Needham

June 22, 2012

Laura Martin, CFA • lmartin@needhamco.com • (917) 373-3066
Dan Medina • dmedina@needhamco.com • (212) 705-0295

Entertainment & Internet

Needham Insights

Providing in-depth analysis of significant industry issues

Martin's Meditations

The Future of TV:
The Invisible Hand

Since 1776, Adam Smith's "invisible hand" has been a central intellectual tenant of markets and free enterprise. The TV ecosystem is one of the best case studies of the invisible hand at work. This report analyzes the Internet's video ecosystem that may one day unseat the incumbent TV ecosystem. It also estimates jobs lost and consumer value destroyed if the government interferes with this transition.

There are several important reasons the TV ecosystem has not suffered the same fate as music and newspapers in the digital age, including:

- **Value Proposition.** Consumers pay about $0.30 for every hour of TV they watch.
- **Technology.** Television has always embraced technology to improve its product. A media business predicated on technology is less likely to be disrupted by technology.
- **Content.** There is no hit-driven content business that can thrive unless the entire slate is funded ahead of time. If you allow consumers to pay for hits only, 80% of programming never earns money.
- **Fierce Rivalries.** The TV ecosystem consists of about two dozen enormous companies engaged in vicious negotiations every 5-7 years over who adds more value and why. Increasingly, they miss contract deadlines, but eventually negotiate how each can add more value to the TV ecosystem.
- **Diversity Wins.** AOL, MySpace and Yahoo are examples of dominant Internet platforms that were obsolete within 20 years. Large companies pursuing independent strategies maximizes the economics and stability of the TV ecosystem.
- **Internet.** YouTube, Netflix, AOL, Yahoo, Hulu and several others are creating a parallel high-quality video business on the Internet. If they work together to solve several tactical issues, we are optimistic that they can unseat the TV ecosystem over time.
- **Government Risks.** The invisible hand is working well in TV today. Technological disruption is based on speed. We calculate that the unintended consequences of government intervention in the TV ecosystem puts at risk approximately 1 million middle-class American jobs, 125 TV channels that would become uneconomic to produce, and $300 billion of market capitalization downside.

Our top stock picks from this work are CBS (Buy, TP $40) and AOL (Buy, TP $31).

Music and Newspapers

More than 70% of the market capitalization of the newspaper and music industries was destroyed as those industries transitioned to digital platforms. How did digital platforms disrupt these media industries? Our views are summarized below.

Music

In the physical world, consumers paid about $15 for an album that packaged one, two or three A-quality songs with several B and C quality songs. Digital platforms enabled piracy, which priced hits at "free." The audience stole the songs they wanted. As consumers stole the hit songs between 2000 and 2003 and stopped buying albums (i.e., zero revenue for A, B or C titles), the music industry was forced to unbundle the album. When iTunes began charging $0.99 for each song purchased, the music industry was able to monetize its hit songs (but not its B and C titles). In the end, getting paid for A-titles was preferable to not getting paid anything at all. We note that 70% of iTunes revenue is paid to content creators and iTunes (the Internet distribution platform) keeps 30%.

Unbundling the album destroyed the economics of the music ecosystem. In hit-driven content businesses, when consumers are allowed to buy only the hits (A-titles), they pay a slight premium for the songs they want, but they only buy about 20% of the songs they did previously, thereby generating about 75% less revenue than the bundle. Giving consumers the ability to purchase hits a la carte starved the music ecosystem of capital because it is impossible to create only hits, and B and C titles are valued at essentially zero.

Newspapers

The advertising revenue stream for newspapers was disrupted because craigslist, monster.com and other online classified listings are near-perfect substitutes (or superior) to a newspaper's classified listings. Classified advertising was the highest margin part of each newspaper's business model.

The potential for an online subscription business model was undermined because the best newspapers gave away their premium content for free on digital platforms. When *The New York Times* (the industry leader) gave away its excellent content online, this precluded any other newspaper's ability to charge for news. Giving away news that used to be paid for undermined the consumer's perception of the value of news.

In addition, when the Internet unbundled newspapers into individual articles available on-demand online, this destroyed value in at least three ways:

- **Volume Cutbacks.** Advertisers used to pay for 100% of subscribers, even though only 10-20% of readers are in the market to buy a particular product on any specific day. When ad dollars move online, advertisers pay only for "click-throughs," paying for only these 10-20% of people.
- **Pricing Pressure.** The Internet has infinite advertising inventory, which limits pricing power. Aggressive competition for ad dollars from infinite online sites puts downward pressure on advertising revenue.
- **Discovery Undermined.** Consumers used to peruse more content when they held a paper in their hands. In the online world, it's harder for a newspaper to introduce readers to new columnists and articles. Discovery and "stickiness" are undermined because articles are called up one at a time, there is more choice, attention spans are shorter, and viewing is often multi-tasked (shared).

Our View. Although we omit the words "we believe" and "in our view" throughout this report, we emphasize that the opinions expressed in this report are solely our own, and not necessarily shared by anyone inside or outside of Needham & Company, LLC.

Cover photo credit: iStockphoto.com/loops7

What's Different About TV?

The following list highlights several key characteristics that make the television ecosystem different from music and newspapers. We discuss each of these in this report:

- TV's Value Proposition
- Technology
- Content Is King, Expensive, and Risky
- An Ecosystem of Giants with Contractual Obligations
- The Internet's Parallel Premium-Video Ecosystem
- Risks of Government Interference

TV's Value Proposition

TV offers one of the best price/value ratios of any consumer product. The average cable bill in the U.S. for unlimited viewing of approximately 135 TV channels is $75 per month. According to Nielsen, average household viewing aggregates about 8 hours per day which, over the course of a month, implies a cost to consumers of about $0.30 per hour of TV watched. Compared with other forms of leisure time, this looks inexpensive. For example, costs associated with competing leisure time activities might include spending $125 for a single park-hopper ticket to Disneyland, $300 per ticket to the One Direction concert or an NBA game, or $50 for 4 movie tickets (3 hours of fun) on a Friday night.

One important value driver of the TV ecosystem is that participants specialize. Each distributor's goal is to minimize costs, drive higher penetration levels, and successfully provide service to millions of individual consumers. We note that up to 25% of consumers in some small markets walk into their local cable office each month to pay their bill in cash. By contrast, content companies employ fewer but more expensive people who work in groups over years, risking enormous amounts of capital to create the next hit. They never talk to a single consumer but pore over Nielsen ratings data: To this end, a typical content company has a research staff of 80-150. Most distributors have less than 12. Specialization maximizes returns on capital invested and minimizes the cost to consumers per hit created.

TV Was Built on Technology

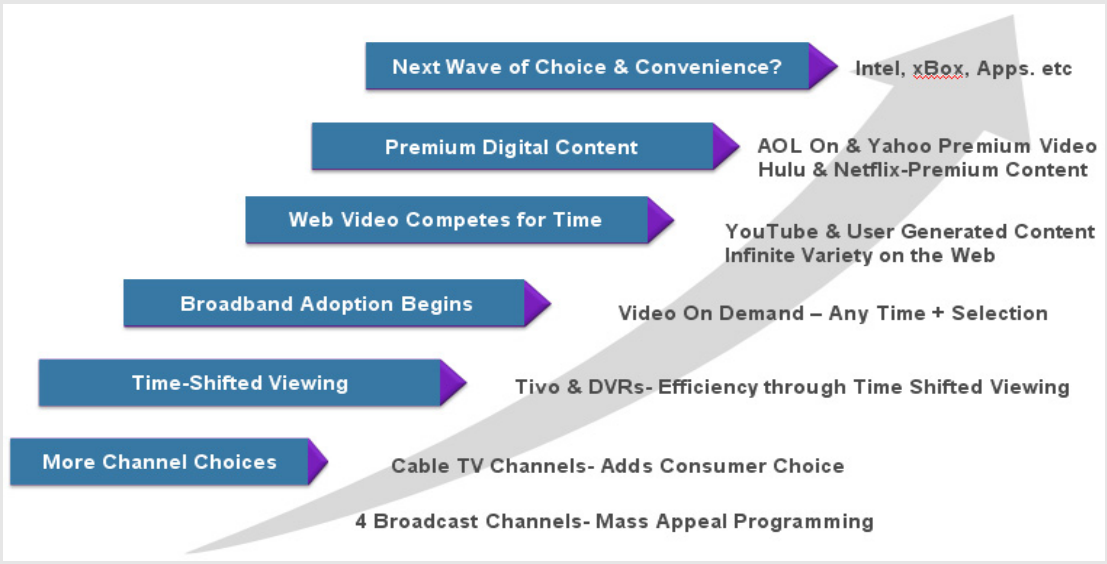
Over the past 35 years, technology has never stopped impacting the TV ecosystem, from the advent of DVRs to a proliferation of innovations driven by broadband adoption across America. The TV ecosystem has the most engineers of any media business, and since the introduction of color TV in the 1950s, the TV distributors (i.e., cable, satellite and telephone companies) have kept pace with the innovation levels of Silicon Valley, upgrading their plant and technology to introduce to 100 million U.S. homes:

- 130 New Channels of Programming
- DVRs
- Video On Demand
- High Definition TV
- 3D-TV
- High Speed Modems
- Voice Over IP (VoIP) Phones
- Home Security

The telcos, satellite and cable companies have each adopted differentiated ways to reach consumers. CableLabs has solved difficult industry-wide engineering problems and, because it sets standards, the cable companies have minimized costs by making fewer mistakes and buying in bulk from suppliers. This low-cost focus by the distribution arm of the TV ecosystem benefits consumers.

As evidenced by Figure 1, since 1977 when Gerald Levin and the HBO team innovated to create a new TV channel paid for directly by viewers, and Ted Tuner used "new" satellite technology to uplink his local WTBS-Atlanta TV signal to maximize viewer ratings and generate advertising revenue across the entire U.S. footprint, the TV ecosystem has introduced both consumer-facing technologies and platform innovations that rival any consumer-facing ecosystem in the U.S.

Technology Adoption by the TV Ecosystem *Figure 1*



Source: Needham & Company, LLC research.

Internet Video Innovation

Technology is enabling the creation of a parallel video ecosystem. Many Internet companies are beginning to create premium video to be originally aired over the Internet on digital platforms and mobile devices. This is a nascent premium video content ecosystem. According to press reports:

- YouTube will spend $100 million to make original video content for the Internet.
- Netflix will spend $200 million to make original video content for the Internet.
- Hulu will spend $500 million to make original video content for the Internet.
- AOL has created 14 "AOL On" premium video channels for the web.
- Yahoo! has slates of original video programming, targeted to women, men and comedy.

We are optimistic about the parallel premium-video ecosystem being created by Google, Yahoo!, AOL, Microsoft, Vevo, etc. This ecosystem is well positioned to take viewing share from the incumbent TV ecosystem, especially on mobile platforms. We think to displace the incumbent TV ecosystem, the premium Internet-video competitors:

- Should work together;
- Must have measurement;
- Must solve the problem of discovering new shows among infinite choice;
- Must spend marketing dollars to promote new shows to create "hits";
- Should integrate ecommerce and social functionality into their content;
- Should create multiple revenue streams;
- Must create barriers to entry; and
- Should have a realistic time-frame (i.e., longer than they think).

The invisible hand works well in TV. We would expect this parallel ecosystem of premium Internet content to take share from the current TV ecosystem, unless the incumbent content creators innovate to create shorter stories (i.e., less than 7 minutes), interactive content, and/or "mobile first" content.

TV Content Is Expensive

Today, the Internet content creators cannot create perfect substitutes for TV content, owing to enormous content costs. For example, broadcast networks (ABC, CBS, Fox and NBC) typically spend $2-3 billion each year, equating to about $2-5 million per hour of primetime (8-11pm) programming. In addition, most of the other 130 cable networks spend over $100,000 to produce each hour of primetime programming, by our estimates.

The primary reason that TV networks can commit to these enormous production budgets is because the business model of the ecosystem raises money before anyone knows which channels and shows will be hits. The broadcasting companies fund 80% of their primetime schedule in the "upfront market," three months before the season begins. There are 135 cable channels in part because cable, satellite and telco companies pay each cable network a guaranteed monthly fee to fund programming before it is made.

Risks of Producing Hit Content Are Rising

Because the Internet fractures audiences, hits have more value in a digital world. Large audiences are more rare and therefore more valuable. Hits (also called A-titles) amass the largest audiences. Hit content has always been difficult to create and money does not guarantee success. NBC and ABC's primetime schedules represent billions of dollars being spent to create hit content by companies that have the right cultures to discover and nurture hits. It's just a lot harder than it looks.

The risks associated with making hits in film or TV has never been higher. The two films *John Carter* and *Battleship* each required a $200 million write-off. B and C titles in both film and TV are worth essentially zero because they compete with a large amount of Internet content. Hits are almost impossible to produce consistently. Higher risk necessitates stronger balance sheets that can sustain several years of B and C titles.

Huge Competitors Maximize Ecosystem Stability

There are enormous amounts of money at risk in various parts of the TV ecosystem. The distributors have been continually buffeted by new competitors and new technologies. On the content side, the cost of failure rises every year and hits are ever harder to create—just ask NBC. One of the primary survival modes of the TV ecosystem is that participants are enormous companies that can survive the growing risk of several bad years in a row.

The bulk of TV economics are highly concentrated in less than two dozen public and private companies. Because content must be funded in advance for a vibrant content ecosystem, long-term (five to seven-year) contracts with guaranteed payments are the norm. Because the distribution companies always drive to lower costs, there tend to be volume discounts for each extra 10 million subscribers reached. Since content represents 40% of total costs, this drives consolidation in the distribution part of the ecosystem, which maximizes efficiencies and minimizes costs to consumers. The satellite companies have some of the lowest content costs in the TV business because their subscriber bases are so large.

A Team of Rivals & Independent Thinkers

Academic research demonstrates that diversity maximizes economic value. In the TV ecosystem, not only do the content and distribution companies engage in vicious contract negotiations, the diversity among the content companies is staggering. One of the stabilizing factors in the TV ecosystem is that the seven public content companies agree on almost nothing. They each make operating decisions consistent with their own goals and strategies. Examples of this lack of hegemony include:

- Hulu is owned by ABC, NBC and Fox but CBS has no investment or programming on Hulu.
- All Time Warner content is available today on all platforms (e.g., HBO.Go) for no incremental fee (i.e., TV Everywhere is enabled everywhere), while Fox and Viacom have signed no TV Everywhere deals at all.
- CBS, Viacom and Discovery have sold programming to Netflix but Disney, Time Warner and Scripps Networks have not.
- Disney and CBS alone have signed long-term deals with Comcast.
- Most TV networks wait more than three days (the window during which they get paid) before they put their expensive content on the Internet, but Viacom puts its two biggest hit shows from Comedy Central (The Colbert Report and Jon Stewart) on the Internet immediately, under the theory that the content is topical and therefore is worth risking ad revenue lost if that program had been DVRed and replayed during the three-day window.
- CBS puts much of its schedule on its website with full commercial loads (14-16 minutes/hour) and disables fast-forwarding.

Distribution

The cable, satellite and telco distributors also have widely different agendas and market strategies. There are at least three TV-distribution competitors in most markets in the U.S. (plus Internet choices), which offers consumers myriad choices and price points. Diversity of options maximizes value, and the push and pull of each cable, satellite and telephone company against each content company during contract negotiations results in "best practices" and stability across the entire TV ecosystem.

Invisible Hand at Work—Cord Cutting

The invisible hand is at work in the TV ecosystem. According to an April 2012 report by Canadian research firm Convergence Consulting Group, 1 million U.S. households cut the cord in 2011. This represents about 1% of the 100 million homes that pay a monthly bill for multichannel video service.

Viewers appear to be leaving TV in favor of video games, social networks, YouTube, etc. Our studies reveal that 80% of households that disconnect their satellite bill say they use Hulu instead. Hulu is a perfect substitute for some NBC, Fox and ABC content at a much lower cost to consumers because the number of commercials is about one-third that of traditional TV. Viacom has put much of its content on Netflix so a household that cares only about Viacom's channels (MTV, VH1 and Comedy Central, etc.) can save $67/month by canceling their $75/month cable, satellite or telco TV subscription and purchasing Netflix for $8/month instead.

As households "cut the cord" and turn off their TV subscriptions, what are the risks to market capitalizations? There are two primary forms of value lost when TV households cancel their TV subscription:

- **Lower Subscription Revenue.** Each cable, satellite and telephone company pays every channel between $0.02/month and $1.00/month for every home that subscribes to the TV bundle, whether or not anyone in that household ever watches that channel. Therefore, as households cut the cord, every fully-distributed channel loses this revenue stream immediately.
- **Lower Ratings and Ad Revenue.** Quantification of lost advertising revenue is more complicated because there are enormous variations between the advertising revenue across shows and channels and dayparts. The most important conclusion is that lower viewer ratings owing to 1 million fewer subscribers implies lower advertising revenue, which adds to the value destroyed by the lost subscription revenue discussed above.

Figure 2 includes our estimates of the negative market capitalization impact for each of the public content companies for every 1 million households that cancel their multichannel video subscription. It shows that every major content company is negatively impacted by TV ecosystem cord cutting.

Negative Impact of Cord Cutting, by Company — *Figure 2*

	CBS	Discovery	Disney	NewsCorp	Scripps Networks	Time Warner	Viacom
Ticker Symbol	CBS	DISCA	DIS	NWSA	SNI	TWX	VIAB
Total 2011A TV revenue (ad+subscription)	$9,221	$3,915	$12,877	$8,037	$2,015	$13,654	$9,145
Our estimate of US portion	100%	65%	90%	75%	100%	85%	85%
US Multichannel Video Subs (mm)	100	100	100	100	100	100	100
Implied Avg Rev/Sub/Year ($)	$92	$25	$116	$60	$20	$116	$78
Marginal EBITDA Lost as Subs Disconnect	85%	85%	85%	85%	85%	85%	85%
EBITDA/Year Per Lost Sub	$78	$22	$99	$51	$17	$99	$66
Current Co EV/EBITDA Multiple	8.1	10.4	7.7	7.5	8.8	7.6	7.8
Value Lost per Sub that Leaves the Pay-TV Ecosystem ($)	**$637**	**$224**	**$763**	**$386**	**$150**	**$748**	**$514**
Assume 1mm Video Subs Disconnect	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Total Implied Value Lost	$637,180,655	$223,878,780	$762,885,202	$386,475,985	$149,983,711	$747,813,727	$513,925,975
Market Cap on 6/12/12	$20,850,000,000	$19,850,000,000	$82,310,000,000	$47,210,000,000	$8,540,000,000	$33,680,000,000	$25,050,000,000
% of Market Cap Lost	**3.1%**	**1.1%**	**0.9%**	**0.8%**	**1.8%**	**2.2%**	**2.1%**

Source: Company reports, Needham & Company, LLC estimates.

A key insight from Figure 2 is that the impact of cord cutting is different across content companies. At the low end, Disney and NewsCorp lose less than 1% of their market cap for every 1 million subscribers that cut the cord. At the high end, CBS, Viacom and Time Warner lose over 2% of their market cap for every 1 million subscribers that stop paying a TV subscription. The disparity primarily relates to business mix (i.e., how many other types of businesses reside alongside the TV business). We note that CBS would lose the bulk of their value through lost advertising revenue because their subscription revenue stream is small, whereas Viacom and Time Warner would lose most of their value through evaporation of the subscription revenue stream.

Invisible Hand at Work—Viewing Shifts

The invisible hand is directed solely by consumers. The foundation of all consumer-facing economic systems is that there must be consumer demand for the product. Then a price may be attached to that product and adoption rates will follow a price/value curve. Consumers who want the product but don't think it's worth the price (i.e., a poor price/value ratio) will not buy it.

Data shows that consumer demand for TV is shifting in the digital age. For example, in a June 2012 comScore study:

- 72% of the 10,000 viewers surveyed stated that they watched TV only on a TV set ("TV-only" viewers).
- Another 11% were "digital-only" viewers, meaning they watched TV content on computers and laptops and smartphones but never on a TV set.
- The final 17% of viewers reported that they were "multi-screen" viewers who use TV, online video and mobile devices to watch TV shows.

This data continues a trend that has been gaining traction over the past three years.

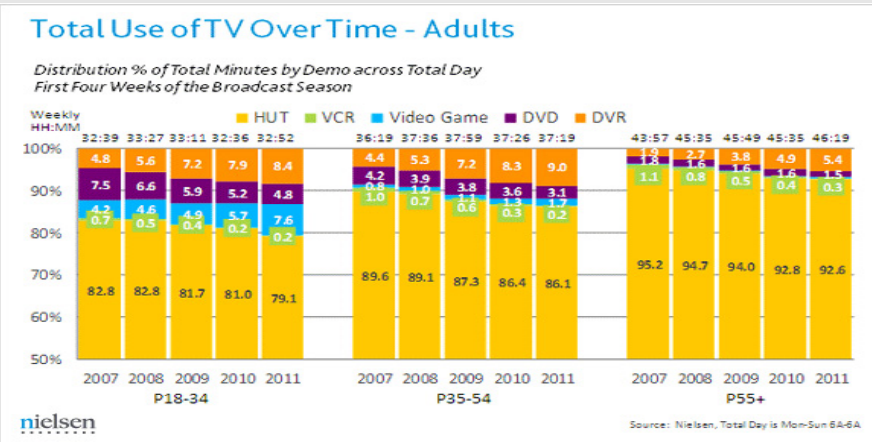
A key new insight from this study was that 61% of viewers say they use the Internet *while* watching TV and of these, *10-25% go to the Web site of the show they are currently watching*. According to comScore, "For one of the networks studied, 25% of consumers who used the Internet concurrently while watching the network on TV were visiting the network website. For the other network, more than 10% were using the network's own websites and online video while watching the channel." This ability to access more information in real time builds consumer loyalty to the show and enables a lean-forward experience to be coupled with a lean-back experience, if desired.

The study also noted that 29% of viewers that use a computer while watching TV are on Facebook simultaneously. This suggests that TV shows are anchors of shared experience and create conversations and interactions. Social media adds relevance to TV shows. Social media also drives discovery of new shows. When your friends are talking about a hot new show, you watch the show in order to join the conversation. The Internet video ecosystem is far more focused on meeting consumers' social needs, which should help them take share of viewing away from the incumbent content producers.

Demographic Shifts

Over the past five years, viewing behavior shifts have varied by age group. A February 2012 study by Nielsen found that 18-34 year olds did 79% of their TV viewing on live TV, 34-54 year olds did 86%, and over 55 year olds watched 93% of their TV live in 2011. Interestingly, there was no difference in DVR viewing for folks under 54 years old, at about 9 minutes per day. The biggest difference for young people (18-34 year olds) was that they spend 7.6 minutes per day playing video games, whereas older groups report nearly zero. Interestingly, DVD viewing has been falling for every age group. Figure 3 includes demographic trends of TV viewing.

Viewership by Age *Figure 3*



Source: February 2012, Nielsen.

TV Everywhere

The TV ecosystem has not ignored the demands of younger viewers, even though they don't pay the bills today. Because consumers are demanding that their favorite TV content be available on any device, the cable and content companies are rolling out "TV Everywhere," which is also called "authentication."

What is TV Everywhere? TV Everywhere is a technology solution that is being paid for by TV distributors that gives every member of the household the ability to watch their favorite TV channels on any mobile device. Customers must input an "authentication" code to prove they paid their bill. After that, they can access any TV content on laptops, tablets and smartphones, anywhere in the U.S.

This new technology solution is directly responsive to demands by the youngest, least powerful, member of each U.S. household, typically kids under 18 years old. The TV ecosystem is taking the long view with this product, a key competitive advantage over most Internet companies. The economic upside of the extra investment in TV everywhere today will come when today's 18 year old establishes his/her own household. The value of every "saved" 23 year old that subscribes to a cable, telco or satellite TV service when he/she first forms his independent household is approximately $54,000 of revenue to the TV ecosystem over their lifetime.

What Do Consumers Say They Want?

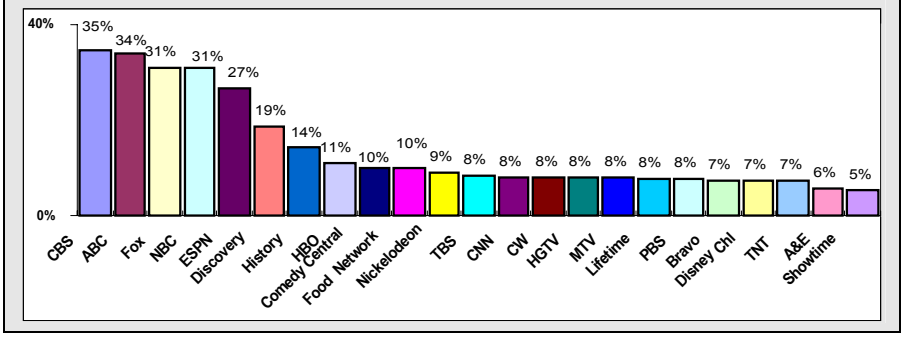
One of the key challenges for the TV ecosystem (and for governmental officials) is that consumers say they want things that the data shows they don't, and visa versa. Following the data rather than the words is a better choice if there is a conflict, but the starting point should be what consumers say they want. Consistent with this view, we did a survey of 500 TV viewers and asked what channels they must have available on the Internet in order to cut the cord. Our key takeaways from Figure 4 include:

- We found that if folks listed one of the four broadcasters (ABC, CBS, Fox and NBC), they generally listed them all. This may be because consumers actually watch shows on all four broadcast networks, or it could be because they have NO idea which network their favorite shows are on.

- We were most surprised by HBO because 11% of survey respondents said they MUST have it, even though HBO has less than 30 million subs (<one-third the total subs of the other channels). This equates to a 33% rating (similar to the broadcast networks) after adjusting for the relative audience sizes.
- Demand fundamentals don't equal pricing power. Comedy Central is one of highest "demanded" channels (at 10%) but when we asked what folks would pay, they said zero because they could get the best Comedy Central programs for free over the Internet.

Figure 4 captures the responses to our question, "Please list which TV channels you must have available online for you to turn off your TV subscription." We did not give respondents a list of TV channels, so their responses were unaided.

What Is Must-See TV? *Figure 4*



Source: Needham & Company, LLC research.

We then took some of the most popular channels above and asked viewers how much they would pay for each of these channels. Even though these were the most popular channels, 51% of viewers said they would pay zero for them in an a la carte world. The highest "payer" category was the four broadcast networks. Of the 50% of people that say they would be willing to pay something, 50% of those (implying 25% of total viewers) said they would only pay less than $2/month. In an unbundled world, each channel that survived must have monthly revenue of $5-10/month payable by consumers in order to maintain current revenue levels, depending on each channel's ultimate penetration levels. We note that there are super-fans for every one of these channels, as evidenced by the fact that a consistent 5-10% would be willing to pay $10 or more for each of these channels.

What Will Consumers Pay for Their Favorite Channels? *Figure 5*

Owner	Channel	% of TV Viewers Who Say They Would Pay Zero	% of TV Viewers Who Say They Would Pay Something ("Payers")	Of "Payers", % Who Say they Would Pay $2/month or Less	Of "Payers", % Who Say they Would Pay $10/month or More
Disney	ABC Broadcast Network	38%	62%	52%	11%
NewsCorp	Fox Broadcast Network	41%	59%	50%	11%
Disney	ESPN	48%	52%	57%	16%
Viacom	Comedy Central	39%	61%	44%	19%
NewsCorp	Fox News	65%	35%	53%	14%
Viacom	MTV	65%	35%	54%	13%
Disney	Disney Channel	56%	44%	59%	16%
Viacom	Nickelodeon	58%	42%	51%	14%
	Averages	**51%**	**49%**	**53%**	**14%**

Source: Needham & Company, LLC research.

A key insight from this survey was consumers' mental math. Viewers' starting point is $75/month divided by 135 channels they now receive, or about $0.55 per channel per month. A premium to them is $0.75 or $1.00, when in reality that would generate far less revenue compared with what each channel receives today. We caution that responses to "what would you pay" questions generally skew lower than reality because folks see no incentive in saying they would pay more.

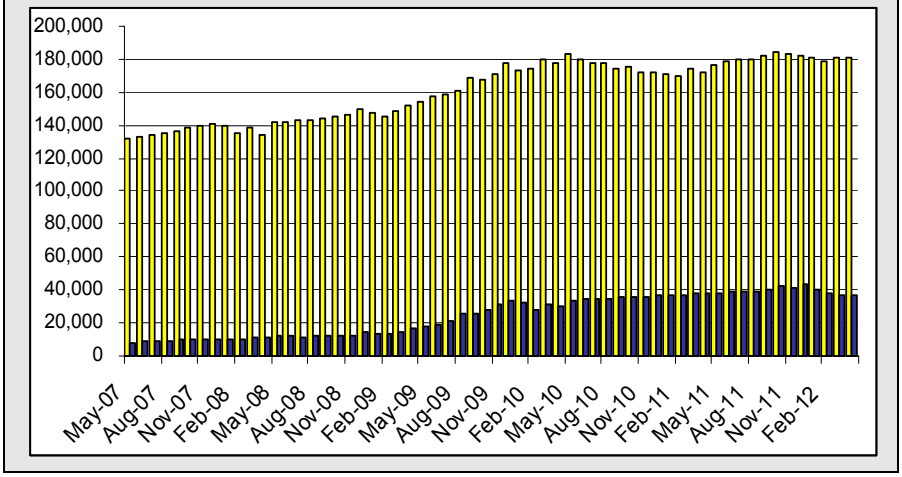
What the Data Shows Consumers Want

It's NOT About Price

Despite their answers in surveys, data from the digital world suggests that the health of a content ecosystem is built on the quality of its content, *not* its price. Viewers *say* they want a lower price or free content (50% say they would pay zero), but the data shows that when the content is low quality or hard to find, they stop watching.

A price of free is not what consumers want, based on data from the online video world. As illustrated by Figure 6, viewing of videos online (i.e., video content priced at free) doubled between May 2007 and November 2009. However, since May 2010 the number of people streaming video to their computers has been flat at 180 million. Worse yet, the number of videos watched online has risen only 8% (from 34 billion to 37 billion) over the past 24 months, according to comScore. This data suggests that consumers care more about the quality (and discovery) of the content than the cost of the content. Free content does not build a robust long-term ecosystem.

Video Streams and Online Video Users *Figure 6*
(videos in MMs, users in 000s)



Source: ComScore, Needham & Company, LLC research.

The invisible hand is at work here. Consumers will not allocate more time to Internet video until it resolves a couple of important tactical issues. We are optimistic that the nascent parallel video ecosystem will solve at least three current shortcomings that it faces in its quest to displace the incumbent TV ecosystem:

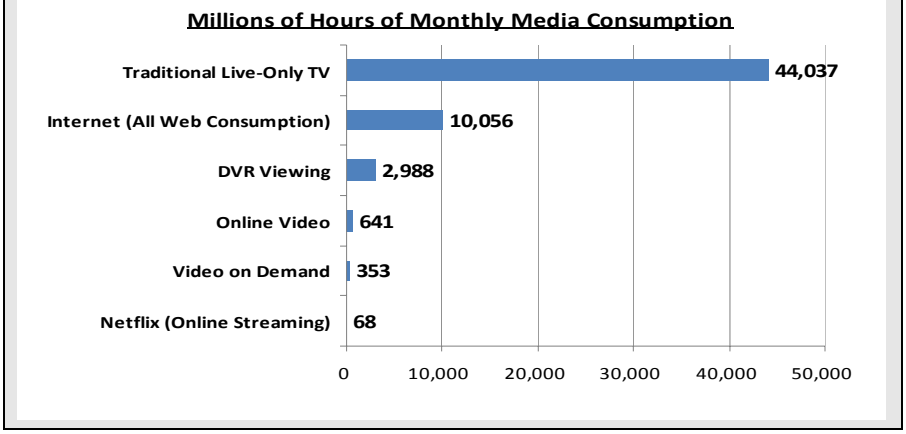
1. There is infinite content online, and good is often mixed with bad, making discovery difficult.
2. Video lengths are typically shorter, which gives customers many excuses each hour to take a break and do something else.
3. The quality of picture is typically better on a TV than over the Internet.

Where Consumers Allocate Time

The data shows that consumer demand (i.e., viewing) of television content is near all-time high levels, at over 240 hours per month, according to Nielsen. Nielsen understates total viewing of TV content because Nielsen does not generally measure online viewing of TV content. Viewing of TV content on any device is the better metric when discussing the health of the TV ecosystem. Where does viewing occur today?

1. Today, live TV viewing is 44 billion hours per month, plus DVR viewing of TV content is an additional 3 billion hours per month.
2. Substitutes such as online Video at 641 million hours per month, Video on Demand (VOD) at 353 million hours per month, and Netflix at 68 million hours per month are small but rapidly growing competitors.
3. Internet usage reached 10 billion hours per month in 2011. This includes all uses of the Internet, some of which compete with TV viewing but most of which do not. We note that the typical length of an Internet video is less than 5 minutes, which works against total time spent.

TV vs. Internet Demand (mm/month) *Figure 7*



Sources: Simulmedia and Nielsen. Traditional Live-Only TV and DVR viewing based on average monthly figures during 1Q2011. Internet and Online Video based on average monthly consumption during April 2011. Video on Demand based on consumption during May 2011. Netflix based on consumption during January 2011.

Where Consumers Allocate Dollars

Every month, 114 million U.S. households make an independent decision about whether to purchase a TV bundle. We would argue that 85% of U.S. households are voting with their wallet each month that the TV bundle is worth the money. There are very few consumer products that have 85% penetration of U.S. households, especially coupled with 8 hours per day of usage. These datapoints suggest that there is consumer surplus being created by the TV ecosystem.

At a cost of $75/month for 240 hours of viewing per month, this implies that viewers are paying about $0.30 per TV hour of entertainment. This represents an excellent value (i.e., consumer surplus). In addition, the cable and telco competitors have lowered the effective price of TV over the past five years through bundling. Double and triple-play bundles represent a discount for the TV product because research shows that consumers value the high-speed modem portion of the bundle at $80/month, leaving only $20/month of the payment attributable to TV in their minds.

Consumers Demand Hit Content

In 2006, Chris Anderson wrote a book entitled *The Long Tail*, which posted that in a digital world, far more product choices would be available to consumers because physical shelf space would no longer be a constraint. This explosion of choices would allow consumers to buy more products down the long tail (non-hits) than they had in the past, which could imply a shift of economics away from the hits (head) toward the long tail of less popular (non-hits) choices. Figure 8 illustrates the promise of the "Long Tail" theory.

The Long Tail Theory — *Figure 8*

Source: Chris Anderson, The Long Tail.

So far, in media at least, the Long Tail theory is exactly backwards. That is, the gap between the economics of hits and average content has been widening in the digital age, as evidenced by the following data:

- Of the 97,000 music albums released in 2010, 2% of them accounted for 90% of total revenue.
- The Top 10 TV shows today garner a record share of ad revenue because they deliver a huge (10-15 million per week) audience.
- Rhapsody (an online music service) has about 300,000 artists available on its service. Of these, the top 200 artists make millions of dollars, the next 4,800 make around $250,000 per year, the next 5,000 make around $50,000 per year, and 290,000 make nothing at all.

Some of the best work in this area is being done by Anita Elberse at Harvard Business School. Her work shows that in a fracturing world, money is moving towards the "head" (the hits). Elberse's academic research mirrors the conclusions above:

- **Quickflix.** Of 16,000 movie titles, the top 10% of DVDs rented accounted for 48% of all rentals and the top 1% for 18% of all rentals.
- **Rhapsody.** When 600,000 subscribers could choose from >1M tracks of music over 3 months, of the 32M played, the top 10% represented 78% of all plays and the top 1% represented 32%.

Why are hits worth more in the digital age? In 1995, Robert Frank and Philip Cook wrote a book entitled *The Winner-Take-All Society*. They posited that widespread fast communication coupled with a low cost of trial would drive a shift in tastes and buying habits toward hits. That is exactly what has happened. The book gave three reasons for this consumer convergence around hits:

- In a digital world, where information is perfect and trial is inexpensive, why would anyone buy the second best? With ubiquitous information, it's easy to determine whether you are reading or listening or watching the best available. Social networks, search engines, customer reviews, recommendation engines, etc. all push consumers toward the best product (super-hits) available.
- People are inherently social animals and therefore they find value in reading, watching and listening to the same content that other people do. Therefore, hits reinforce themselves.
- Because the marginal cost of creating the next copy is low in the digital world, the profit margins of hits are large. This makes suppliers want to create "hit" content because the upside is huge.

Government Interference—What's at Risk

The government has launched several investigations in recent weeks, mostly aimed at the distribution sector of the TV ecosystem. Everything affects everything: All parts of the TV ecosystem rise and fall together. If any part is damaged, the entire ecosystem is negatively impacted. For example, the rising uncertainty surrounding potential governmental intervention raises the cost of capital for all TV participants.

Technology-driven disruption is partially based on speed. By the time the government acts, technological innovation may have shifted the competitive landscape completely. The new video competitors are doing a competent job entering the TV business. The government is a bull in the proverbial china shop with unintended consequences likely to destabilize the delicate work of the invisible hand, which is working today in the TV ecosystem. We believe that the government should trust that Silicon Valley entrepreneurs with 150 IQs can solve the puzzle of how to steal a portion of the $150 billion annual revenue from TV incumbents.

Even with the best intentions, government interference in the TV ecosystem adds risk of negative unintended consequences. In this section, we discuss qualitatively and quantitatively what's at risk. We quantify three key risks:

1. Employment
2. Consumer Choice/Consumer Surplus
3. Valuation/Market Capitalization

Employees at Risk

What troubles us the most about government intervention into an ecosystem where the invisible hand is working is the employees they put at risk. In total, we estimate that **U.S. employees dependent on the TV ecosystem for their livelihood are approximately 1 million.** These employees are typically middle-class folks, some with college degrees, who live in rural America. They answer phones in Virginia, service trucks in New Mexico, and install wires in homes in Alabama. These are good, stable jobs for middle-class Americans.

If the government intervenes to step on the invisible hand, the sector it is trying to protect has a tiny number of employees, most of whom have graduate degrees and live in large cities. Internet video competitors like Hulu (based in LA) has 420 employees, YouTube (Silicon Valley) has 650, and Netflix (Silicon Valley) has 2,348. This is typical of the broader Internet as well, as evidenced by the fact that Facebook has a market capitalization of about $70 billion, 900 million users worldwide, but only has 3,500 total employees. This structurally low level of employees represents a core competitive advantage of all Internet companies because it lowers their costs and aids in speed to market, innovation and adaptability. These types of employees do not need government protection: There are many job alternatives for them.

We calculate the 1 million jobs put at risk by unintended consequences of government interference based on the following analytical building blocks:

- The National Cable Television Cooperative (NCTC) has nearly 1,000 corporate members with approximately 100 employees each, for an aggregate of 100,000 employees.
- The video employees of the Telcos, primarily at Verizon (191,000 total employees) plus AT&T (252,000 employees).

- Private companies in the TV ecosystem, some of which are large. For example, Cox Cable and Mediacom are private cable companies with 22,000 and 5,000 employees, respectively.
- Over 500,000 employees in public companies that depend on TV profits to stay in business, as itemized in Figure 9.

What's at Risk? *Figure 9*

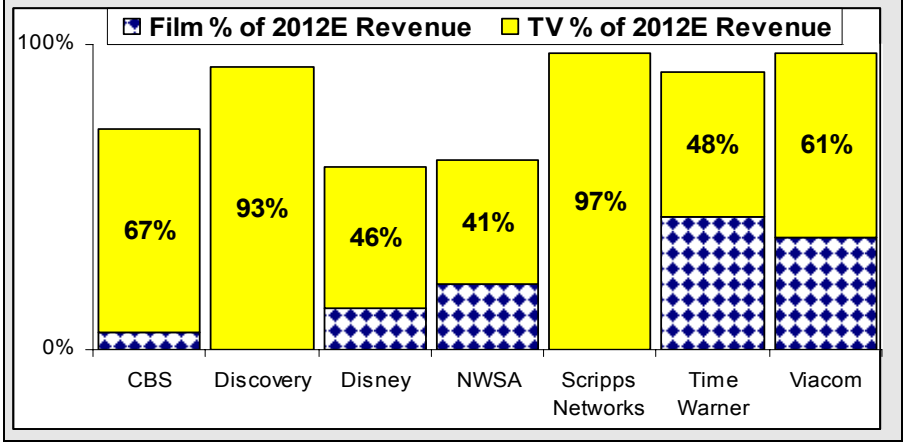
	Public Company	Ticker Symbol	Total Employees (at 3/31/12)	Market Cap at 6/12/12 ($B)	Type
1	Cablevision	CVC	15,451	$3.1	TV Distribution
2	CBS	CBS	20,951	$21.0	TV Content Creator
3	Comcast	CMCSA	126,000	$82.1	TV Distribution
4	DirecTV	DTV	25,700	$28.3	TV Distribution
5	Discovery	DISCA	4,600	$20.1	TV Content Creator
6	Dish Network	DISH	34,000	$12.3	TV Distribution
7	Disney	DIS	156,000	$82.9	TV Content Creator
8	NewsCorp	NWS	51,000	$48.1	TV Content Creator
9	Scripps	SNI	1,800	$8.6	TV Content Creator
10	Time Warner Cable	TWC	47,300	$24.3	TV Distribution
11	Time Warner	TWX	34,000	$33.9	TV Content Creator
12	Viacom	VIA	10,580	$27.7	TV Content Creator
	Totals		**527,382**	**$392.6**	

Source: ComScore, Needham & Company, LLC research.

We believe that every job in these companies is at risk if the TV ecosystem is disrupted by the government because TV is *the most material contributor* to revenue in every case. Figure 10 includes our projection of revenue mix from TV and film for each of the largest content companies that we cover. The two key insights from Figure 10 include:

1. TV is material, representing 41-97% of total revenue, for each of the seven largest public content companies. Therefore, unintended consequences of government intervention threatens the very existence of these companies.
2. Film ROICs are about half those of TV, so the profit contribution of TV to the enterprise is far more consequential than the revenue mix shown below.

Importance of TV and Film *Figure 10*



Source: Company reports, Needham & Company, LLC research.

Consumer Surplus at Risk

Industry research shows that the average household watches about 12-14 TV channels per month. As household penetrations went above 50%, the TV ecosystem had to create more niche channels to convince the next household to subscribe to the TV bundle. Each new channel had to appeal to an audience that had said "no" to the price/value ratio before. This incarnation of the invisible hand brought specialty sports channels, channels based on race, and many foreign language channels to the TV ecosystem. These channels have passionate but small audiences. Only with this broad diversity of content channels could the TV ecosystem amalgamate 12-14 channels that appeal to *each* household. That is, only with 12-14 "must see" channels will a household commit to paying $75/month, thereby achieving a fair price/value ratio nationwide.

The only way to fund programming on niche channels like the Hindi channel or the Fly Fishing Channel is to bundle them with larger channels, which are more profitable and sell advertising across multiple channels. Conversely, we believe that ripping apart the TV bundle into a la carte pieces destroys consumer surplus. Although it lowers consumer prices in the short term, it bankrupts all niche channels within five years, destroying enormous value for the highly diverse U.S. population and especially the smallest minority groups.

Consumer Choice Is Predicated on the TV Bundle

The extreme bundling of TV is an important foundation of broader consumer choice on the television dial. Bundling creates value in three primary ways: 1) bundling almost always discounts the component pieces; 2) it allows each person in the household to attribute differing values to various parts of the bundle; and 3) it lowers churn and costs by making it mental and physical work for the consumer to replace the bundle with separate a la carte services. A bundle is essentially a volume discount given to consumers. The more pieces a consumer takes, the bigger the discount.

We estimate that only 5-10 hit channels would be profitable enough on a stand-alone basis to survive unbundling, implying that 125 channels would become uneconomic to produce. Minority and special interest channels would be unlikely to survive. Since the average household watches 12-14 channels each month, every household would lose channels that they believe are important to them. In an a la carte world, consumer satisfaction would be destroyed.

The TV Ecosystem is built as bundles on top of bundles:

- Individual TV shows are rolled up into TV channels.
- TV channels are tethered together by owners such as Disney, Viacom and Time Warner and sold to cable/satellite/telco distributors.
- One content company's bundle is lashed to many other content companies' programming and sold by satellite, cable and telephone companies as three tiers of service available to consumers. Marketing research demonstrates that consumer value is maximized by three choices. Small, Medium, Large. Bronze, Silver, Gold. Tall, Grande, Venti.
- The cable and telephone companies bundle voice, video and data services together into "double-play" and "triple-play" bundles. EchoStar's Blockbuster-streaming service, available to its existing customers, is another example of "bundling up."

Programming Bundles

The TV ecosystem bundle begins with programming. The content companies bundle on several levels. At the lowest level, individual programs are scheduled across dayparts into television channels. TV programmers have told us that "good scheduling" (i.e., which program comes after which) can add

20% to revenue. Bundling content into channels is a good idea because it aids in discovery. Consumers finish watching one show and immediately the next program comes on, facilitating discovery of the next show.

Contrast this to the nascent Internet video ecosystem. Discovery today is hard online. Consumers must already know what they want to watch and after they watch it, nothing new is introduced to them. The question of what should be watched next isn't answered efficiently. This burdens the consumer, adds inconvenience, and lowers average viewing length on digital platforms.

Channel Bundles

Large content creators don't sell channels one at a time to any cable, satellite or telephone company. They bundle their channels when they sell them to distributors, and they charge for every home reached, whether or not anyone actually watches the channel. That is, each large content creator ties its hit channels to a collection of its weaker channels. In this way the hits pay for the B and C channels to remain on the air, adding to the breadth of choices for consumers. In some cases, content companies will sell only the hit channel, but at a higher dollar cost than buying a bundle of A, B and C channels, because the content creator can sell advertising on all channels carried. Although the data is old, Figure 11 includes an idea of channel bundles for several public companies.

Content Bundles Economics, 2009 *Figure 11*

	Bundle Economics		
	US Multi-channel HH* (mm)	Estimated Price/ Month	Telcos/ Satellite/ Cable Per Month
NewsCorp subscriber fees at "bulk rates"*			
1 Fox Broadcast Channel	100	$0.60	$60
2 Fox News	97	$0.25	$24
3 FX & FX HD	95	$0.30	$29
4 National Geographic Channel	69	$0.20	$14
5 SPEED HD & SPEED	73	$0.25	$18
6 Big Ten Network HD & Big Ten	70	$0.25	$18
7 Fox Reality Channel	50	$0.05	$3
8 FSN	91	$1.00	$91
9 12 O&O regional sports nets	50	$0.50	$25
10 FUEL TV	50	$0.20	$10
11 Fox Movie Channel	50	$1.00	$50
12 FOX Soccer Channel	50	$0.20	$10
13 FOX Panamerican Sports	50	$0.10	$5
14 FOX College Sports	50	$0.10	$5
Total NewsCorp		**$5.00**	**$361**
Disney subscriber fees at "bulk rates"*			
1 Disney Channel	98	$0.75	$74
2 Playhouse Disney	50	$0.25	$13
3 Disney XD-Toon Disney	74	$0.15	$11
4 ABC Family	98	$0.25	$25
5 BVS Entertainment	20	$0.15	$3
6 Jetix Europe	50	$0.15	$8
7 Hungama	20	$0.15	$3
8 SOAPnet	73	$0.15	$11
Total Disney Channels		**$2.00**	**$146**
ESPN (Owned by Disney) at "bulk rates"*			
1 ESPN and HD	Costs $4/mo total if all channels are purchased.		
2 ESPN2 and HD	Costs $5/mo if ESPN is purchased alone.		
3 ESPN Classic			
4 ESPNews and HD			
5 ESPN Deportes			
6 ESPNU			
7 ESPN Now			
8 ESPN Plus			
Total for 8 ESPN Channels	**100**	**$4.00**	**$400**

	Bundle Economics		
	US Multi-channel HH* (mm)	Estimated Price/ Month	Telcos/ Satellite/ Cable Per Month
Viacom subscriber fees at "bulk rates"*			
1 Comedy Central	98	$0.30	$29
2 Nickelodeon	100	$0.30	$30
3 MTV	99	$0.30	$30
4 MTV2	77	$0.25	$19
5 VH1	98	$0.20	$20
6 VH1 Classic	56	$0.20	$11
7 BET	90	$0.17	$15
8 BET J	34	$0.15	$5
9 Logo	45	$0.15	$7
10 Spike	99	$0.15	$15
11 Nick@Nite	100	$0.10	$10
12 TeenNick	69	$0.10	$7
13 Nick Jr	71	$0.10	$7
14 TV Land	97	$0.15	$15
15 CMT	90	$0.15	$13
16 Nicktoons	55	$0.15	$8
17 VIVA	75	$0.15	$11
18 TMF	10	$0.15	$2
19 Palladia	20	$0.10	$2
Total Viacom		**$3.32**	**$256**
Lifetime and A&E Television Networks*			
1 Lifetime	99	$0.15	$15
2 Lifetime Movie	72	$0.15	$11
3 Lifetime Real	14	$0.15	$2
4 A&E Network	99	$0.20	$20
5 The History Channel	98	$0.20	$20
6 Biography Channel	55	$0.10	$6
7 History International	54	$0.10	$5
8 Crime/Investigation	20	$0.10	$2
Lifetime + A&E		**$1.15**	**$80**

*Bulk is the lowest rate because the distributor is required to carry the channel on the expanded tier (100mm households).
Source: Company documents, Needham & Company research-2009 data.

Source, Needham & Company, LLC research, 2009 data.

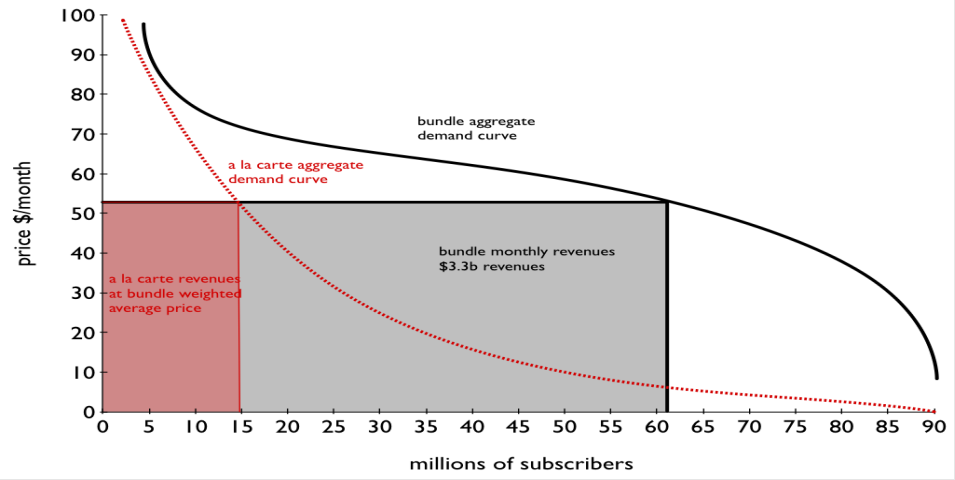
Consumer Bundles

There are typically only three bundles offered to consumers (basic, expanded basic and premium), because this maximizes advertising revenue to the content owners and minimizes the complexity of consumer choice. The three-bundle structure pushes out and "flattens" the demand curve in the TV ecosystem. As Hulu, Netflix, Roku, AppleTV, GoogleTV, Intel, etc. create products and services with a better price/value ratio for consumers, the demand curve should begin to chip away at the edge of the stair-step and move toward a steeper demand curve, closing the gap between the two demand curves shown in Figure 12.

Market Cap at Risk

The public companies in the TV ecosystem have approximately $400 billion of investable equities. Figure 12 shows a "normalized" demand curve (dotted line) which would survive in an a la carte or prolific "over-the-top" world, compared with the current demand curve (thick black line) for the TV ecosystem. The small shaded area represents the economics that would be captured in an a la carte world, and the large grey shaded box is the economics at risk through unbundling. According to FCC numbers, approximately three-quarters of the total economics of the TV ecosystem would be lost through unbundling. This mirrors the market capitalization at risk, implying $300 billion of market capitalization downside.

Value at Risk Through Unbundling — *Figure 12*



Sources: FCC, NCTA, Dr. Scott Wallsten, Needham & Company, LLC research.

Unbundling destroys value within the TV ecosystem in three primary ways:

- Subscription revenue would decline by about 15-20%, according to our research;
- Advertising revenue would fall by about 75%, as there are 14-16 minutes of advertising per hour on TV compared with 4 minutes per hour on the web; and
- If content companies deliver content directly to consumers, they must incur customer service costs, which we estimate at $50 per customer per year, or $5 billion nationally. These costs would be duplicative of costs already incurred by distributors and therefore NPV negative to the TV ecosystem.

Investment Recommendations

Our top stock picks from this work are CBS and AOL.

CBS (CBS, Buy, Target Price $40)

Hits have more value in the digital world and cost more to create. We believe that the TV broadcasters such as CBS, ABC, Fox and NBC are most likely to produce the type of hit content that is becoming more valuable as audiences fracture. CBS is the highest-quality, pure-play premium TV content creator. We also like CBS owing to its:

- **Outstanding Strategic Position.** CBS is the #1 TV network and has been for much of the past decade. CBS airs and owns the copyright for many current top-ten TV shows, as well as owning an enormous library of old TV series.
- **New Revenue Streams.** We believe that CBS has $3 billion of potential new revenue streams over the next 4 years.
- **New Digital Devices** drive value for CBS. New devices (tablets, iPads) and platforms (Netflix, Amazon, etc.) require CBS's hit TV content, both old and current.
- **Political.** Political ad spending on TV in 2012 is estimated to be $4 billion, up 50% vs. 2010 levels. The bulk of political ad spending is spent on local TV stations. CBS is the largest owner of TV stations in the U.S, reaching 40% of total U.S. households.
- **International Upside.** CBS's content generated $1.1 billion of international revenue in 2011, growing at double-digit rates. International syndication lowers CBS's dependence on advertising.

Risks to our target price for CBS include economic weakness, an advertising recession, ratings weakness, unbundling of the TV ecosystem, and greater competition from digital alternatives.

AOL (AOL, Buy, Target Price $31)

AOL is one of the leaders at creating the parallel Internet video ecosystem. We commend AOL's deal with Michael Eisner to produce TV-quality storytelling directly for the Internet. We like the fact that AOL is creating a broad range of premium video content and is organizing it into 14 channels. This eases consumer discovery. We believe this parallel Internet video ecosystem will be successful over time, and AOL is among the best positioned to benefit from this transition. Other positives include:

1. **Project Devil.** The largest branded advertisers spend billions of dollars every year in TV, radio, magazine and newspaper advertising creating price-premium brands. The discounting focus of the Internet has kept these largest advertisers away. AOL has targeted branded advertisers that do NOT want to introduce themselves to their next client via a discount. AOL's "Project Devil" commands a $30 CPM (our estimate) compared with a more typical $1 CPM across the Internet.
2. **Patch.** About 80% of total household spending is done within 12 miles of home. "Patch" is AOL's local initiative which offers investors the chance to participate in the growth of local advertising as it moves online. We believe that Patch commands a $50 CPM and that Patch markets are profitable within 12 months. We think the upside from local advertising revenue could be enormous.
3. **Subscription.** AOL's access revenue declines are moderating, providing more FCF (i.e., higher ROICs) than are built into Wall Street's models.
4. **Return of Capital.** AOL has enough tax shelters to protect 100% of the $1 billion sale price of AOL's patents to Microsoft. In addition, AOL has committed to distribute this $10 per share to shareholders this year, via either share buybacks or a dividend.

Risks to our target price for AOL include rising employee turnover, contracting access revenue, the inability to turn around fallen Internet angels (it's never been done) and economic cyclicality.

ANALYST CERTIFICATION

I, Laura Martin, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject company (ies) and its (their) securities. I also certify that I have not been, am not, and will not be receiving direct or indirect compensation in exchange for expressing the specific recommendation(s) in this report.

ANALYST CERTIFICATION

I, Dan Medina, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject company (ies) and its (their) securities. I also certify that I have not been, am not, and will not be receiving direct or indirect compensation in exchange for expressing the specific recommendation(s) in this report.

Companies mentioned in this report under coverage by Needham & Company, LLC:

Company	Symbol	Closing Price 6/20/2012	Rating	Disclosures
AOL	AOL	$26.51	Buy	B
Apple	AAPL	585.74	Buy	A, B, G
CBS	CBS	32.02	Buy	B
Discovery Communications	DISCA	52.52	Hold	B, G
Facebook	FB	31.60	Buy	B, G
Google	GOOG	577.51	Buy	B, G
Intel	INTC	27.64	Hold	B, C, D, G, J
Netflix	NFLX	68.16	Underperform	B, G
NewsCorp	NWSA	20.48	Hold	B, G
Nielsen	NLSN	27.77	Hold	B
Scripps Networks Interactive	SNI	56.82	Buy	B
Time Warner	TWX	37.13	Hold	B
Time Warner Cable	TWC	79.46	Buy	B
Viacom	VIAB	48.40	Buy	B, G
Walt Disney	DIS	47.73	Hold	B
Yahoo!	YHOO	15.74	Buy	B, G

Thomas A. Maloney, CFA	Director, Equity Research	(212) 705-0366

CLEAN TECHNOLOGY & INDUSTRIAL GROWTH

Sean K. F. Hannan	Electronic Manufacturing Services, Electronic Components & Smart Grid	(617) 457-0906
Michael Lew	Energy Efficiency	(212) 705-0383
Y. Edwin Mok	Solar Photovoltaics, LED & Lighting	(415) 262-4896
James Ricchiuti	Display, Vision & Imaging Technologies; Industrial Technology	(212) 705-0381

COMMUNICATIONS & ENTERPRISE INFRASTRUCTURE

Glenn Hanus	Enterprise Storage/Datacenter Technology	(212) 705-0361
Steven Zaccone	Research Associate	(212) 705-0286
Alex Henderson	Networking & Optical Equipment	(212) 705-0432
Richard J. Kugele	Disk Drives & IT Distribution/IT Hardware & Software	(617) 457-0908
Anjaneya Singh	Research Associate	(617) 457-0914
Richard F. Valera	Communications Infrastructure	(212) 705-0373

HEALTHCARE

Alan Carr, Ph.D.	Biotechnology	(212) 705-0435
Mark Vignola	Research Associate	(212) 705-0405
Dalton L. Chandler	Medical Technology	(212) 705-0315
Chad Messer, Ph.D.	Biotechnology	(212) 705-0317
Elliot Wilbur, CFA	Specialty Pharmaceuticals	(212) 705-0333
Serge Belanger	Research Associate	(212) 705-0407

INTERNET, ENTERTAINMENT & CONSUMER

Laura Martin, CFA	Entertainment & Internet	(917) 373-3066
Dan Medina	Research Analyst	(212) 705-0295
Sean McGowan	Leisure, Retail & Digital Gaming	(212) 705-0466
Fred Wightman	Research Associate	(212) 705-0480
Kerry Rice	Internet & Digital Media	(415) 262-4890
Charles R. Wolf	Digital Lifestyle	(212) 705-0447

SEMICONDUCTORS & SEMICONDUCTOR EQUIPMENT

N. Quinn Bolton, CFA	Communication ICs & Consumer Semiconductors	(212) 705-0322
Vernon P. Essi, Jr.	Analog & Mixed Signal Semiconductors	(617) 457-0948
Rajvindra S. Gill	Consumer Semiconductors	(212) 705-0355
Y. Edwin Mok	Semiconductor Capital Equipment	(415) 262-4896

SOFTWARE

Michael Huang	SaaS/Application Software	(415) 262-4898
Mayank Tandon	Business Services & Financial Technology	(617) 457-0943
Elizabeth Colley	Research Associate	(617) 457-0925
Richard F. Valera	Electronic Design Automation	(212) 705-0373
Scott Zeller	Enterprise Software	(617) 457-0903

Lawrence Tarantino	Managing Editor	(212) 705-0402
Willie Johnson	Graphic Design/Publishing	(212) 705-0285

	% of companies under coverage with this rating	% for which investment banking services have been provided for in the past 12 months
Strong Buy	6	0
Buy	59	14
Hold	33	5
Underperform	1	0
Rating Suspended	<1	0
Restricted	0	0
Under Review	0	0

Needham & Company, LLC (the Firm) employs a rating system based on the following (Effective July 1, 2003):

Strong Buy: A security, which at the time the rating is instituted, indicates an expectation of a total return of at least 25% over the next 12 months.

Buy: A security, which at the time the rating is instituted, indicates an expectation of a total return between 10% and 25% over the next 12 months.

Hold: A security, which at the time the rating is instituted, indicates an expectation of a total return of +/-10% over the next 12 months.

Underperform: A security, which at the time the rating is instituted, indicates an expectation that the price will depreciate by more than 10% over the next 12 months.

Under Review: Stocks may be placed UR by the analyst, indicating that the stock rating and/or price target are subject to possible change in the near term, usually in response to an event that may effect the investment case or valuation.

Rating Suspended: Needham & Company, LLC has suspended the rating and/or price target, if any, for this stock, because there is not a sufficient fundamental basis for determining a rating or price target. The previous rating and price target, if any, are no longer in effect and should not be relied upon.

Restricted: Needham & Company, LLC policy and/or applicable law and regulations preclude certain types of communications, including an investment recommendation, during the course of Needham & Company, LLC's engagement in an investment banking transaction and in certain other circumstances.

For disclosure purposes (in accordance with FINRA requirements), we note that our Strong Buy and Buy ratings most closely correspond to a "Buy" recommendation. When combined, 65% of companies under coverage would have a "Buy" rating and 15% have had investment banking services provided within the past 12 months; Hold mostly correspond to a "Hold/Neutral" recommendation; while our Underperform rating closely corresponds to the Sell recommendation required by the FINRA.

Our rating system attempts to incorporate industry, company and/or overall market risk and volatility. Consequently, at any given point in time, our investment rating on a stock and its implied price appreciation may not correspond to the stated 12-month price target. For valuation methods used to determine our price targets and risks related to our price targets, please contact your Needham & Company, LLC salesperson for a copy of the most recent research report on the company you are interested in.

To review our rating system prior to July 1, 2003 please refer to http://clients.needhamco.com/Research/Documents/DisclosureLegend2.pdf

Stock price charts and rating histories for companies under coverage and discussed in this report are available at http://www.needhamco.com/. You may also request this information by writing to: Needham & Co., LLC, 445 Park Ave., 3rd Floor (Attn: Compliance/Research), NY, NY 10022.

ANALYST CERTIFICATION

By issuing this research report, each Needham & Company, LLC analyst and associate whose name appears within this report hereby certifies that (i) the recommendations and opinions expressed in the research report accurately reflect the research analyst's and associate's personal views about any and all of the subject securities or issuers discussed herein and (ii) no part of the research analyst's or associate's compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst or associate in the research report.

The following disclosures (as listed by letter on the cover page) apply to the securities discussed in this research report:

"A" The research analyst and/or research associate (or household member) has a financial interest in the securities of the covered company (i.e., a long position consisting of common stock).

"B" The research analyst and research associate have received compensation based upon various factors, including quality of research, investor client feedback, and the Firm's overall revenues, which includes investment banking revenues.

"C" The Firm has managed or co-managed a public offering of securities for the subject company in the past 12 months.

"D" The Firm and/or its affiliate have received compensation for investment banking services from the subject company in the past 12 months.

"E" The Firm and/or its affiliate expect to receive or intend to seek compensation for investment banking services from the subject company in the next three months.

"F" The analyst or a member of the analyst's household serves as officer, director or advisory board member of the covered company.

"G" The Firm, at the time of publication, makes a market in the subject company.

"H" The Firm and/or its affiliates beneficially own 1% or more of any class of common equity securities of the subject company.

"I" The analyst has received compensation from the subject company in the last 12 months.

"J" The subject company currently is or during the 12-month period preceding the date of distribution of this research report was a client of the Firm and received investment banking services.

"J1" The subject company currently is or during the 12-month period preceding the date of distribution of this research report was a client of the Firm and received non-investment banking securities related services.

"J2" The subject company currently is or during the 12-month period preceding the date of distribution of this research report was a client of the Firm and received non-securities related services.

"K" Our affiliate has received compensation for products and services other than investment banking services from the subject company in the past 12 months.

Needham & Company, LLC

Laura Martin, CFA
Managing Director, Needham & Company, LLC
Senior Analyst: Entertainment & Internet

Laura Martin received her BA from Stanford and her MBA from Harvard Business School. She also holds a Chartered Financial Analyst (CFA) designation. Martin began her career at Drexel Burnham Lambert in media investment banking. After the Drexel bankruptcy, she moved to Capital Research & Management as a media analyst where she advised $100 billion and managed a $500 million portfolio of media stocks. She moved to Credit Suisse First Boston in 1994 as the senior media analyst publishing research on the largest U.S. entertainment and cable companies. She was nationally ranked by *Institutional Investor* magazine each year between 1999 and 2001. In 2002, Martin moved to Paris to become EVP of Financial Strategy and Investor Relations for Vivendi Universal. In 2004, she founded Media Metrics, LLC publishing equity research on the largest entertainment, cable and Internet stocks in the U.S., where she was nationally ranked as "Best of the Independent Research Boutiques" by *Institutional Investor* for many years. In 2009, Martin moved to Needham & Company, LLC, where she publishes research on the largest Internet, entertainment, and cable companies. Martin also provides speaking, expert witness, and valuation consulting services through Capital Knowledge (www.CapKnowledge.com).

Dan Medina
Entertainment & Internet

Dan Medina received his AB from Harvard College and his MBA from Harvard Business School. Medina began his career in New York as an investment banker with Salomon Brothers, Inc. He then moved to the investment banking department of Bear, Stearns & Co., in LA. In 1992, Medina began working in the business development and corporate advisory groups within the Bank of Tokyo at its U.S. subsidiary, Union Bank of California. In 1996, he moved to Avco Financial Services to become head of acquisitions and divestitures for North and South America. In 2000, Medina founded Capital Knowledge, LLC (www.CapKnowledge.com), a financial consulting firm providing expert witness testimony, capital markets advice, and valuation services to senior management teams. In 2009, Medina moved to Needham & Company, LLC, where he publishes research on the largest Internet, entertainment and cable companies.

445 PARK AVENUE
NEW YORK, NY 10022
TEL: (212) 371-8300
FAX: (212) 371-8415

3000 SAND HILL ROAD
BUILDING 1
MENLO PARK, CA 94025
TEL: (650) 854-9111

ONE FEDERAL STREET
BOSTON, MA 02110
TEL: (617) 457-0910

100 SPEAR STREET
SAN FRANCISCO, CA 94105
TEL: (415) 262-4860

www.needhamco.com