches 2008's numbers. From 2010 onwards, we assume that because of audience dilution, advertisers will offer decreasingly higher amounts of money per viewer

(097) Table for consumer sensitivity to price gaps(

[(0,0)-(1,1)],(0,0),(0.1,0.025),(0.2,0.075),(0.3,0.15),(0.5,0.5),(0.8,0.8

),(1,0.9))

Units: **undefined**

(098) Table for effective goal for piracy control(

[(0,0)-(1,1)],(0,0),(0.05,0),(0.1,0),(0.2,0.05),(0.3,0.125),(0.5,0.25),(0.75

,0.5),(1,1))

Units: Dimensionless

(099) "Table for Internet-centric innovation"(

[(0,0)-(1,1)],(0,0),(0.25,0.5),(0.5,0.75),(0.75,0.9),(1,1))

Units: Dimensionless

(100) table for league payroll(

[(0,0)-(2100,10)],(1970,0.19),(1985,0.4),(2005,0.6),(2025,0.7))

Units: Dimensionless

In 1970, the payroll represented 19% of the Red Sox' revenue. In 1985, it was 40. From 2005 and onwards, it represented 60% of the team revenues.

(101) Table for variety of content on cable TV(

[(0,0)-(1,1)],(0,0),(0.1,0.025),(0.2,0.075),(0.3,0.15),(0.5,0.4),(0.7,0.475

),(0.8,0.49),(1,0.5))

Units: **undefined**

Maximum variety of content attainable is 0.5, due to the technological limitations associated with cable. The more people are watching on cable TV, the more variety is going to be offered, but there needs to be a "critical mass" first.

(102) TIME STEP = 0.125

Units: Year [0,?]

The time step for the simulation.

(103) Total Attractiveness of All Products=

Attractiveness of Cable TV + Attractiveness of Web TV

Units: Dimensionless

Total attractiveness is the sum of the attractiveness levels of all products in the marketplace.

(104) total fan attendance=

MIN(seat capacity,fan demand for stadium tickets)

Units: People

If the demand for tickets is less than the capacity of the stadiums, the total attendance will be equal to the demand. If not, then the capacity of the stadiums will determine how many fans get to see live games.

(105) Total fan base for broadcasted sports=

casual fan base+rabid fan base

Units: People

This is the total population that wants to watch sports on television

(106) Total Installed Base=

Installed Base for cable viewing + Installed Base for Web TV

Units: People

The total number of products that are currently in use.

(107) unsatisfied demand for tickets=

MAX(0,fan demand for stadium tickets-seat capacity)

Units: People

The number of tickets that will not be sold because the demand is higher than the offer

(108) variety of content in Web TV=

DELAY1I("Internet-centric innovation", 2 , 0)

Units: Dimensionless

(109) Variety of content on cable TV=

Table for variety of content on cable TV(Relative size of the audience of cable TV

)

Units: Dimensionless

As the cable TV technology is mature, and the number of cable channels heavily regulated and slow to move, the variety of content offered on cable TV is going to depend mainly on the relative size of the audience

(110) web TV attrition=

Installed Base for Web TV/web TV average attrition time

Units: People/Year

(111) web TV average attrition time=

15

Units: Years

see chapter 8

(112) Web TV quality enhancement=

(1-Quality of Web TV)*"Internet-centric innovation"/average time to improve Web TV quality

Units: 1/Year