Cable's Digital Future

François Bar and Jonathan Taplin

The deployment of digital technology throughout the U.S. communication networks over the last decade promised "the end of scarcity" for television.[1] Not only would fiber optics and electronics increase by orders of magnitude the capacity of each infrastructure--telephone, cable or wireless--but once-specialized networks would all become able to transmit video streams, adding ever more channels for television distribution. By contrast with the old oligopolistic world of broadcasting and cable, various competing companies would own these new infrastructures, so there would be no single gatekeeper to program distribution. At the same time, digital technology would slash the cost of the equipment needed to produce video programming, bringing the ability to create video content within reach of an ever-growing number of sources. Finally, digital technology would spur the proliferation of devices able to display video streams--not just television sets in living rooms, but also digital theaters, computers, laptops, game consoles, mobile phones, personal digital assistants, and liquid crystal displays mounted in cars, airplanes and shopping malls. Internet Protocol (IP) would become the lingua franca connecting all the components of this new production, distribution and consumption system. While scarcity had been the organizing principle of the old television broadcasting business, abundance would be the new rule. Amid the abundance of distribution channels, anyone could become a creator and find a distributor for their work; any viewer could access any video program, anywhere, anytime.

As of 2006, we can get a glimpse at this abundant digital future on the broadband Internet. In July 2006, on-line video site YouTube.com crossed a milestone as it served over 100 million video clips per day.[2] Its success is followed closely by Google Video and Yahoo, along with about 180 new online video start-ups.[3] In the classic cable and satellite networks, however distribution pathways remain tightly controlled by a few owners, steadfastly opposed to granting open access to their networks. While telephone companies were allowed, starting in 1992, to enter the video distribution business, in 2005 they only provided video programming to 322,700 homes out of 94.2 million, a 0.3 percent share of the video programming distribution market that barely registers on the competitive landscape.[4] Though new digital cameras and editing software have allowed many to create videos, getting these widely distributed still requires deep pockets and substantial marketing muscle. Thus, all those screens populating our everyday lives tend to display very similar programming.

This chapter describes the recent digital transformation of the cable television networks. It outlines the tremendous potential for the way we create, distribute, and access video programming. It examines the reasons why this potential has yet to be realized and suggests policy options that could help address these issues.

I. The Video Distribution Competitive Landscape

The recent evolution of U.S. mass media policy has seen a continuation of the trend toward deregulation--the increasing reliance upon market competition, rather than government rules, to influence the behavior of media organizations. Competition in the provision of video distribution, it was assumed, would stimulate innovation in the underlying infrastructure, in distribution services and in content, insuring low prices and consumer choice. The Telecommunications Act of 1996 laid out a new framework to foster broader competition in the multichannel video programming distribution (MVPD) market, 87.7 percent of which was then controlled by cable companies.[5]

Competition to the cable industry was expected to come from a variety of sources. Policy makers expected telephone companies ("telcos") to become the strongest competitors. Telcos had long lobbied to be allowed in the video distribution business, seeking to expand beyond the telephone market. With the spread of digital technology, they seemed the most likely source of robust competition for the cable operators. Further competition would come from direct-to-home satellite distribution systems, primarily Direct Broadcast Satellite (DBS) providers DirecTV and EchoStar (later renamed Dish Network), but also Home Satellite Dish (HSD) providers.[6] Satellite was in fact the strongest competitor to cable in 1996, accounting for 9.1 percent of the MVPD market. Another competitor was "wireless cable" operators, also known as "multichannel multipoint distribution service" (MMDS), which used spectrum in the 2Ghz band for local distribution. Finally, emerging broadband network providers, including the growing number of competitive local exchange carriers (CLECs), were expected to deploy fiber optics throughout the nation, competing with the incumbent telcos. By 1998, Qwest Communications International was well on its way to laying out over 16,000 route miles of fiber optics throughout the U.S., a network that would have given it at the time more capacity than AT&T, MCI, Sprint, and Worldcom combined.[7]

The Telecom Act of 1996 allowed telephone companies to offer video distribution services and in return, allowed cable operators to provide local and long distance telephone service. This would allow both telephone and cable companies to offer full bundles of services to their customers, including video, local and long-distance telephony, and a range of "advanced services" including Internet access. The combination of the emerging alternatives for video distribution with the new regulatory framework introduced in the 1996 Act was expected to result in a vibrant competitive marketplace, with a multiplicity of high capacity delivery conduits for video programming.

Reality turned out to be markedly different, as illustrated by Table 1. Ten years after the passage of the 1996 Act, we are still awaiting a direct confrontation between Telecom and cable. The two compete actively for the provision of broadband Internet access, and the cable industry has made some inroads into the telephony business, with 5.6 million telephone subscribers as of December 2005,[8] although this figure overstates the extent of actual competition since the cable provider is providing voice over IP through its own network for only 1.2 million of these.[9] Phone companies were only beginning in 2006 to deploy high-capacity, fiber-based local networks and no significant CLEC has emerged to do it in their place. By 2005, the broadband service providers (including the telcos) only served about 1.5 percent of the US MVPD market. Fierce regulatory efforts on the part of both cable and telco incumbents to limit CLEC's access to their networks "last mile" connections with end customers partly explain this surprising lack of competition. The *Wall Street Journal* noted that "the competitive local exchange carriers (CLEC's) have been forced to sell their accounts or file for bankruptcy because of heavy network construction spending."[10] With the CLECs in bankruptcy, Wall Street pulled the money plug and the incumbents had the space to themselves.

Table 1: Competing Technologies' Shares of the Multichannel Video Programming Market (1996-2004)

Access Technology	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cable	87.7%	87.1%	85.3%	82.5%	79.8%	77.5%	75.9%	73.6%	71.6%	69.4%
Satellite (HSD + DBS)	9.1%	9.8%	12.0%	14.7%	17.4%	19.8%	21.6%	23.2%	25.5%	27.9%
Wireless Cable (MMDS)	1.6%	1.5%	1.3%	1.0%	0.8%	0.8%	0.6%	0.2%	0.2%	0.1%
Private Cable Systems	1.6%	1.6%	1.2%	1.8%	1.8%	1.7%	1.8%	1.3%	1.2%	1.1%
Broadband (BSP + OVS)	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	1.6%	1.5%	1.5%

Source: compiled from FCC's Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming (various years)

With one notable exception, none of the alternative video delivery distribution technologies really took off. By 2005, wireless cable had declined to 0.1 percent and broadband service providers and private cable systems each barely passed the 1 percent mark. The important exception is satellite, whose market share of video distribution rose from 9.1 percent in 1996 to 27.9 percent in 2005. Within that segment, the true success story of the past decade has been the rise of DBS from a 5.1 percent share of the MVPD market in 1996 to 27.7 percent in 2005. (HSD, the older, larger dishes, declined from 3.1 percent to 0.2 percent during the same period.). Cable subscribership remained essentially flat during that period, resulting in a declining market share from 87.7 percent in 1996 to 69.4 percent in 2005. Among the top four U.S. MVPD companies in 2005, together serving 63 percent of U.S. subscribers, two are cable systems operators (Comcast and Time Warner, with 23 percent and 12 percent respective shares), and the other two are DBS operators (DirecTV and Echostar, with 16 percent and 12 percent respective shares.)[11]

As a result, the competitive situation in the video distribution market is not radically different from that of ten years ago. Viewers do indeed have more choices now than they did then, since the vast majority of U.S. households can chose between one cable provider and two direct broadcast satellite providers, in addition to traditional over-the-air broadcasting. However, the programming packages they can obtain through these different providers are remarkably similar. Both cable and DBS operators currently offer essentially similar channel packages and compete primarily on price. One differentiating feature for cable operators, however, is their ability to deliver high-speed Internet and telephony over the same cable infrastructure. Such bundles remain technically impossible for DBS providers. This has led DBS providers and telcos to cooperate and compensate with marketing for the shortcomings of satellite technology. Thus, SBC teamed up with Echostar and Verizon with DirecTV to bundle their respective services to offer "one-stop shopping" packages including telephone service, Internet access, and video programming to their customers.

Ultimately, this piecing together cannot compete fully with the integrated delivery of video, data, and voice services on a single network platform. The telco-DBS alliances (much like cable operators' initial resale of telephone service) are temporary steps. Cable operators can best compete with direct broadcast satellite by offering an integrated high-speed network that supports symmetrical video, data, and voice communication. Similarly, telcos are unlikely to survive in the long term unless they too develop an integrated network platform that can support combined services, such as those promised by AT&T's project Lightspeed and Verizon's FIOS[12]. We explore this vision of "IP-Television" in the final section of this chapter.

II. The Age of Digital Cable

In the mid-1980s, as the U.S. telephone companies were beginning to deploy fiber optics and as direct broadcast satellite promised to compete directly for video distribution, the cable television industry realized that its collective survival would require significant upgrade of its technology infrastructure. It would have made little sense for individual systems to pursue technology upgrades in isolation, so they decided to join forces and establish CableLabs in 1988. The brainchild of Dr. John Malone, CEO of TCI (then the largest cable MSO in the country), CableLabs was meant to be a non-profit version of Bell Labs, the research-and-development subsidiary of AT&T. The initial project of CableLabs in 1990 was the specifications for the 750 MHz hybrid-fiber/coax plant that would become the foundation of the Digital Cable TV system. This was followed in 1995 by DOCSIS (Data Over Cable Service Interface Specification), which defined how cable modems would offer high-speed data over cable systems. The underlying notion was that the cable plant would need to become a complete two-way system capable of delivering interactive services in order to compete with the increased channel capacity of satellite TV systems. It made sense for the industry to cooperate in this R&D effort not only to spread its substantial costs, but also to insure interoperability and achieve scale economies. This insight into the competitive edge offered by a true two-way broadband system turned out to be prescient: although it was started well before the Internet had become a mass medium, the digitization of the cable's infrastructure would turn out to be essential to the industry's Internet strategy. The cable industry’s early commitment to data over cable gave it the edge in the early years of broadband deployment.

The Telecommunications Act of 1996 transformed the competitive landscape. In response, the cable industry began a system-wide network upgrade to the hybrid fiber/coax architecture. This would not only boost the capacity of the cable networks to several hundred channels, but it would also be key to the deployment of new digital services, ranging from interactive television to Internet access and telephony. Investment banks backed the upgrades and over the next six years almost $85 billion was spent on capital improvements to the cable plant, the largest capital improvements expenditure in the industry's history.

The initial rationale behind this upgrade was simply to compete with the Satellite digital plant. By the time the majority of the capital improvements were completed, the high-speed Internet business had become a major source of cash flow on its own. The ability to deploy a 1.5 MBPS high speed data system gave the cable companies an initial advantage over the Regional Bell Operating Companies (RBOC) who were beginning to roll out a technology called DSL (Digital Subscriber Line) that had been on its shelves for ten years. The RBOC were slow to deploy DSL, in part for fear it would cannibalize their extremely profitable business data services. For the cable industry by contrast, Internet access provision was a new market which could only add to existing revenues. Given the RBOC's slow rollout of DSL, the cable companies moved quickly to establish a dominant position in the home Broadband market. Initially priced at $49 per month, the service had a gross profit margin of almost 50 percent, making it the most profitable cable service to the MSO.[13] By 2000 the RBOCs began to aggressively market their high speed Internet alternative. They chose to compete with cable on price and offered their service for $35 per month. However, DSL service only works for customers within 18,000 feet from a central office and the cable companies were able to maintain the higher price and compete on service quality.

The deployment of digital broadcasting service has not gone quite as smoothly as the rollout of cable modem service. Most cable customers already had 100 analog channels and balked at paying an additional $10 per month to upgrade to a 200 channel digital service. According to Nielsen Media Research of the over 400 channels available on digital cable and satellite systems, the average viewer watches 15 channels but considers only 8 to 10 of those "destinations channels".[14] Most operators found that customers were signing up for three months of free HBO to convert to digital but went back to the analog service at the end of their free trial. The resulting "churn" in digital cable subscription led Comcast to introduce free Video-on-Demand as incentive to switch to digital.[15]

By January 2004, the cable's network upgrade was essentially complete. A digital cable plant of at least 550 MHz passed more than 90 percent of all cable homes, capable of carrying 450 traditional TV channels, or 90 High-Definition channels.[16] The remaining task for MSOs is to broaden the digital cable market beyond early-adopters. The sooner they convert all of their subscribers to digital, the sooner they can free up 450 MHz of capacity they currently must devote to distributing all broadcast channel under the "Analog Must-carry" regulatory requirement. At that point, the stage will be set for the true Interactive TV age to begin.

III. Policy Principles

Tthe regulatory principle behind the 1996 Act was that facilities competition would suffice to drive diversity, without requiring an extension of common carriage to cable. If one video infrastructure refused to distribute some programming, the logic went, there would be other competing infrastructures eager to do so. Furthermore, one of these infrastructures would be owned by the telephone company, whose regulatory history promoted open access. However, since substantive facilities competition failed to materialize, an integrated policy framework for cable and telcos becomes necessary, one that matches technological convergence with regulatory convergence. A first debate on these issues was ignited by AT&T's 1998 acquisition of TCI, then the largest cable operator in the U.S. As part of the cable franchise transfers, a number of city governments attempted to impose "open access" conditions on the broadband Internet service offered by cable operators.[17] Ultimately, these efforts failed, but the principle behind them remains hotly debated: in the emerging broadband world, should the owners of the Internet infrastructure be allowed to constrain the range of applications, the pattern of communication, or the kind of content that can use their network?

Before stepping down as FCC Chairman in 2005, Michael Powell spelled out his version of this principle as the "Four Freedoms of Broadband."[18] First, the "freedom to access content," would guarantee anyone's right to access any Internet content. Network owners could not selectively block or hinder content delivery. Implicitly, this also recognizes everyone's right to publish (or broadcast) on the Internet. Second, Internet users should be guaranteed the "freedom to use applications," so that infrastructure owners do not predetermine patterns of interaction among Internet users, nor the kinds of experimentation they can engage in. The third would guarantee the "freedom to attach personal devices" to the network, as long as they do not harm the network. In particular, network owners should not restrict their consumers to connecting only the equipment they supply. Finally, Internet users should have "freedom to obtain service plan information" to guarantee market transparency.

Powell articulated these four freedoms with Internet service provision in mind, but they would logically extend to other services, including video distribution provided by cable operators or telcos. Yet today's cable TV infrastructure is far from guaranteeing these freedoms. In particular, it can be very difficult for niche or controversial programming to get distribution. The applications cable consumers can run on their cable-operator provided Internet are limited (among other restrictions, they cannot operate web servers); they are free only to attach set-top boxes supplied by their network provider and must comply with the provisions spelled out in restrictive "acceptable use policies" (AUPs). Cable companies argue that such restrictions are necessary to prevent network congestion, because of the limited uplink capacity of their Internet offering. However, emerging technical approaches, including, for example, the peer-to-peer mechanisms built within BitTorrent, could alleviate these concerns.[19] Conveniently, however, the AUP's restrictions prevent cable Internet users from competing in any way with cable providers for content distribution. More broadly, the natural economic incentives of the network owners, cable and telcos alike, will be to explore only the network architectures and services that promote their financial interests, preserving their traditional role as content gatekeeper and allowing them to leverage new income streams out of that control. They are less likely to encourage broad exploration of peer-to-peer architectures and applications that would encourage bottom-up content creation and horizontal exchange. Their economic incentives are more closely aligned with extending one-to-many, centrally controlled communication patterns than with fostering many-to-many interaction and horizontal discourse.

IV. Laying the Foundation for the IP TV Revolution

The combination of the 1996 Telecom Act and the dot-com boom of the late 1990s led to massive deployment of fiber optics throughout the U.S. long distance networks. More than 15 new Competitive Local Exchange Carriers (CLEC's) and cable over builders, including Qwest, Global Crossing, 360 Networks, and Level 3, received Wall Street financing to lay vast amounts of fiber optic cable, creating enormous potential backbone capacity. Qwest, one of the companies that built out the backbone, ran an ad in 2003 where a tired salesman pulls into a motel and asks the clerk if they have movies in the rooms, to which the clerk replies "every movie ever made." This is not an idle boast. Qwest's 34 strands of fiber could technically serve up every movie ever made on demand to every hotel room in the country.

Strategic planners at equipment companies like Cisco, Nortel, and Lucent, as well as many of their competitors and suppliers, looked at the amount of fiber optic cable being delivered in 1999 and 2000, projected the number of routers, switches, lasers, and other gear that would be needed to enable that fiber, and geared up production capacity accordingly. But this proved to be a miscalculation and the orders never came, partly because wave division multiplexing allowed carriers to increase throughput by two orders of magnitude for each strand of fiber and partly because local broadband connectivity did not grow as expected. The backbone providers simply left the "dark fiber" in the ground. The boom of the late 1990s' telecom financing was followed by a bust of overcapacity. The ensuing telecom market crash hit both the suppliers and the carriers

The crash, it appeared, might have a silver lining: as a result of over-investment, there is a considerable amount of cheap, unused transmission capacity. With that infrastructure, the conversion to an IP-TV platform would seem within reach. One problem however is the lack of last mile broadband connectivity. It was as if we had constructed the interstate highway system in the 50's but neglected to build the on-ramps. Further, while the telecom industry had deployed completely new ways to distribute content, the content owners remained deeply concerned with digital piracy and refused to release content to the new IP distribution system.

Although the existing build out of broadband to the home has been progressing well, with Merrill Lynch estimating 50 million home broadband subscribers by 2007,[20] the US has recently slipped from thirteenth to sixteenth in per capita broadband diffusion in the world. On the surface it is easy to see that densely populated countries like South Korea and Japan are relatively easy to provision for last mile fiber connectivity. The American suburban sprawl makes this task quite expensive and time consuming. However, the recent moves by the RBOC's to roll out fiber to the home may introduce a new competitive force into the system to compete alongside the cable industry's nearly complete hybrid fiber/coax build out. This could help speed up the transition to a new system of IP-Television.

Let's assume that every home had access to universal broadband. A browser-based IP media terminal with a TV display connects to the Internet at two Mb/s minimum, capable of receiving streaming DVD quality video on demand. This system would use the Internet's existing open standards (IP, HTML, MPEG) to avoid choosing a winner from the existing competitive technology and media companies. Obviously, simply using Internet standards does not guarantee an open distribution system free of gatekeepers. In fact, two starkly contrasting views of how that infrastructure could be used are currently emerging. Following industry watcher Robin Good, we call these "IPTV" and "Internet Television."[21]

IPTV is the vision of the future promoted by the established media groups, cable operators, telecommunication providers, along with Microsoft. It represents a substantial upgrade of the current access infrastructure, but one that is led by established carriers to set up a controlled platform. Control would reside in the network's architecture, the operating system of the media terminals (the new set-top boxes), and the digital rights management system. Within that environment, content distributors remain gatekeepers and, thanks to detailed information they gather about customers viewing habits, leverage this new video distribution system into a highly targeted e-commerce platform.[22] By contrast, Internet Television proponents envision a world much like the world-wide-web, where anyone can set up a server that publishes their video content globally. In this view, by contrast with IPTV, publishers establish direct relationships with their viewers. These relationships can take a multitude of forms, supporting a wide variety of business models. The next section focuses on that latter vision and explore how such a video environment might function.

V. Prospects for an Open Media Ecology

A ubiquitous Internet Television platform would enable a very different media ecology--a world in which television technology would no longer require gatekeepers. In this world anyone who wanted to publish media would have no more trouble than putting up a web site. They could choose to sell their programming by subscription, pay-per-view, or give it away for free with targeted advertising. There would be no need for gatekeepers assembling program grids and determining who could reach what audience, under what conditions. Anyone who wanted to access media could point the browser built into their display screens and sound systems to that content, much like they do to access a web site. Traditional worries about Media Concentration would recede in this new world of abundance. While it is clear that the marketing power of major media conglomerates like AOL Time Warner or Viacom/CBS would have huge power in the marketplace, it would be the power to persuade, not the power to control.

Why would the current media distribution powers, whose enormous market capitalizations have been built on a world of scarcity, ever allow such a world of abundance to come into being? One answer could be that they may have no choice: Internet technology could make it very difficult for them to retain control. A better answer might be quite simply that they could make more money in that new world. The dominant music companies first tried to control the online distribution of their music through branded portals (Sony, Universal, etc.), but it was only when Apple's neutral iTunes service entered the market that this distribution method took off. To understand how an Internet Television system might benefit all parties, we must look at the five constituents that control the current media universe: talent, producers, advertisers, distributors, and telecom suppliers.

Talent**:** It is one of the great ironies of the age of media consolidation that giants like Fox, Time Warner, and Universal promote themselves as "brands." In the world of entertainment, however, the artist is the brand. Nobody buys a Sony Music CD or goes to see a Miramax movie--they want to listen to a Springsteen song or to watch Scorsese's *The Aviator* with DiCaprio. New affordable digital tools for both music and video production further empower artists. For the many artists who do not have the mass appeal of Springsteen or DiCaprio, inexpensive production tools mean they no longer need the deep pockets of traditional labels and studios to create songs and movies. Furthermore, many artists would trade large up-front salaries for a real stake in the gross earning power of their work.

Beyond the professional creative world, millions of amateurs now use cheap production tools such as Apple's GarageBand and iMovie to create their own songs and movies, resulting in a profusion of "content" of all types. One only needs to look at the tremendous growth in decentralized production of low-bandwidth creative content, such as text blogs and pictures on flickr.com, each aimed at incredibly diverse and overlapping audiences, to get a glimpse of what could happen once similarly straightforward production and distribution mechanisms exist for high-bandwidth media like video and films. Recent developments provide an indication of what is to come: new video distribution tools have been introduced by YouTube, Google and Yahoo that allow users to upload videos for free on to the network. YouTube's business model appears centered on generating page views and selling advertising, but other platforms are experimenting with alternative models. For example on Google Video, the content provider can choose to charge a fee for streaming or downloading, with Google taking a small commission. In fact, the success of these internet video distribution platforms suggests that the boundary between "professionals" and "amateurs" may be blurring. With these platforms, musicians and filmmakers can begin to produce and distribute their content to very small audiences, and support themselves in the process.

So how would the arrival of universal broadband support this content proliferation? The world of channel scarcity could not, because its production, marketing, and distribution cost structures required mass audiences. Further, while 500 cable TV channels certainly represented a quantum leap from a dozen broadcast channels, Internet Television provides an infinite number of channels, constantly reconfigurable to address a multitude of changing niche audiences. This world of abundant, cheap digital technology and distribution should help artists escape the traditional media "hit" economics. If only content with mass audience appeal is financed, then artists with a different perspective have a hard time getting distribution. As a result, the bulk of the industry's revenue traditionally comes from a very small number of artists. But the Internet's reach and the precision of its search technologies make it economical to produce and distribute very large numbers of cultural goods that each appeal to niche audiences, a phenomenon Chris Anderson calls the “long tail".[23] In his example, while a record store might stock a total of 40,000 individual songs, the digital music service Rhapsody can afford to store digital copies of over 500,000 songs, and the least popular still sells enough to cover marginal storage and transmission costs. With universal broadband, this model would extend directly to video content. This allows distribution of a quasi-infinite variety of cultural, political, or educational video content, even though each item may only appeal to a very small audience.

Producers: Producers develop, create, and finance programming. Though many producers are also distributors (Time Warner, Viacom, Disney, etc.), it is important to separate the two roles in order to understand the Internet Television transformation. As an example, let's take Discovery Networks. Originally begun as The Discovery Channel, it bought existing nature, science, history, travel, and exploration programming from around the world as cheaply as possible and packaged it for distribution under The Discovery Channel brand. This proved quite lucrative as the demographic of educated affluent customers attracted to this programming was attractive to higher end advertisers (Mercedes, Merrill Lynch, etc.) who were just beginning to move their ads from high end print publications (*Wall Street Journal*, *New Yorker*, *Vanity Fair*, etc.) into television. For Mercedes to advertise on a network sit-com was a waste of money since most of that audience couldn't afford their product and the lower pricing of The Discovery Channel was a relatively efficient buy. However, two developments changed the economics for Discovery. First, they began to run out of programming they could acquire cheaply and therefore had to begin producing their own shows at a much higher cost per hour. Second, as the number of cable distribution channels began to grow (and then explode with satellite and digital cable), Discovery grew niche networks to defend its brand against imitators (Animal Planet, Discovery Health), each of which requiring programming 24 hours a day, seven days a week, 365 days per year.

While the mainstay of the Discovery Networks (The Discovery Channel) averages $0.23 per subscriber home passed per month, the newer networks like The Travel Channel get less than $0.03 per sub.[24] More importantly, the ratings of the new niche channels continue to fall so that by 2008 they may be bringing in 20 percent less advertising.[25] Extrapolating to a universe of 300 "Programming Services" on cable or satellite, the economics become increasingly tenuous. Discovery alone is responsible for programming 5000 hours of original content per year.[26] Given 14 networks programming 365 days a year, the remaining 40,000 hours of daily programming would be reruns. For Discovery to keep a fresh look, the programming will have to get cheaper each year in order for them to reach break-even on the new networks, as there is no way the advertiser will continue to pay higher rates for an increasingly fractured audience. For instance, Discovery Health, the most popular of the niche networks garnered an average rating of 0.2.[27] Increasingly, Discovery will shrink its broadcast production and put more content on demand

In contrast, with Internet Television, Discovery could cut by half its programming budget and produce twenty great hours of new "on demand" programming a week with extraordinary production values. Their most fanatic viewer probably does not have more than ten hours per week to spend watching this type of programming. But if they did, Discovery could cheaply archive every single episode of programming it owns and make those accessible on a pay-per-view or subscription basis. The viewer could watch the programs on-demand, with full VCR-like controls. Discovery could offer a "My Discovery" option that would push pet shows to the pet lover and alligator wrestling to the fans of that genre. Since the object of Discovery's business is to sell advertising, it could offer the pet food advertiser very targeted opportunities to not only advertise to the specific audience they wanted, but also to sell their product through interactive ads with e-commerce capability. All of the technology to enable this vision currently is in place.

Advertisers: It is clear from the recent network "upfront" ad-selling declines, that advertisers are aware that the 30 second broadcast spot is an endangered species. As the *Wall Street Journal* recently reported, "Procter & Gamble Co. is sharply cutting its advance purchases of television commercials for the upcoming season ... the latest change in the way companies reach consumers and how broadcast and cable networks draw revenue."[28] The movement of dollars away from the broadcast and cable networks continues as advertisers seek the more targeted opportunities presented by Internet advertising. The famous maxim by department store mogul John Wanamaker that "50 percent of my advertising expenditures are wasted; I just don't know which 50 percent" is truer than ever. This problem has been exacerbated by the introduction of the Personal Video Recorder (PVR), originally under the brand name TiVo and later bundled with set top boxes, which let viewers fast-forward through the commercials. However, the evidence that both the major cable companies Comcast and Warner are embracing the new ad paradigm of on demand TV points toward a quicker adoption of the Internet Television paradigm.

A video-quality broadband network affords advertisers the Holy Grail: the ability to target like the web combined with the ability to run full screen 30-second commercials that allow interested users to click-through to the e-commerce page of the advertiser. If you are moved by the Gap ad, you can immediately buy the clothes. Furthermore, the ad buyer can specify a demographic target (females, 14-18, in specific zip codes) and only pay for that target.

Distributors**:** In an Internet Television world, the role of distributor would change. Today, there are five basic conduits for video media: theaters, video purchase and rental, cable TV, satellite TV, and broadcast TV. The classic distributor seeks to market its product sequentially through every one of the existing channels, hoping to extract as much profit as possible from each of the corresponding video windows. Unless they own a player in one of these channels, distributors must deal with a third party who can demand a share of the revenue from the transaction. Four of these channels are one-to-many "broadcast" channels and while viewers have a choice, it is a limited choice constrained by those who program the channels. Video purchase and rental is the exception, the only "addressable" channel that allows the distribution of hundreds of thousands of programs to very small audiences, on-demand. So far, however, this "on-demand" character is slow and inconvenient.

The emergence of broadband IP networks as a sixth conduit and the transformation of the cable TV system into an addressable network together introduce a fundamentally new distinction. In the new world of Internet Television it will be important to differentiate between broadband carriers and broadcasters. Broadband carriers would be comprised of all DSL providers (the Baby Bells), all cable providers with upgraded hybrid fiber/coax plants (90% of the nations MSO's), all ISP's offering broadband service (AOL, Earthlink, MSN), and all fixed wireless providers. Broadcasters would consist of all over-the-air TV networks and all satellite networks. In an Internet Television world the broadband carriers would make their money by providing metered service much like your cellular or utility service. Heavy users of streaming media would pay more than light users. Distributors of content could then sell to the carrier's customer base on an open access basis and use the three basic models for payment: monthly subscription, pay-per-view, or ad supported content.

Clearly the broadcasting model would not be able to compete because of lack of a two-way network. However, this transition to IP-TV would be gradual and still the "event" type of programming like sports or award shows which demands a specific mass audience to be present at a specific time would be a staple of the broadcasting universe for a long time.

Conclusion

With the transition to Internet Television, TV is entering the third phase of its evolution. Each of these three phases corresponds to a distinct architecture of the medium, leading to a specific allocation of roles between content providers and consumers and resulting in a unique control structure. This is why Internet Television, holds so much excitement. It promises to transform the current structure of control over the most important mass medium and thus revolutionize the patterns of communications which have been articulated around it. The implications for the social, cultural, political, and economic activities organized around the corresponding communication activities are equally far reaching.

Industry and policy choices at each preceeding phase have led to the construction of television systems around a particular network technology and these technological choices have had important implications for the medium's architecture and its economic characteristics. Radio transmission of video programming was central to the first phase of broadcast television and the limited frequencies available resulted in channel scarcity, giving central control over the television system to a handful of broadcasters granted licenses to use these frequencies. Since they could not exclude individual users from receiving their signal, the core economic model was to assemble mass audiences and sell advertising.

The second phase technology--co-axial cable-- alleviated scarcity and ushered in a new era in which viewers could chose among hundreds of channels. Mass audiences then begun to fragment into niche audiences, with programming increasingly finely targeted to the tastes of particular demographic segments. While control over programming expanded from a handful of broadcast networks to several dozen cable networks and cable systems operators, it still remained largely centralized. With cable, however, individual viewers could be barred from receiving specific channels or programs, enabling new economic models such as subscription and pay-per-view that offered an alternative funding mechanism to advertising.

Internet technology will be the foundation of the next phase, Internet Television. More than a physical medium, like the radio waves and co-axial cables of the two first phases, the Internet is a software overlay that can tie any existing network into an "inter-network," thus potentially combining all the existing transmission capacity existing in the broadcast, cable, but also telecommunication networks, into a single transmission system. However, unlike its broadcast and cable predecessors, it can be configured to support an infinite variety of communication patterns--not just one-to-many like broadcast or one-to-few like cable. As a result, the Internet potentially enables a far-reaching transformation of television, making it possible to construct a system in which anyone can offer programming for any type of audience, with any kind of access control--and pricing mechanism--they choose. The resulting medium would look much like the web, for video.

However, the fact that such an open, symmetrical, flexible video communication system is technically possible doesn't mean it will necessarily emerge. In fact, the very programmability of the Internet that allows the creation of a system supporting a multitude of communication patterns also makes it possible to shape Internet Television merely as an expanded version of the centrally controlled systems that dominated the first two phases of television, what we have called IPTV. Which path television ends up following among these two opposed visions, will largely depend on who is allowed access to the Internet distribution network and who has the ability to program its configuration. This is precisely why the policy decisions contemplated today are so critical, in particular those that will determine how we chose to implement the legacy of the "four freedoms of broadband."

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http://www.latimes.com/business/la-fi-overheat16jul16,0,3141389,print.story

4. FCC, 12th Annual Video Competition Report to Congress, March 2006, p.4.
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-11A1.pdf

5. Data cited in this section, unless noted otherwise, was compiled primarily from Appendix B / table B-1 ("Assessment of Competing Technologies") of the FCC's successive Annual Report on Competition in Video Markets filed from 1996 on, "In the Matter of Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming" (available on the FCC Media Bureau web site at http://www.fcc.gov/mb/csrptpg.html).

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