

# **Pay TV is Not Dead!**

## **Myth Busting 101: It's (NOT) Inferior to OTT Cost and Value Experience**

A Technical Paper prepared for SCTE/ISBE by

**Charles Cheevers**  
CTO Customer Premises Solutions  
ARRIS  
3871 Lakefield Drive  
Suwanee, GA 30024  
678-473-8507  
Charles.Cheevers@arris.com

**Michael McCluskey**  
VP Product Management  
Espial  
200 Elgin St #1000, Ottawa, ON K2P 1L5, Canada  
mmcluskey@espial.com

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## Introduction

There is not a week that goes by without a member of the media commenting on the way that consumers are consuming video content. Much of this discussion is around the threat to the Pay TV industry, changing viewing habits of consumers, and the increase in choice at different cost points. This threat is defined as coming from several areas:

- The rise of Over-the-Top (OTT) video sources and the potential for choice
- Use of the retail set-top box (STB), Smart TV, and other OTT video source and subscription based services
- Cord Shaving from Pay TV and using OTT sources
- Desire for à la carte video of OTT video services, applications and content
- Overall cost of video entertainment and the growing subscriber pushback on video costs
- New non-linear viewing experiences like time shifted content, binge viewing, and follow me video services
- The quality of the video package and relative value for money against other options
- Re-defining Pay TV to include paid for streaming services and ‘skinny bundles’

Change is certainly happening within many facets of traditional video delivery and video content and consumption. However, this paper will review what is actually happening and which changes are potentially disrupting the Pay TV industry. We will explore how the Pay TV industry is best positioned to still be the aggregation point for the home video experience.

Consumers are always looking for ways to save money. They are much more likely to cord shave if, and only if, the overall Pay TV package is not good enough. It is this “not good enough” equation that this paper will explore to ensure that all the must have factors of the Pay TV package are not only present but strengthened going forward. This “total package” will keep consumers happy (or at least not wanting to change) with their overall home video entertainment experience.

How much is good enough to circumvent the desire for lower cost for all home services? This paper will propose suggestions for the strategy to retain and potentially grow the subscribers for Pay TV services. It will show that this strategy revolves around 5 key tenets and in particular the control point the STB gives the MSO to effect these tenets.

This paper has several sections that explore the following simple 5-point formula for winning the home HDMI input battle as illustrated in Figure 1 below.



**Figure 1 - The Simple 4 Keys to the Pay TV Consumer Retention Experience**

Re-enforcing this simple strategy will be analyzing the following key tenets:

- (i) Operator supplied STB device to own the quality of the pixels on the TV screen
- (ii) Focus on in home Wi-Fi distribution for video with operator controlled quality end points
- (iii) Focus on the key user experience (UX) elements of the video experience
- (iv) Integration of key OTT sources into the overall Pay TV service package
- (v) Addition of new services on the TV experience, as part of the Pay TV experience
  - a. In particular, leveraging the TV for new services such as
    - i. Health
    - ii. Energy Management
    - iii. Self Help
    - iv. Education
    - v. Smart Home, Security, and Privacy
    - vi. Aging in Place

Now, read on and explore the following sections in this paper, showing the template for continued success in the Pay TV experience. The paper will first explore the current drivers and satisfaction levels of the Pay TV services available as well as the Cord Shavers OTT packages. It will do this through a combination of public information from providers and analysts and also from an ARRIS and Espial Pay TV and Cord Shaving survey that was conducted for this paper to show the dynamic in the US for existing Pay TV and Cord Shaver consumers. The first sections will outline:

- Current Pay TV solutions
  - Typical Packages and Pricing
  - ARRIS Espial Feedback from Internal Survey of Pay TV consumers
  - Public Analyst commentary as correlation
- Current OTT Video solutions
  - Typical Packages and Pricing
  - ARRIS Espial Feedback from Internal Survey of Pay TV consumers
  - Public Analyst commentary as correlation

Then the paper will look at the data from over 144 thousand sampled homes on their use of the features in their Pay TV solution. This solution based on Espial Elevate solution also has Netflix integrated. It's an ideal platform to see user behavior for what is working in the combined world of Pay TV, Linear content, and the OTT source integrated.

The remainder of the paper will outline suggestions and recommendations for Multichannel Video Programming Distributors (MVPDs) to continue to provide the central entertainment experience for the customer. While cost may always be ever present, the consumer will not churn when all the other factors of user experience and new sticky services are present. If they are not present, then the lure of cheaper video entertainment and a Do It Yourself (DIY) à la carte solution may entice them off an MSO service offering. This section will outline:

- The role of Multiple System Operator (MSO) devices versus customer owned devices versus applications as part of the converged home user experience for video delivery and future other experiential services
- The video bundle and the “thousands of channels to the one you want” problem that seems to always drive the consumer to look for lower cost points for video service
- Taking control of the TV for more than just the TV show and movie experience by leveraging the largest video portal in the house for all digital home experiences and solutions

## Content

### 1. Current Pay TV solutions

Current Pay TV solutions in the USA are widely spread in cost, perceived value for money, user experience, and where they are on their journey to incorporate new OTT sources and new TV experiences.

See below for the current costs for Basic to Premium TV access from a representative group of cable and telco/satellite providers. This information is all taken from their respective websites pricing in June of 2017 and is subject to change.

To just buy TV service is not easy or as attractive as bundling a service with Internet and phone. However, for this introduction of the Pay TV industry to the reader, the figures below show just the cost of TV service where possible for the new subscriber. Some of the offers include features like Digital Video Recorder (DVR) and associated access to streaming services. However, this paper is not focused on trying to define a single value for money estimate.

#### 1.1. Comcast TV Packages

Comcast services for TV range from \$31/pm for Basic Cable TV service to \$109/pm for premium channels like HBO, Cinemax, etc.

One of Comcast's most popular TV + Internet service is the 220+ Channel for TV with additional 75 Mbps broadband service.

Comcast also includes a bundle for Cord Shavers with 300 Mbps Broadband and access to Basic Cable TV with inclusion of HBO package for both TV and streaming.

## 1.2. Altice

Altice/Optimum TV services range from \$64.95 to \$109.95 as illustrated below with Value TV up to Gold TV packages available.

## 1.3. Charter

Charters has a \$59.99 TV service for over 110+ channels including DVR support to 4 TVs.

## 1.4. DIRECTV

DIRECTV has new TV packages ranging from \$50 to \$125 a month.

### 1.4.1. The 2015 FCC Report on the Cost and Channels Available to the US Consumer

The FCC released its yearly report “Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment” in October 2016. It outlines the costs of Basic, Expanded, and the most popular packages as well as Customer Premises Equipment (CPE) costs for 2015. The report also included some competitive analysis for the cable industry, Direct Broadcast Satellite (DBS) providers, and wireless offerings in 2015. With the increase in unlimited data packages and streaming packages from DIRECTV the wireless number is growing faster from the 2015 analysis.

Figure 2 below shows the monthly price of programming across cable and satellite services were an average of \$23.79 for Basic Cable to an average of \$81.75 to the most popular Extended Cable package. That package was also similar with DBS competition average prices. In 2015, the average increase of Cable TV service was about 2.45% over the previous year.

Cable Service	Overall Average	Non-competitive	Effective Competition	Effective Competition Subgroups				
				Second Cable Operator Overbuild Subgroup			DBS	Wireless / Low Penetration
				Incumbent	Rival	Both		
Basic service	\$23.79	\$24.55	\$22.96	\$21.43	\$20.06	\$21.24	\$23.29	\$25.57
Annual change	2.3%	2.5%	2.2%	4.3%	3.3%	4.1%	1.6%	2.2%
Expanded basic	\$69.03	\$67.85	\$70.31	\$69.46	\$74.05	\$70.11	\$70.41	\$69.97
Annual change	2.7%*	3.3%*	2.0%*	3.2%*	10.3%*	4.2%*	1.3%	1.8%
Next most popular	\$81.75	\$81.86	\$81.64	\$78.85	\$86.80	\$79.97	\$82.15	\$82.27
Annual change	2.2%*	2.8%*	1.5%	3.1%*	7.5%*	3.8%*	0.8%	2.0%

Sources: Attachment 2. \* Annual change is statistically significant at the 95% confidence level. Expanded basic prices include basic service prices, and next most popular service prices include expanded basic prices.

**Figure 2 - Monthly Price of Programming in the US - 2015**

Figure 3 below shows the average price per channel in 2015, which overall has continued to decrease as more channels are added. The number of channels raises a lot of discussion amongst consumers as they typically tend to cluster on about 15 channels (ARRIS numbers & Nielsen show about 17 channels) per household for most of their viewing.

Cable Service	Overall Average	Non-competitive	Effective Competition	Effective Competition Subgroups				
				Second Cable Operator Overbuild Subgroup			DBS	Wireless / Low Penetration
				Incumbent	Rival	Both		
Basic service	\$0.602	\$0.682	\$0.516	\$0.447	\$0.698	\$0.483	\$0.519	\$0.596
Annual change	-2.4%	-1.3%	-3.9%	-0.7%	6.1%	0.8%	-5.3%	-3.9%
Expanded basic	\$0.456	\$0.497	\$0.412	\$0.400	\$0.475	\$0.411	\$0.412	\$0.419
Annual change	-1.8%	-0.6%	-3.3%	-2.4%	3.3%	-1.5%	-3.7%	-4.3%
Next most popular	\$0.359	\$0.392	\$0.326	\$0.328	\$0.351	\$0.331	\$0.323	\$0.339
Annual change	-2.3%	-1.0%	-4.1%	-0.7%	4.7%	0.1%	-5.4%	-4.6%

Source: Attachment 4. Annual change is statistically significant at the 95% confidence level. Price per channel is the service price divided by the number of viewable channels with that service. Expanded basic prices include basic prices, and prices of the next most popular service include expanded basic prices. Similarly, expanded basic channels include basic channels, and next most popular service channels include expanded basic channels.

**Figure 3 - Average Price Per Channel in January of 2015**

Figure 4 below shows the 2005-2015 cost of each service and the 10-year compound average rate of change of the cable TV bill is 5.2%. In comparison, the CPI (Consumer Price Index) compounded annual change over the same period was 2.5%. Thus, the consumer feels their cost of TV has increased in cost at 2x+ the rate of other essential consumer products and services. This perception is the basis of much of the Cord Shaver momentum and the cost dissatisfaction amongst existing Pay TV consumers.

Year	Basic Service Price	Expanded Basic Service			Next Most Popular Service and Equipment	CPI Index	
		Price	Channels	Price per Channel		All Items	Cable
2005	\$14.30	\$43.04	70.5	\$0.620	\$56.03	127.2	169.6
2006	\$14.59	\$45.26	71.0	\$0.650	\$59.09	132.2	174.4
2007	\$15.33	\$47.27	72.6	\$0.670	\$60.27	135.0	179.0
2008	\$16.11	\$49.65	72.8	\$0.680	\$63.66	140.8	183.9
2009	\$17.65	\$52.37	78.2	\$0.710	\$67.92	140.8	186.5
2010	\$17.93	\$54.44	117.0	\$0.560	\$71.39	144.5	191.9
2011	\$19.33	\$57.46	124.2	\$0.569	\$75.37	146.9	192.0
2012	\$20.55	\$61.63	149.9	\$0.505	\$78.91	151.2	199.8
2013	\$22.63	\$64.41	159.6	\$0.484	\$81.64	153.6	206.5
2014	\$22.78	\$66.61	167.3	\$0.496	\$84.65	156.0	212.0
2015	\$23.79	\$69.03	181.3	\$0.456	\$86.83	155.8	216.4
<b>Compound Average Annual Rate of Change</b>							
<b>5-year average</b>	5.8%	4.9%	9.2%	-4.0%	4.0%	1.5%	2.4%
<b>10-year average</b>	5.2%	4.8%	7.1%	-1.4%	4.5%	2.0%	2.5%

Source: 2005-2015 surveys. See Attachment 7 for references. Attachment 7 also shows the series back to 1995.

**Figure 4 - 5-10 Year Change in the Pay TV Monthly Bill**

The number of channels available in the 3 service tiers has also continued to rise (Figure 5) with the range of increase being 3.2% to 3.9% in added channels, tracking about 2-3 additional channels at the basic tier, and to 8-9 additional at higher tiers. Adding more channels does not necessarily add value for a lot of Pay TV subscribers, and particularly the OTT Cord Shavers, as they believe they need more à la carte services.

Cable Service	Overall Average	Non-competitive	Effective Competition	Effective Competition Subgroups				
				Second Cable Operator Overbuild Subgroup			DBS	Wireless / Low Penetration
				Incumbent	Rival	Both		
<b>Basic service</b> Annual change	<b>58.8</b> 4.9%*	<b>54.3</b> 5.1%	<b>63.7</b> 4.7%	<b>72.3</b> 6.1%	<b>51.0</b> 2.6%	<b>69.3</b> 5.6%	<b>62.4</b> 4.1%	<b>58.0</b> 7.6%
<b>Expanded basic</b> Annual change	<b>181.3</b> 4.4%*	<b>169.4</b> 4.7%*	<b>194.0</b> 4.1%*	<b>199.8</b> 5.8%	<b>191.0</b> 6.7%	<b>198.6</b> 5.9%*	<b>193.3</b> 3.2%	<b>186.4</b> 6.7%
<b>Next most popular</b> Annual change	<b>264.4</b> 3.2%*	<b>248.6</b> 3.8%*	<b>280.4</b> 2.7%	<b>281.1</b> 3.9%	<b>291.3</b> 2.3%	<b>282.5</b> 3.9%	<b>280.3</b> 2.0%	<b>274.5</b> 6.3%

Source: Attachment 6. \* Change is statistically significant at the 95% confidence level. Table refers to viewable channels offered with the service at no extra charge including those requiring equipment to view. Expanded basic channels include basic channels; next most popular service channels include the expanded basic channels.

**Figure 5 - Increase in the Number of Channels Added to a Pay TV Package Annually**

Within the Basic Tier Cable TV service, the composition of programs is typically similar for Cable, DBS, and Wireless with around 58-69 channels, because the majority are broadcast or other channels.

Video Channel Category	Overall Average	Non-competitive	Effective Competition	Effective Competition Subgroups				
				Second Cable Operator Overbuild Subgroup			DBS	Wireless / Low Penetration
				Incumbent	Rival	Both		
Broadcast	33.6	30.2	37.3	40.3	36.6	39.8	36.8	33.4
PEG	3.4	3.3	3.5	4.1	3.4	4.0	3.4	2.9
Leased access	1.0	0.9	1.2	1.1	0.7	1.0	1.2	1.9
Regional sports	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other channels	20.7	19.8	21.6	26.7	10.2	24.4	20.9	19.7
<b>Total</b>	<b>58.8</b>	<b>54.3</b>	<b>63.7</b>	<b>72.3</b>	<b>51.0</b>	<b>69.3</b>	<b>62.4</b>	<b>58.0</b>

Source: 2015 Survey. By individual channel (standard definition, high definition, and multicast).

**Figure 6 - Channel Composition across Cable and DBS**

Both sports and news channels account for a lot of the thinking around the need for Pay TV and linear viewing. The number of sports networks channels is about 3.4 in the Expanded Basic service with 4.2 in the next most popular tier.

Table 7 Regional Sports Networks By Status of Effective Competition January 1, 2015								
Cable Service	Overall Average	Non-competitive	Effective Competition	Effective Competition Subgroups				
				Second Cable Operator Overbuild Subgroup			DBS	Wireless / Low Penetration
				Incumbent	Rival	Both		
Basic service	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Expanded basic	3.4	3.3	3.4	3.5	5.9	3.9	3.4	2.5
Next most popular	4.2	4.2	4.1	3.6	6.3	4.2	4.2	2.7

Source: 2015 Survey. Channels are the number of channels offered at no extra charge including those requiring equipment to view. Expanded basic channels include basic channels, and next most popular service includes expanded basic channels.

**Figure 7 - Number of Sports Channels in the Different Pay TV Tiers - 2015**

The CPE or the STB is also another discussion topic when it comes to Pay TV. The cost of leasing the device versus the typical one time purchase at retail of an OTT video device also sways opinions on the reasons to cord shave and why a Pay TV customer may not be satisfied. The average cost per month of the single leased STB was about \$8.50 in 2015. Additional costs can be incurred for additional outlet devices.

Table 8 Price for Most Commonly Leased Customer Premises Equipment January 1, 2015								
Cable Service	Overall Average	Non-competitive	Effective Competition	Effective Competition Subgroups				
				Second Cable Operator Overbuild Subgroup			DBS	Wireless / Low Penetration
				Incumbent	Rival	Both		
Basic service	\$8.40	\$8.30	\$8.49	\$8.23	\$10.10	\$8.51	\$8.51	\$8.18
Annual change	1.5%	0.7%	2.2%	6.2%	-0.9%	5.1%	0.8%	3.4%
Expanded basic service	\$8.34	\$8.17	\$8.49	\$8.23	\$10.10	\$8.52	\$8.51	\$8.18
Annual change	1.4%	0.5%	2.2%	6.2%	-0.8%	5.1%	0.8%	3.4%
Next most popular svc.	\$8.76	\$8.41	\$9.07	\$8.65	\$10.10	\$8.87	\$9.17	\$9.06
Annual change	1.3%	0.6%	1.8%	5.5%*	-0.8%	4.5%	0.7%	1.8%

Source: Attachment 5. \* Annual change is statistically significant at the 95% confidence level. These prices are for a single lease of the most commonly leased equipment and not the average charge per customer or per household, which would depend on the number and type of equipment leases.

**Figure 8 - CPE Leasing Costs for STB for Pay TV in 2015**

The final table from the 2015 FCC study of the Cable TV sector is the type of features supported by the supplied STB and the software (Figure 9). Some surprising numbers for DVR support were found. 2016 and 2017 saw increased use of DVR as part of the architectures deployed. For example, Comcast X1 and the use of the XG1 DVR gateway (GW) device with only 28% of higher tier services having DVR capability. Additionally, the number of High Definition (HD) channels featured below in each tier is a % of the overall channels offered. The Basic Tier having a higher proportion of HD Channels at 83% versus about 45% of higher tier with more channels offerings. The snapshot showed that many of the additional channels are Standard Definition (SD) only, and shows opportunity to further improve consumer viewing satisfaction with HD upgrade.

Cable Service	Feature	Overall Average	Non-competitive	Effective Competition	Effective Competition Subgroups				
					Second Cable Operator Overbuild Subgroup			DBS	Wireless/ Low Penetration
					Incumbent	Rival	Both		
Basic service	DVR	27%	20%	34%	55%	4%	48%	28%	41%
	HD	83%	80%	87%	92%	93%	92%	87%	66%
	IPG	85%	82%	88%	89%	46%	83%	90%	86%
	RCU	92%	89%	95%	92%	96%	93%	97%	95%
Expanded basic	DVR	28%	22%	34%	60%	9%	53%	27%	44%
	HD	43%	39%	47%	70%	93%	73%	39%	48%
	IPG	93%	93%	94%	93%	100	94%	94%	91%
	RCU	97%	95%	98%	97%	96%	97%	99%	100%
Next most popular	DVR	28%	23%	34%	60%	5%	52%	27%	44%
	HD	47%	42%	53%	74%	87%	76%	44%	55%
	IPG	98%	95%	100%	100%	100	100%	100	100%
	RCU	97%	94%	99%	97%	95%	97%	100	100%

Source: 2015 Survey.

**Figure 9 - Features Offered for Pay TV with the Different Tiers of Pay TV Services - 2015**

The full report from the Federal Communications Commission (FCC) for the 2015 update on the Average rates paid for Cable Programming can be found at [https://apps.fcc.gov/edocs\\_public/attachmatch/DA-16-1166A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DA-16-1166A1_Rcd.pdf)

### 1.5. Nielsen’s Q4 – 2016 Total audience report

Moving on to some of the 2016 Total audience report published by Nielsen:

<http://www.nielsen.com/us/en/insights/reports/2017/the-nielsen-total-audience-report-q4-2016.html>

It is interesting in that it shows that there is a large increase in the use of Smartphone via App or Web with more than 100% growth in the last 2 years. See Figure 10 below where in Q4 2016 consumers spent 2 hours and 16 minutes on average **per day** on their smart phone App/Web.

In the same 2 year period, linear TV viewing **per day dropped only 8 minutes**. Time shifted TV usage grew on average 2 more seconds per day to 33 minutes on average. One of the reasons is that many US homes have TVs left on for ambient noise. Additionally, there has been an 18% increase in the consumption of news from 2015 to 2016, with 44% increase in watching cable news the most significant. While consumers are doing more engagement with phones and tablets they also seem to prefer the larger screen as a bigger part of their at home entertainment. Figure 11 shows the change in consumption per specific medium from 2014 to 2016.

EXHIBIT 1 - BASED ON THE TOTAL US POPULATION

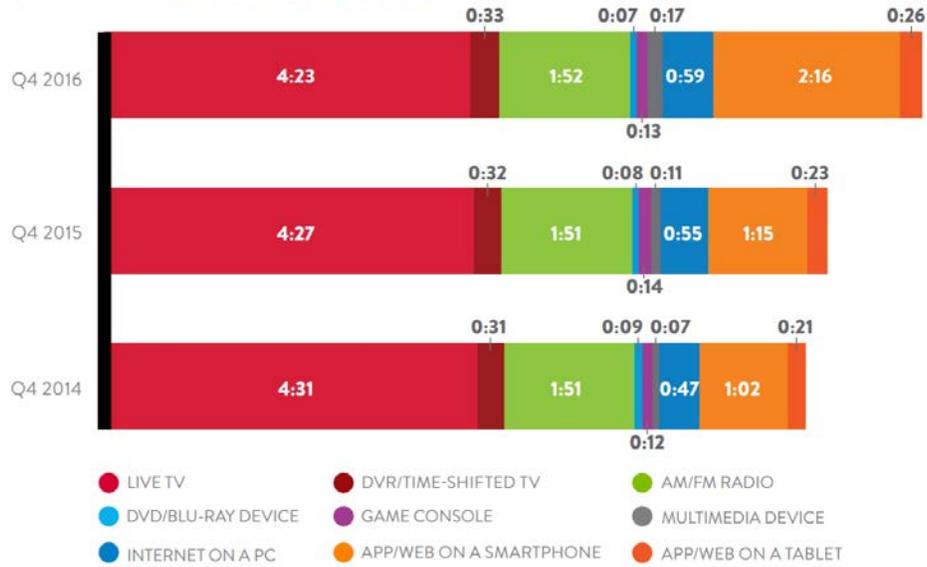


Figure 10 - Consumer Change in Device Usage Time from 2014 to 2016

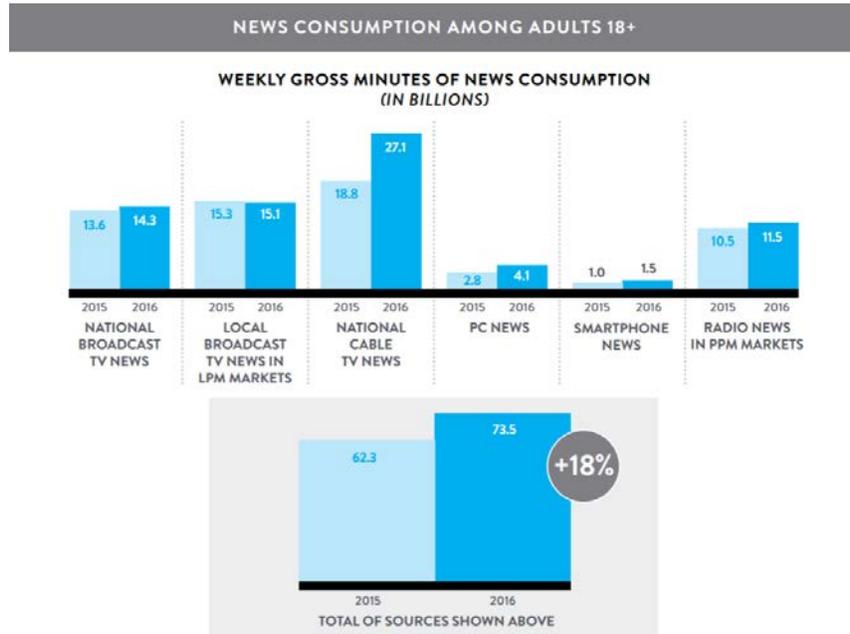
EXHIBIT 2 - BASED ON USERS OF EACH MEDIUM

	Q4 2014	Q4 2015	Q4 2016
Live+DVR/Time-shifted TV	6:39	6:45	6:24
DVR/Time-shifted TV	2:00	2:01	1:57
AM/FM Radio	2:42	2:43	2:45
DVD/Blu-Ray Device	1:42	1:41	1:51
Game Console	2:48	3:02	3:00
Multimedia Device	2:30	2:23	2:23
Internet on a PC	2:13	2:55	3:11
App/Web on a Smartphone	1:49	2:02	3:17

The data sources in Exhibit 2 should not be added or subtracted; they are based on users of each medium and the bases vary by source. Panel enhancements made in March and August 2016 impacted mobile reporting.

Figure 11 - Specific Time Spent on Each Medium from 2014 to 2016

Just like sports viewing watching the news accounts for one of the main reasons for both linear viewing and the desire for a Pay TV service. There was significant increase in watching the news from 2015 to 2016 mainly can be attributed to the US presidential election and key world events. Cable TV viewing of the news grew 44% Year-over-Year (YoY) with overall news watching growing 18% YoY.

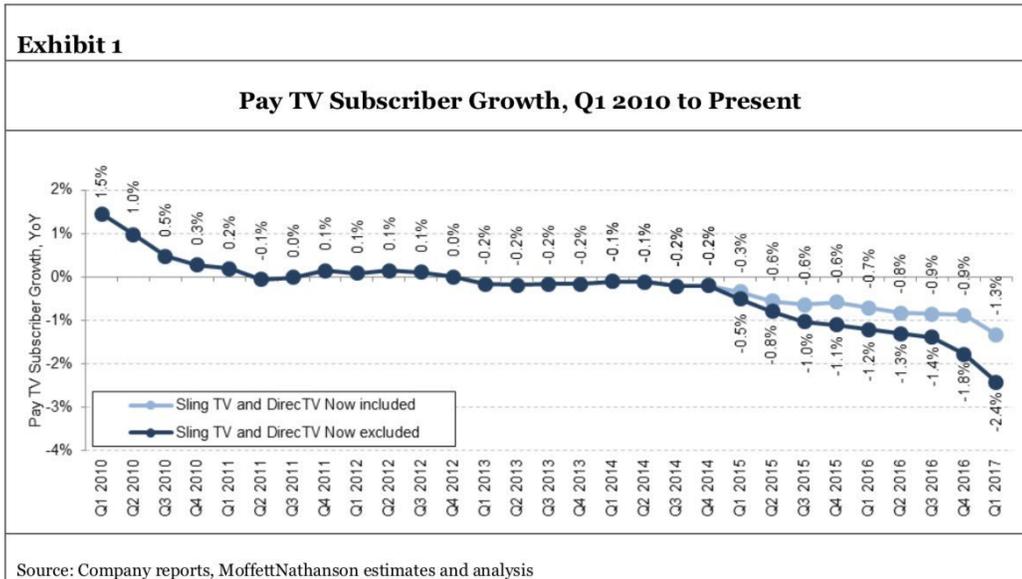


Source for analysis: National TV News (Nielsen National Television Panel, News summary type code, Broadcast - ABC, CBS, FOX, NBC, TEL, UNI; Cable - CNBC, CNN, FOXNC, MSNBC); Local TV News (Nielsen 25 LPM Markets, Local news genre, Broadcast - ABC, CBS, FOX, NBC, TEL, UNI); PC News (Netview, Current Events & Global News subcategory); Smartphone News (EMM, Current Events & Global News subcategory); Radio News (Nielsen PPM Markets, 339 News/Talk, All News and Spanish News/Talk radio stations combined, including 52 NPR affiliates). See page 34 for full sourcing.

**Figure 12 - The Rise in News Watching from 2015 to 2016**

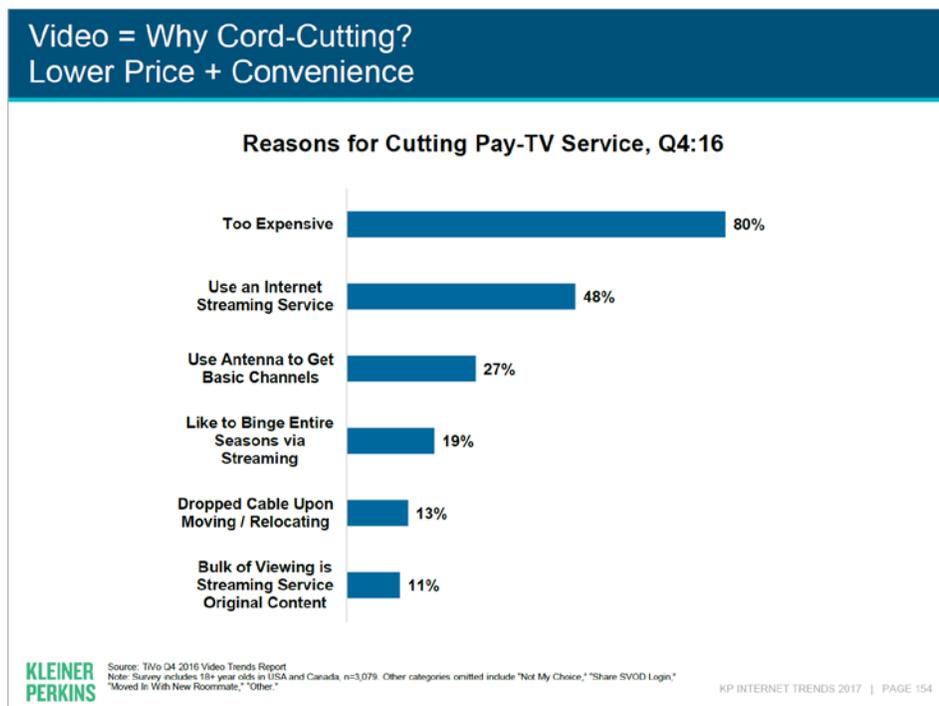
### 1.6. Some of the Analyst Commentary on the Pay TV and Cord Shaver Markets

As there is much analyst commentary on the status of Pay TV solution and the Cord Shaver market the following are some representative dialog based on analysis of Pay TV market trends. MoffettNathanson below show the decline in US Pay TV growth for the last 6 years where the industry has lost 3.9% since Q1 2010 and the trend is downwards. However, the inclusion of Pay TV streaming services like Sling TV and DIRECTV now shows that these services when included reduce the shift by over 1.1%. An additional trend that has not yet fully been realized in this analysis is the inclusion of the primary OTT sources into the traditional Pay TV experience.



**Figure 13 - MoffettNathanson Report Showing Pay TV Growth from Q1 2010 to Q2 2017**

In a report from Mary Meeker of Kleiner Perkins on Internet Trends 2016 cited the following reasons for the Cord Shavers and highlighted the sensitivity around price and the convenience factor. The first is understandable and the second is the key to target for the Pay TV provider.



**Figure 14 - Kleiner Perkins – Q4 2016 Video Trends Report**

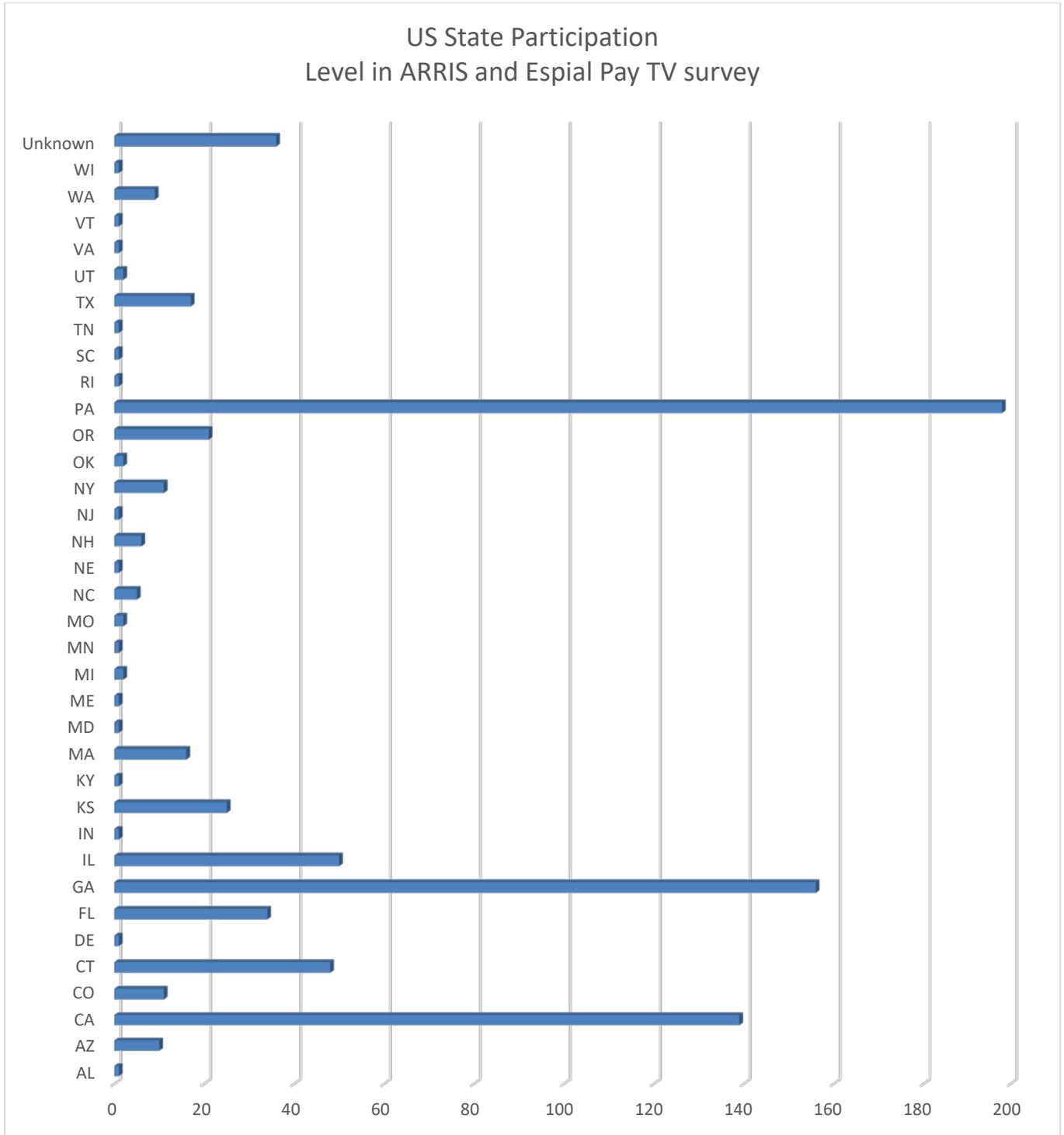
The Kleiner Perkins report showed the significance of cost in the decision process with 80% of consumers making choices with cost as the primary factor. The ability to cord shave and use an Internet Streaming service drove 48% of people to make the decision. The ability to catch both local and broadcast channels was a factor with 27% of people. A feature, which can be replicated by Pay TV solution, like bingeing full seasons of a series was a factor in 19% of people. 11% of people felt that all their viewing needs were mostly met by Streaming service original content. One surprising factor is that 13% of people will make the change when they move or relocate.

### **1.7. ARRIS Pay TV Survey Assessment**

ARRIS and Espial also conducted its own survey on nearly **900 US respondents across multiple States and job functions**. The survey showed that **78% of those surveyed had a Pay TV service and 22% did not watch TV or had shaved the cord**.

The distribution of USA respondents by state is shown below in Figure 15. Pennsylvania, California, and Georgia had the highest number of respondents to the survey. This survey was conducted in June 2017 and also included another 800 respondents in various countries across the globe.

For the US respondents the survey showed that the split was Pay TV service (78%) and those that did not (22%). This provided a good insight into the drivers, trends, and wants from each tier.



**Figure 15 - State Distribution of Respondents in ARRIS Q2 2017 Pay TV and OTT Survey**

With 78% of the respondents having a Pay TV service we first looked into this group to see the breakdown of their satisfaction, use, and wants.

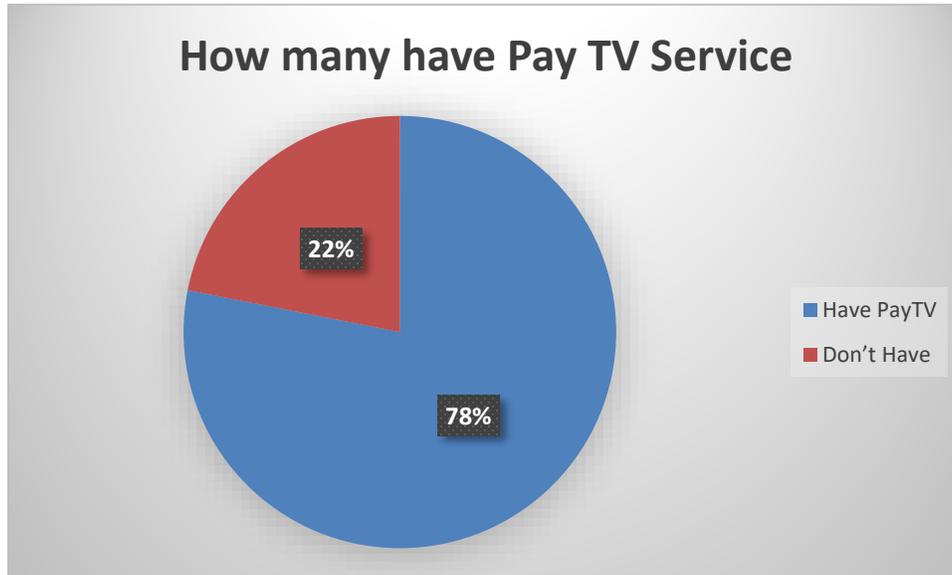


Figure 16 - Respondents Who Had Pay TV and Who Did Not Have Pay TV

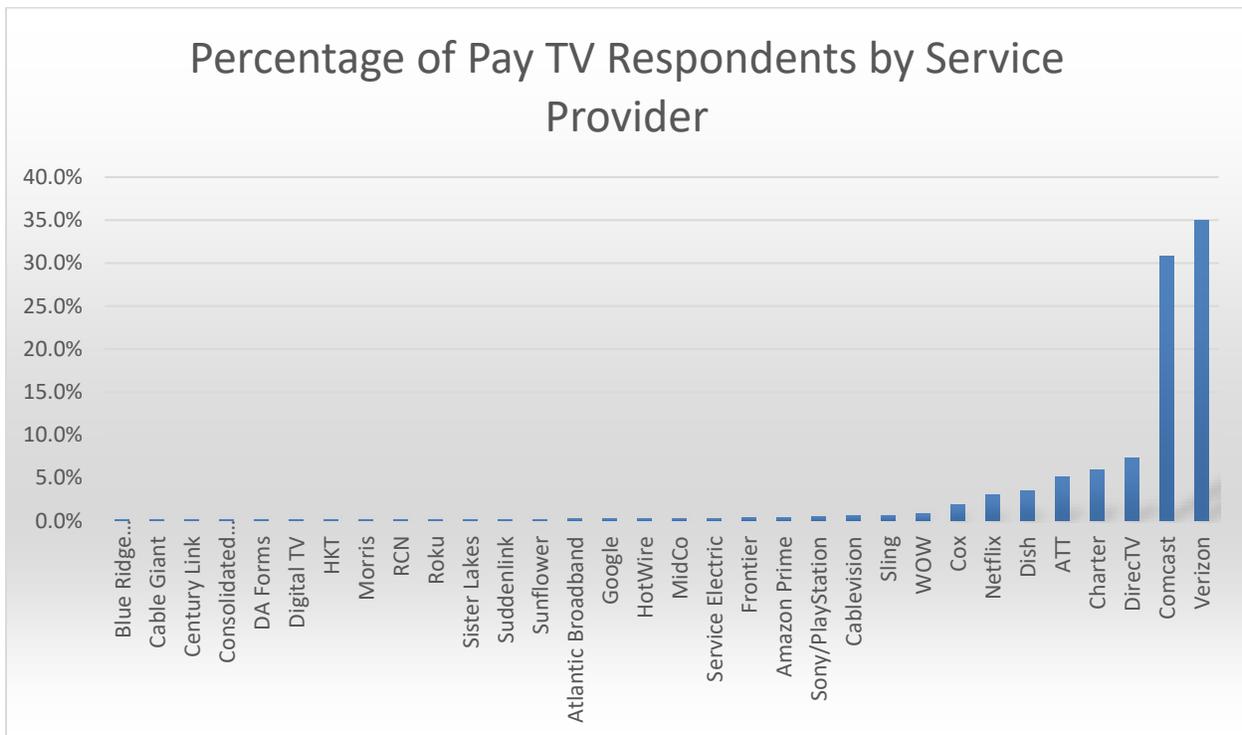
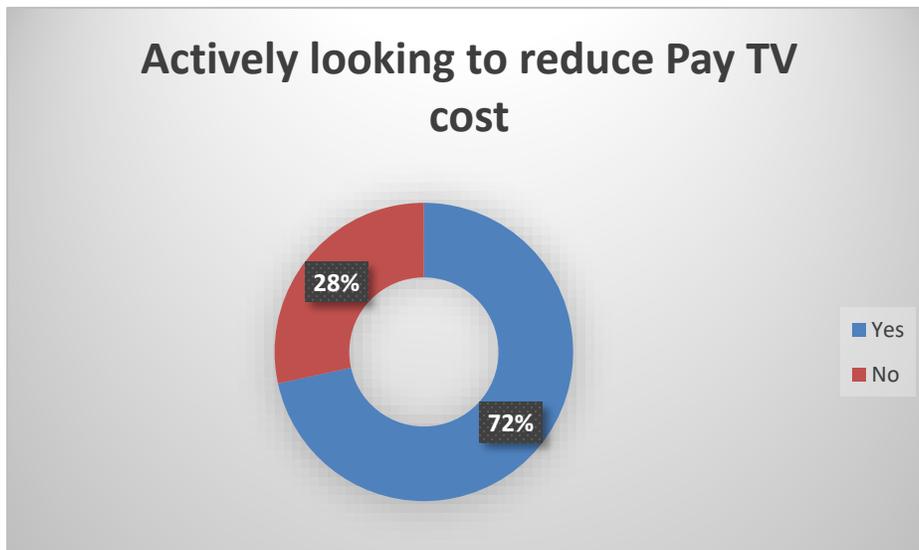


Figure 17 - Percentage of Respondents with Pay TV by Service Provider

35% of Pay TV respondents were using Verizon. Comcast was second at 31%. Respondents of AT&T and DIRECTV were recorded separately if they did not cite AT&T in their response. DIRECTV was about 7% and AT&T about 5% of overall respondents. Only a few respondents to the Pay TV section cited Netflix or Sling as their primary Pay TV service.

Of the 78% people surveyed who had a Pay TV service, the first big piece of information was that 72% of them were actively looking for or believed they wanted a reduction in their cost for Pay TV. 28% were not actively looking for a reduction in their Pay TV service.

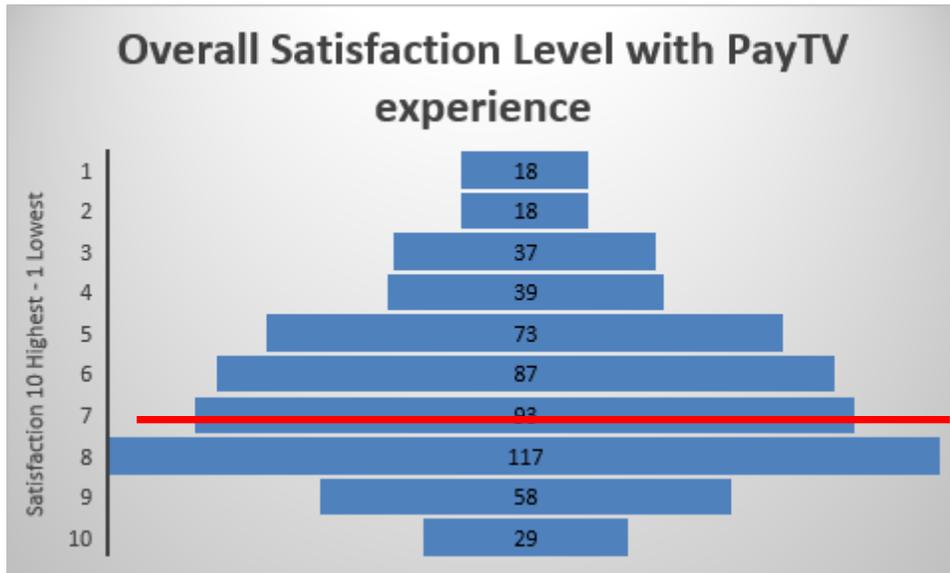
This statistic tracks the Kleiner Perkins Mary Meeker report and is generally a function of most people wanting value for money. However, with competition and choice, the number of people actively looking to reduce Pay TV at 72% shows the importance of other elements of the Pay TV and overall experience for the customer to keep them from switching.



**Figure 18 - How Many of the Survey Respondents Were Actively Looking to Reduce Their Pay TV Bill**

Let's explore the most important part of this equation, the perceived value for money versus the inertia of changing Pay TV provider versus the inertia of Cord Shaving.

The average overall satisfaction with Pay TV service was 6.3%. This incorporated both the cost and user experience. This is quite low and suggests a fundamental issue or a potential to improve with deliberate steps to focus on the value proposition for Pay TV differently.

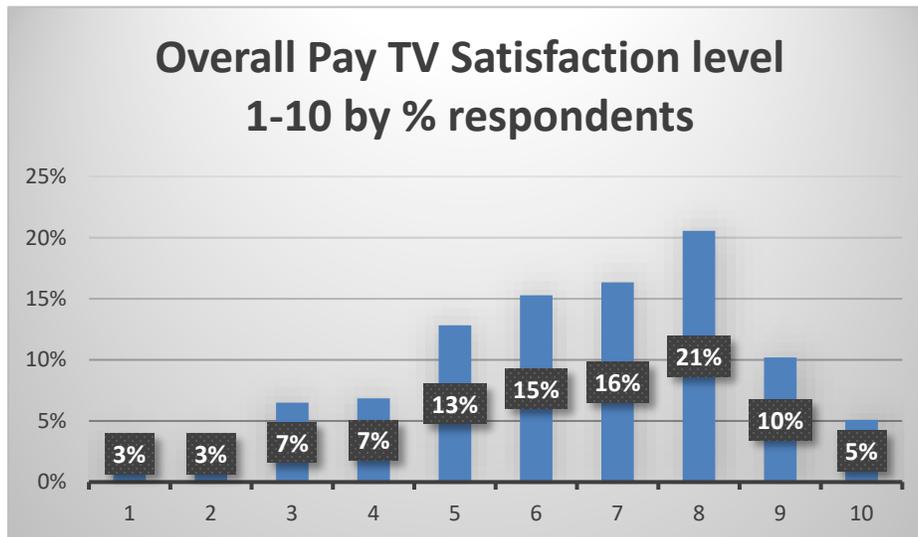


**Figure 19 - Overall Satisfaction Level with Pay TV by Number of Respondents (1-lowest 10 Highest)**

36% of respondents scored 8 or more on the 10-points satisfaction scale.:

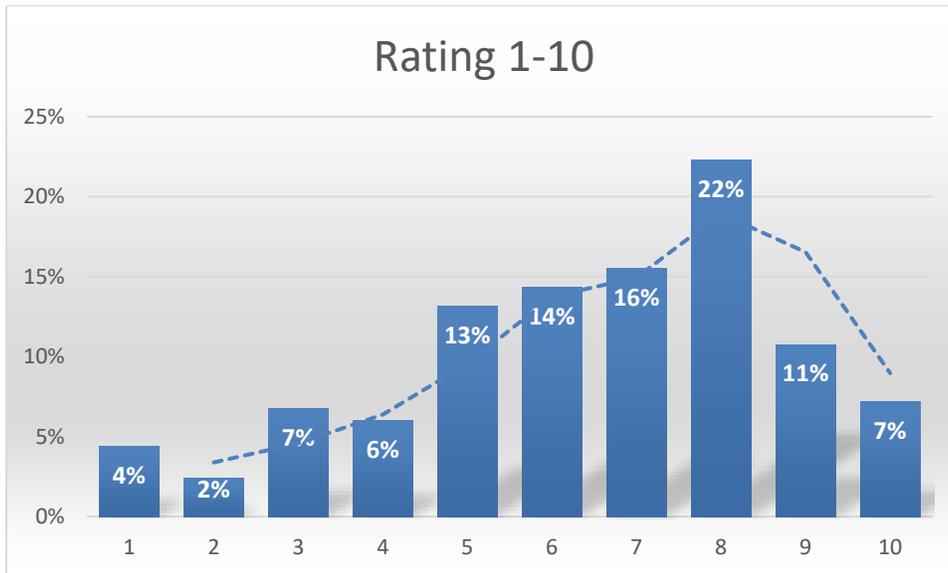
34% of respondents scored 5 to 7 on the 10-point satisfaction scale.

20% of respondents scored under 5 on the 10-point satisfaction scale.



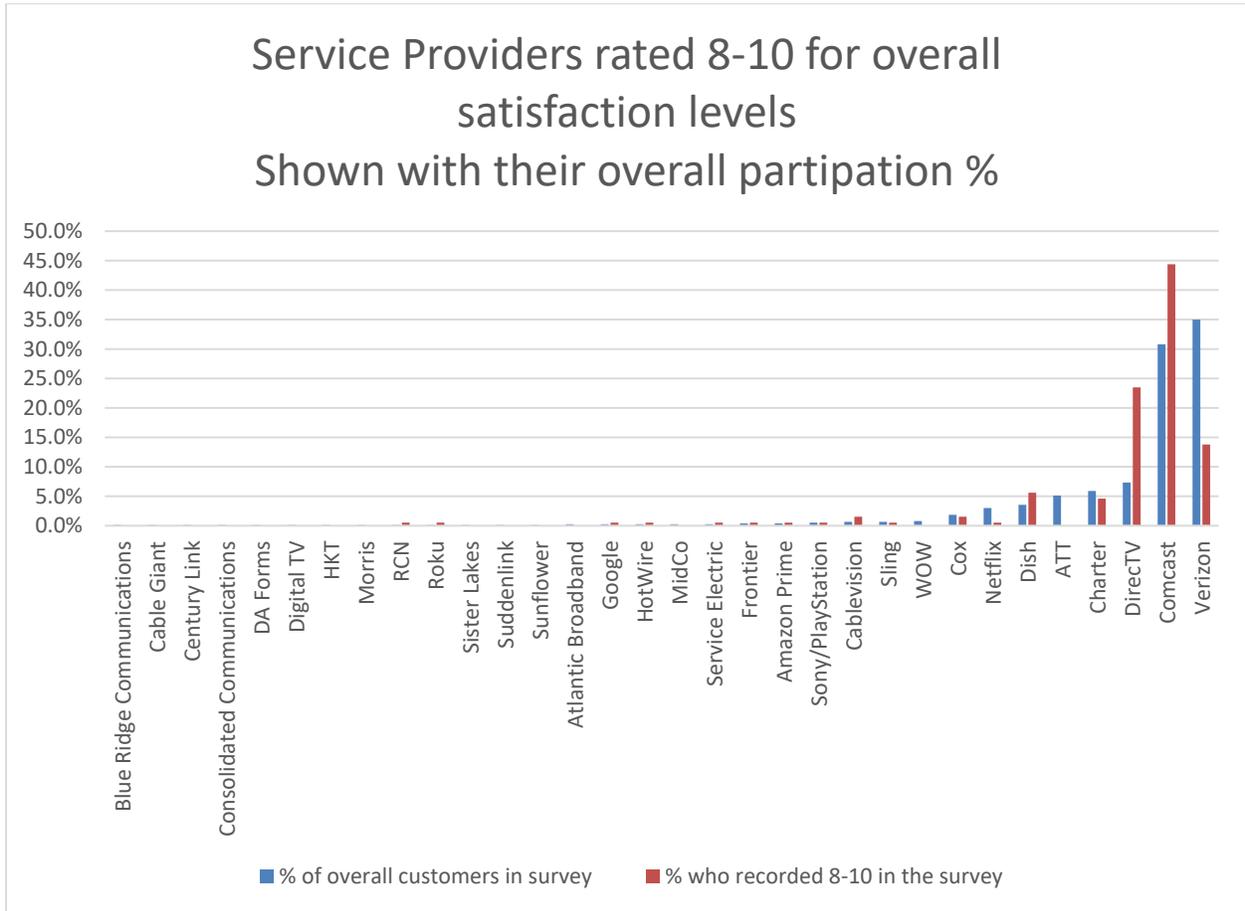
**Figure 20 - Overall Pay TV Satisfaction Level (1-10) by Overall Percentage**

Taking the example of Comcast respondents — they generally tracked to the same trend for overall satisfaction.



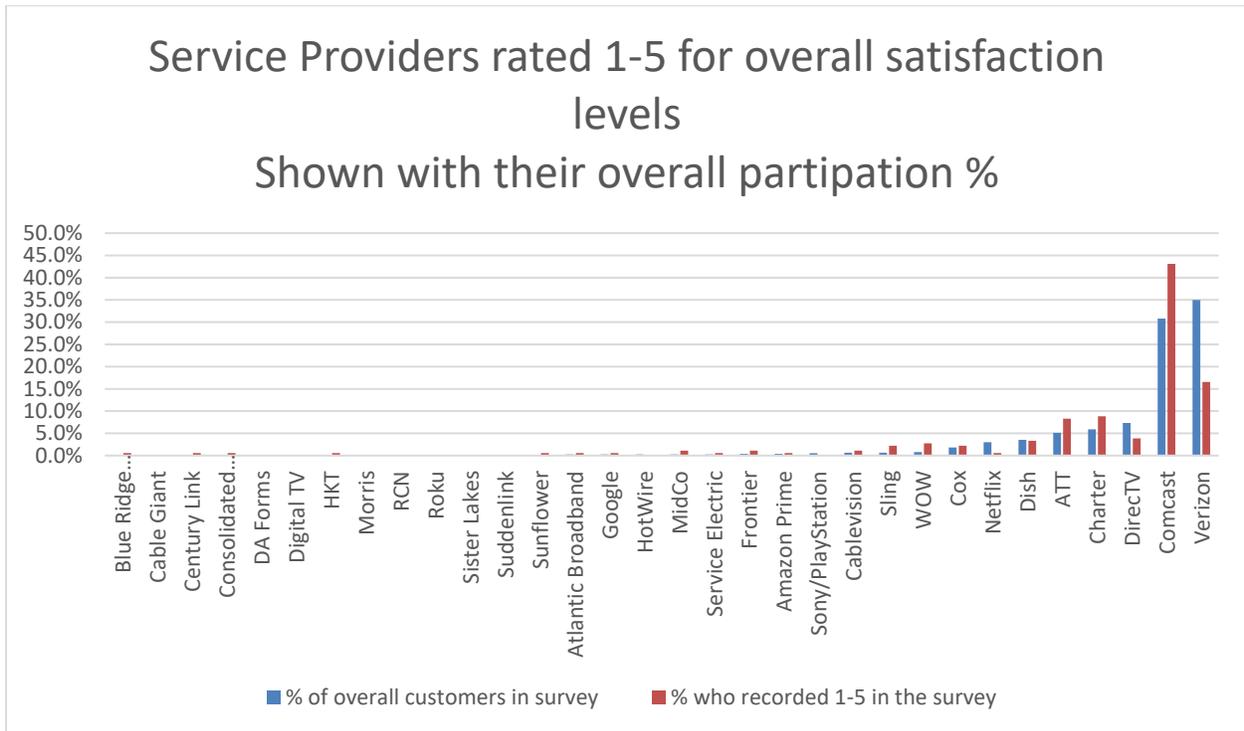
**Figure 21 - Comcast Overall 1-10 Scoring for Satisfaction Level: 1 = lowest 10 = highest**

Taking all the Service Providers who scored an 8-10 on overall survey and then showing their overall % of the 8-10 score against their overall participation level in the survey yields the chart in Figure 22 below. Comcast, DIRECTV (no AT&T), Dish, and Cablevision all scored higher percentage of 8-10 satisfaction scores than their overall participation level in the survey. Interestingly Verizon scored lower % of 8-10 scores to their participation level in the survey. There was a direct correlation between the customers scoring their Service Provider 8-10 level satisfaction and their value on integrated OTT sources as well as the UX services. Over 85% of respondents who rated their SP 8-10 commented on the importance of their OTT service integration, single High-Definition Multimedia Interface (HDMI) port and other features such as multiscreen and other device streaming services.



**Figure 22 - SP % of 8 -10 Scores Versus Their Overall Participation Level in Survey**

At the other end of the satisfaction scale from 1-5 the following was the respondent’s answers. In this case Comcast scored the most 1-5 responses and it was higher than their overall percentage of participation. Verizon had the second highest number of 1-5 responses but was at about 50% the rate of participation and DIRECTV also scored lower 1-5 rate than the participation level. See Figure 23 below. Charter and AT&T also scored higher percentage of 1-5 ratings than their participation level.

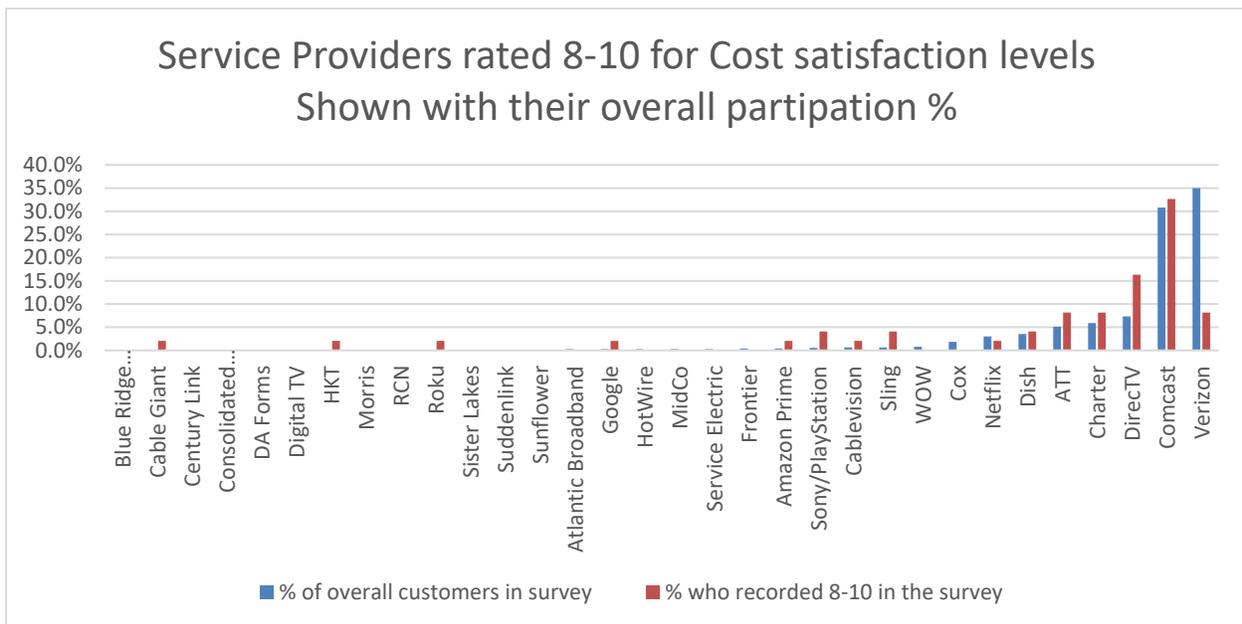


**Figure 23 - The % of 1-5 Ratings (1 Lowest Score) from The Survey Respondents Against Their Overall Survey Participation**

The overall satisfaction level for Cost of Pay TV was the lowest factor and most influential on the overall result — with just 3.9% happy with the cost of their Pay TV service.

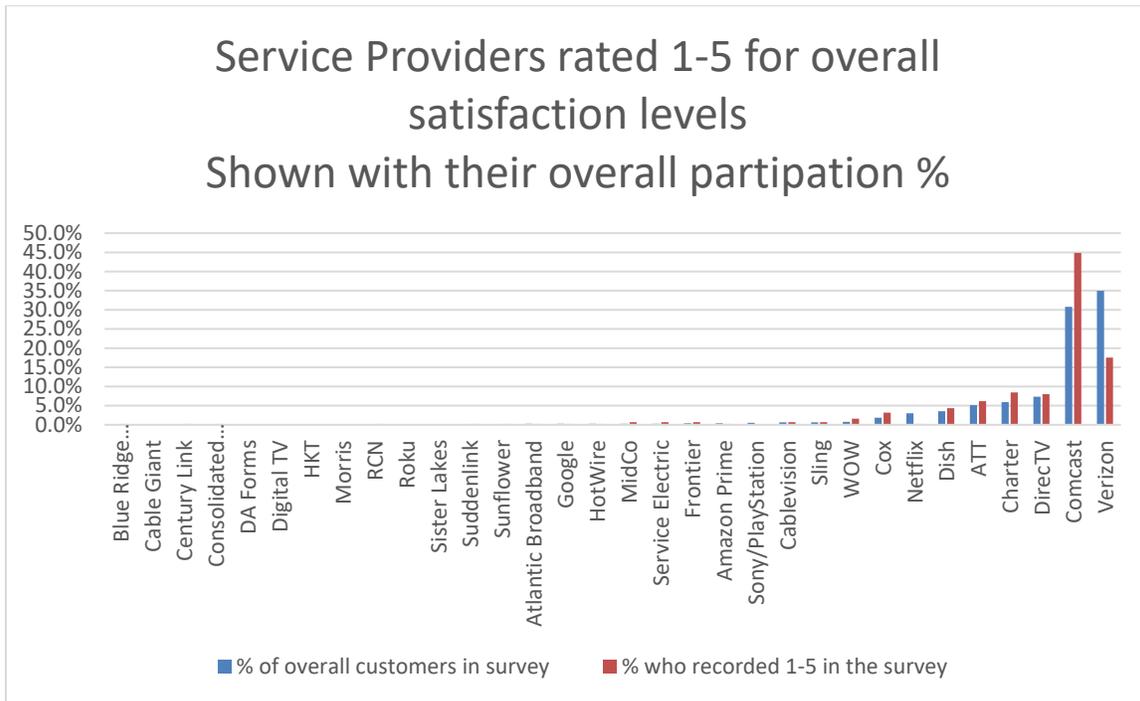


**Figure 24 - Cost Satisfaction with Pay TV Service**



**Figure 25 - Cost Satisfaction Level 8-10 by Service Provider**

As you can see above Comcast, DIRECTV, Charter, and AT&T scored higher % of 8-10 than their survey participation. Interestingly Netflix did not. Clearly respondents are already trying to get Netflix to reduce costs as well. Figure 26 below shows the lower rating levels for Cost satisfaction. In this one, only Verizon scored a lower number of 1-5 ratings to their overall participation in the survey. Comcast showed about a 50% 1-5 rating per their participation in the survey.



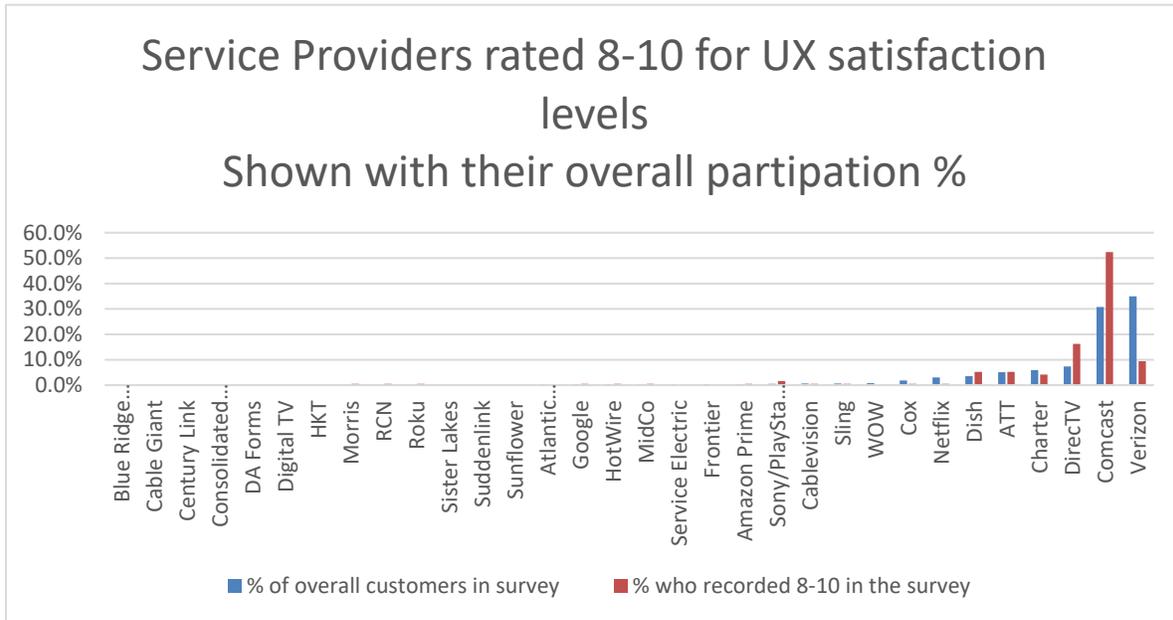
**Figure 26 - Cost Ratings 1-5 (5 Lowest Satisfaction) Against Overall Survey Participation Level**

The UX satisfaction level of the experience fared better with an overall average satisfaction level of 6.1%. This shows that there is substantial opportunity to improve this — to balance some of the dissatisfaction of cost levels for the service. Figure 27 below showed consumer’s satisfaction level with UX from 1-10.



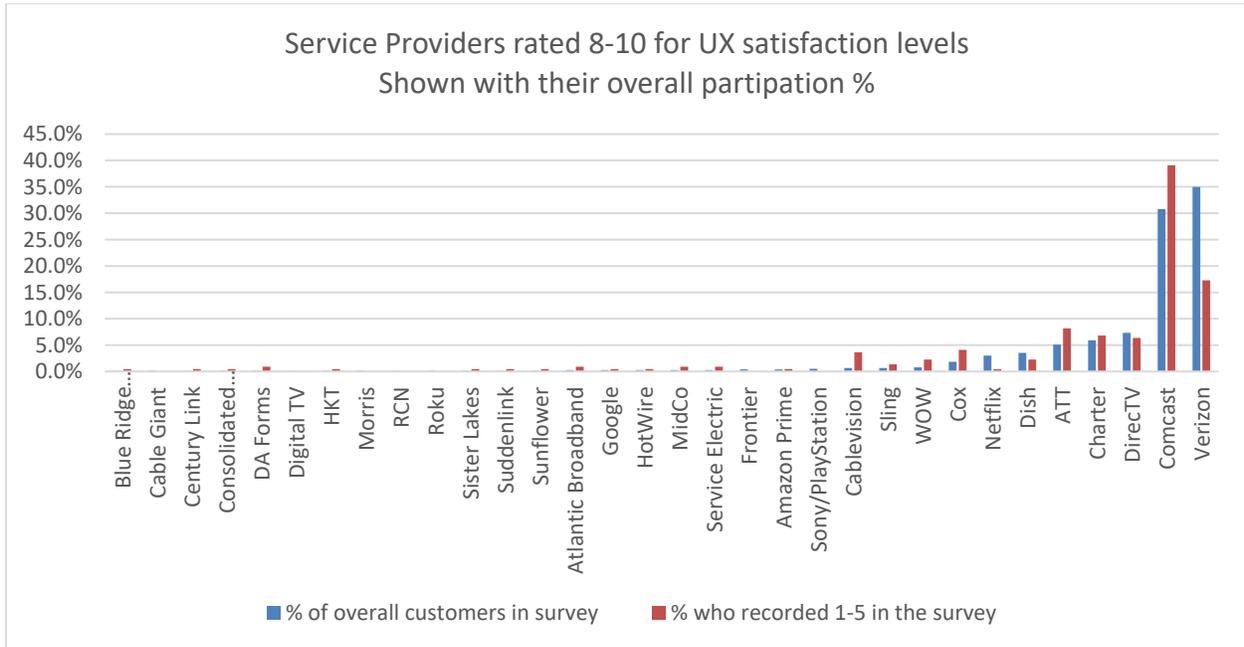
**Figure 27 - UX Satisfaction Levels - 1-10 - 1 being lowest - 10 Highest**

Comcast scored the largest number of 8-10 satisfaction ratings with over 50% more than their participation levels. DIRECTV and Dish scored higher 8-10 satisfaction levels to their participation level. Verizon had 27% 8-10 ratings of their participation level.



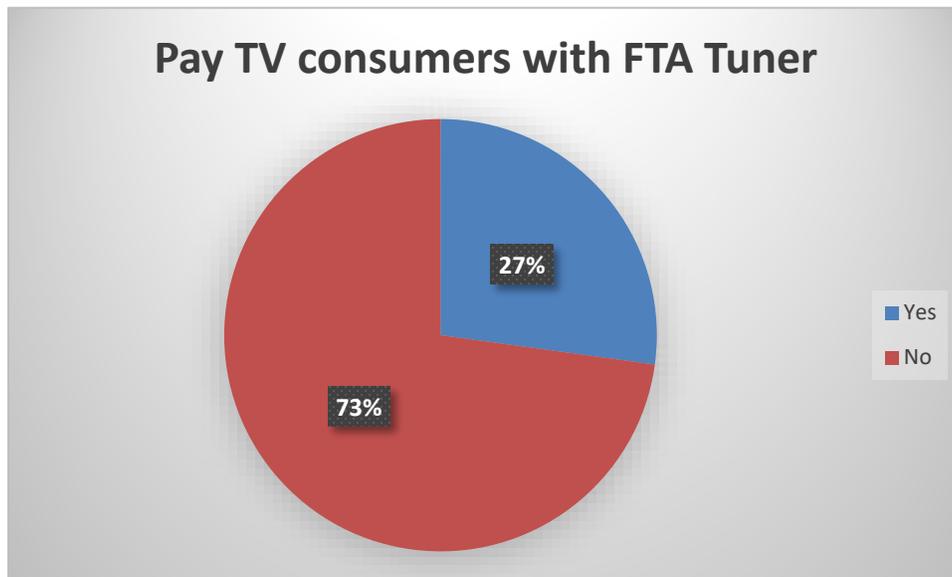
**Figure 28 - UX Satisfaction levels (8-10) 10 highest against participation levels**

Figure 29 below shows the more dissatisfied level of UX for the respondents — scores for 1-5. Verizon showed a lower number of 1-5 respondents versus their participation level — about 50% better. Comcast scored more 1-5 than their participation level. Interestingly this number is much lower when you review the data for the words XFINITY, X1 — where this is much lower. Charter, AT&T, Cox, Wow, and Cablevision all scored higher 1-5 than their participation level.



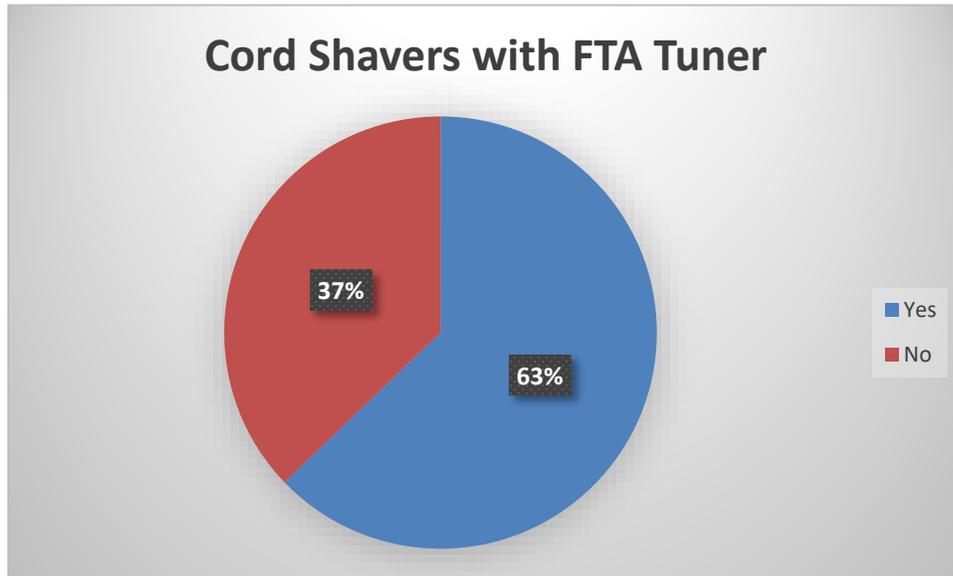
**Figure 29 - UX Satisfaction ratings (1-5) 1 worst - shown with participation level in survey**

The use of a free-to-air (FTA) tuner was also interesting in the poll of consumers. The Pay TV subscribers poll showed that 27% of Pay TV users also used FTA tuner in their home video solution — probably for additional TV outlets rarely used in the home and in conjunction with OTT only TV. Figure 30 below shows this result from survey.



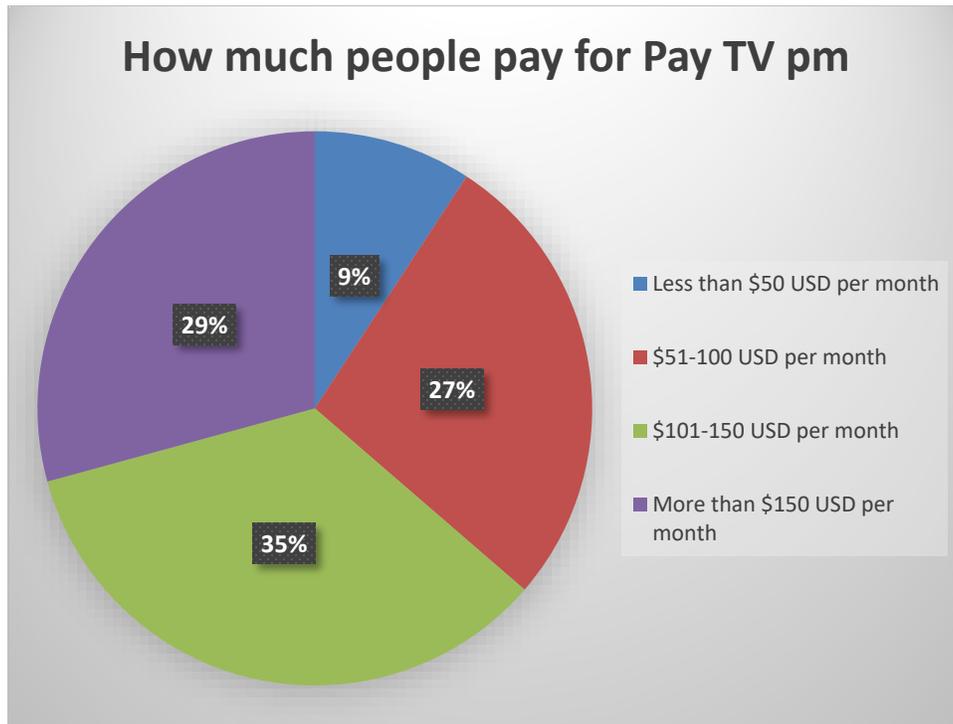
**Figure 30 - Pay TV Consumers Using FTA Tuners**

As you would expect a higher percentage 63% of Cord Shaver consumers polled were using an FTA source with their video solutions — see Figure 31.



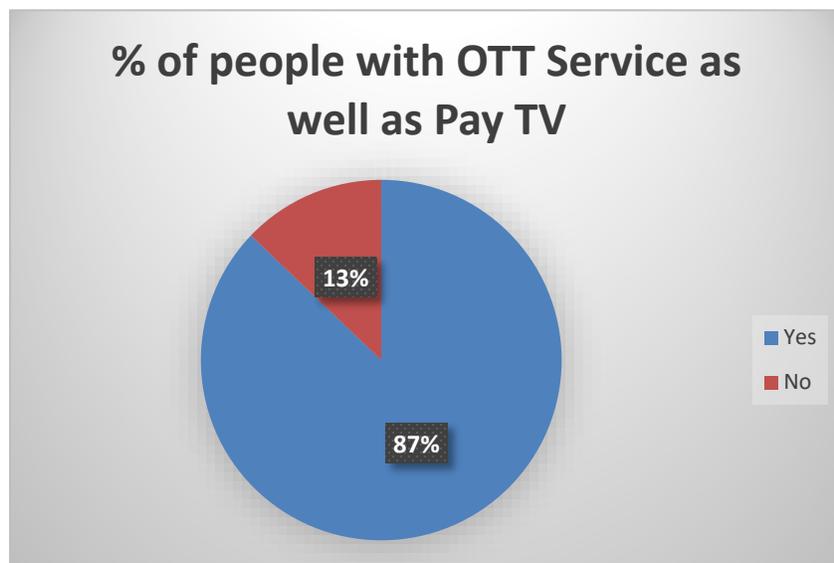
**Figure 31 - Cord Shavers using FTA Tuners**

As cost remains the main driver for decisions on what the consumer chooses for their entertainment package at home — our survey showed that the US — 65% of people are still paying above \$100 for their total TV service. We found that people included additional to their service provider provided Pay TV solution — their additional subscriptions to Netflix, Amazon, Hulu, and others — as well as including their STB and additional STB costs on a monthly basis.



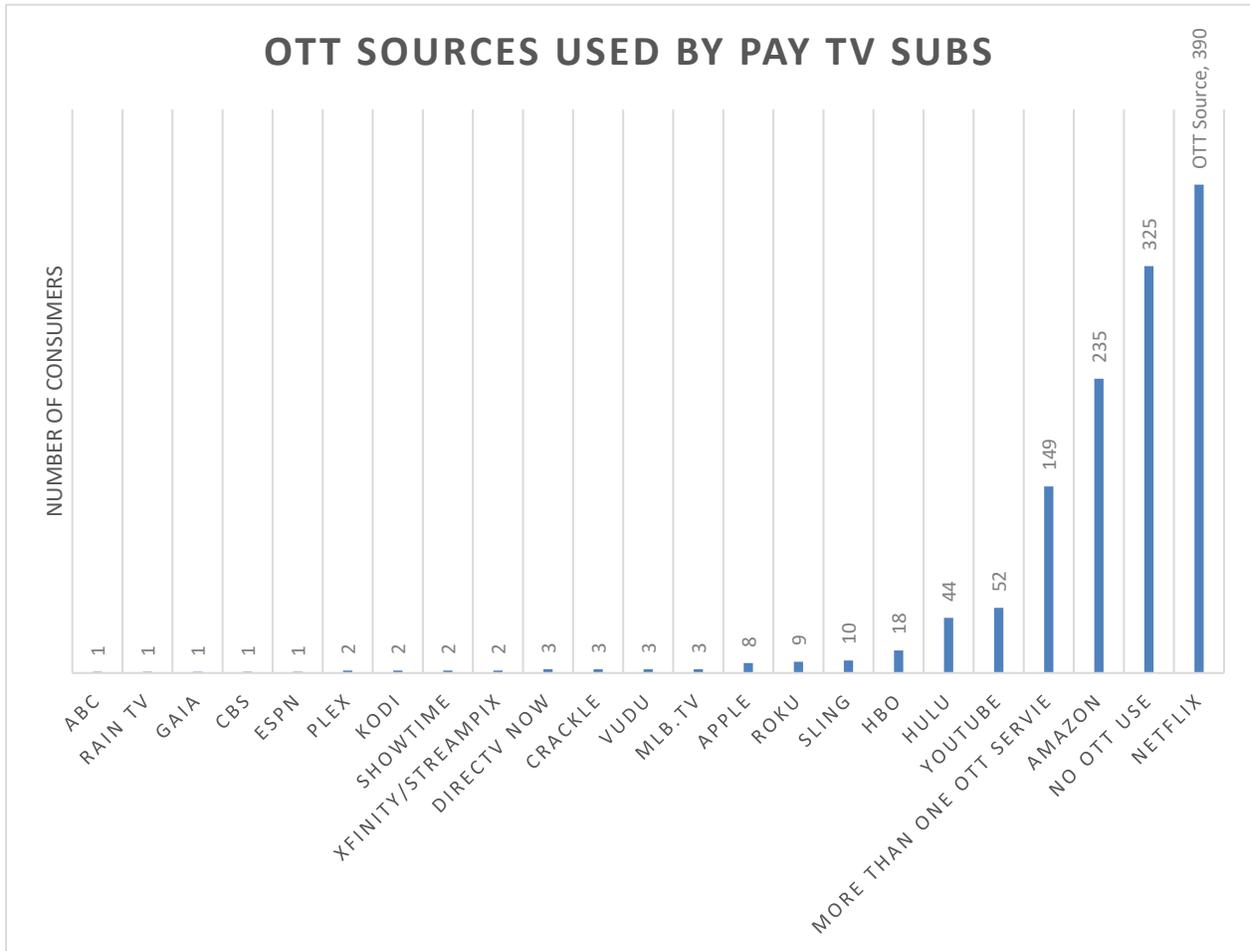
**Figure 32 - How Much are People Paying for Their Pay TV Service**

For the people with Service Provider Pay TV service over 87% of people also subscribed to an OTT service as well.



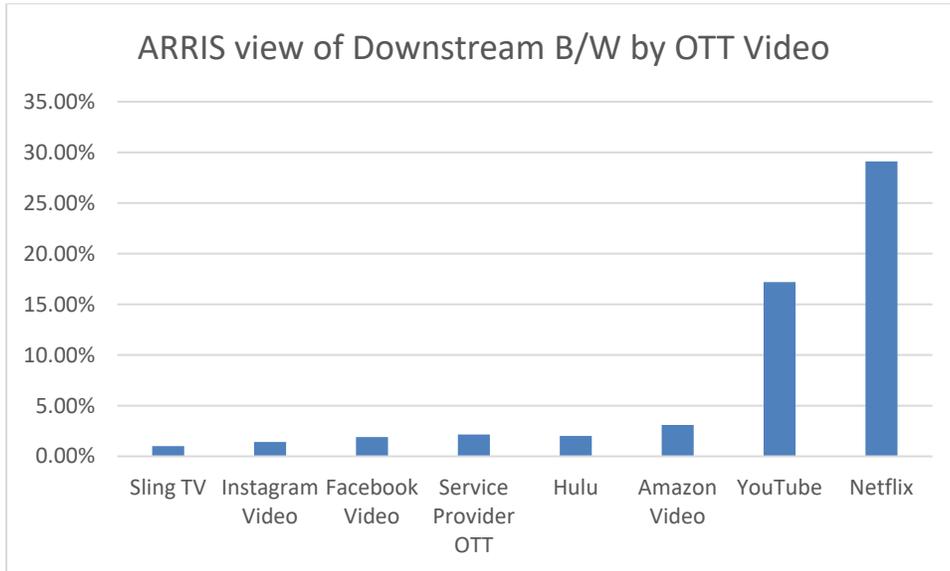
**Figure 33 - Percentage of Pay TV Consumers who also Subscribed to OTT Sources**

As with the Kleiner Perkins report — ARRIS/Espial survey showed that Netflix was the dominant OTT source. Amazon Video, YouTube/Red, and Hulu made up the top additional top 4 sources. Respondents called out Roku, Apple TV, and Sling TV specifically as their OTT service and also some respondents cited DIRECTV NOW and XFINITY Streaming/Streampix as their OTT source.



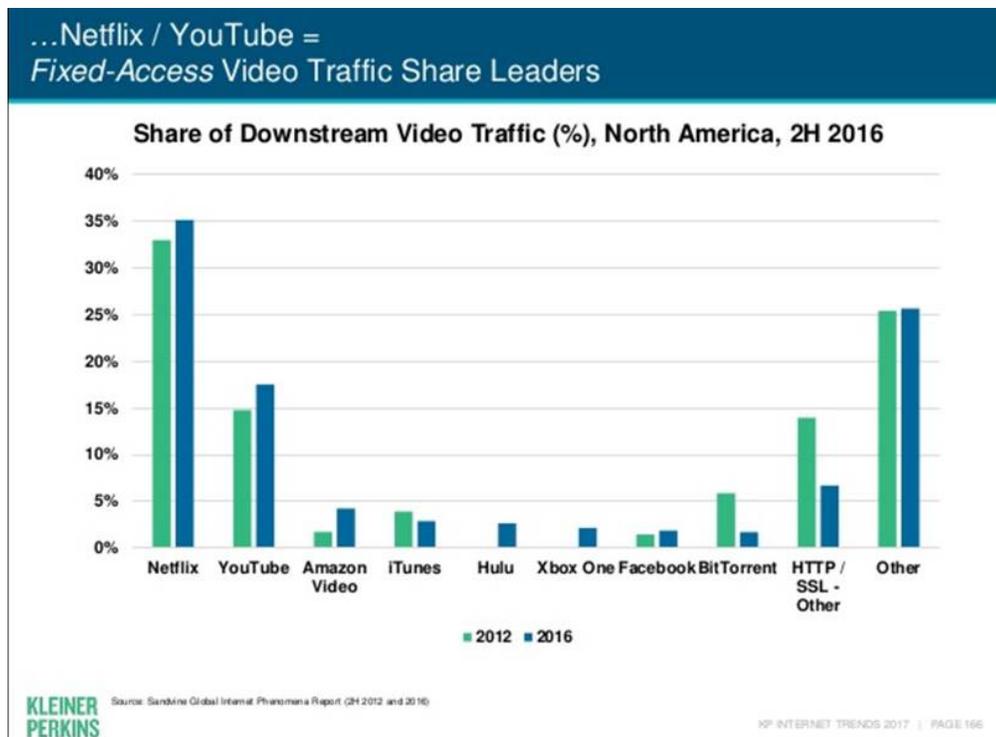
**Figure 34 - OTT Sources Used by Pay TV Subscribers**

ARRIS also independently tracks the Downstream consumption of video traffic on the Hybrid Fiber-Coax (HFC) / Data Over Cable Service Interface Specification (DOCSIS) networks of the US and the following table also tracks consistently with the Kleiner Perkins and ARRIS/Espial survey. Netflix accounting for almost 30% of Downstream video IP traffic, with YouTube at ~17% and Amazon Video at about 3% - with Hulu, Service Provider own streaming services, Sling TV, and others under 2%.



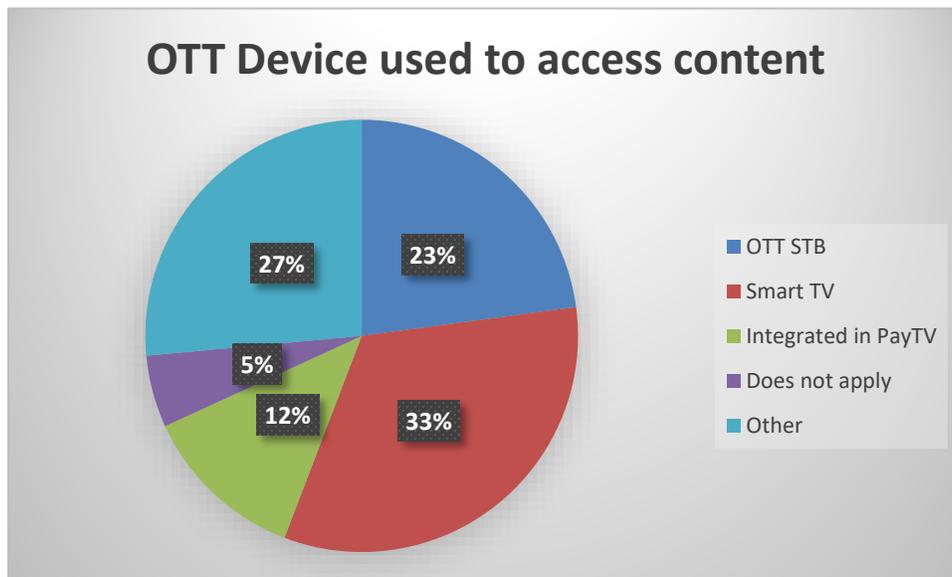
**Figure 35 - Downstream Traffic Percentage by Video OTT Source**

Kleiner Perkins — Mary Meeker Fixed Access Video Traffic Share Leaders correlates with ARRIS data and survey.



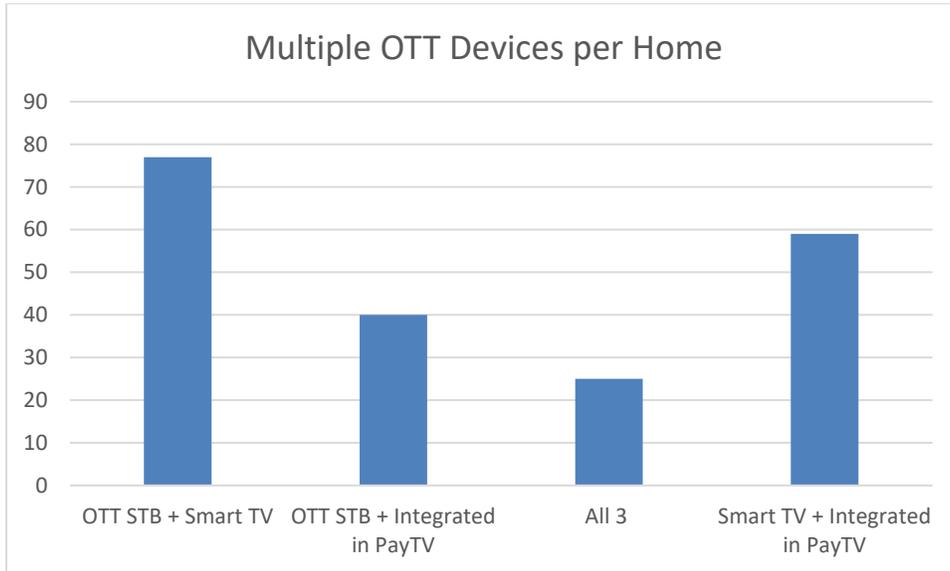
**Figure 36 - Kleiner Perkins - Share of Downstream Traffic % NA 2016**

The survey response to “What devices consumers use to access OTT content” showed that the Smart TV was most commonly used with 33% of respondents declaring it their preferred OTT device. OTT STB only accounted for 23% of respondents OTT viewing. 27% of respondents responded “other” as their answer in the survey. A subsequent check on this showed that the ‘Others’ were typically smart phones, tablets, and PCs — which were not specifically cited in the question choices but the respondents entered them specifically.



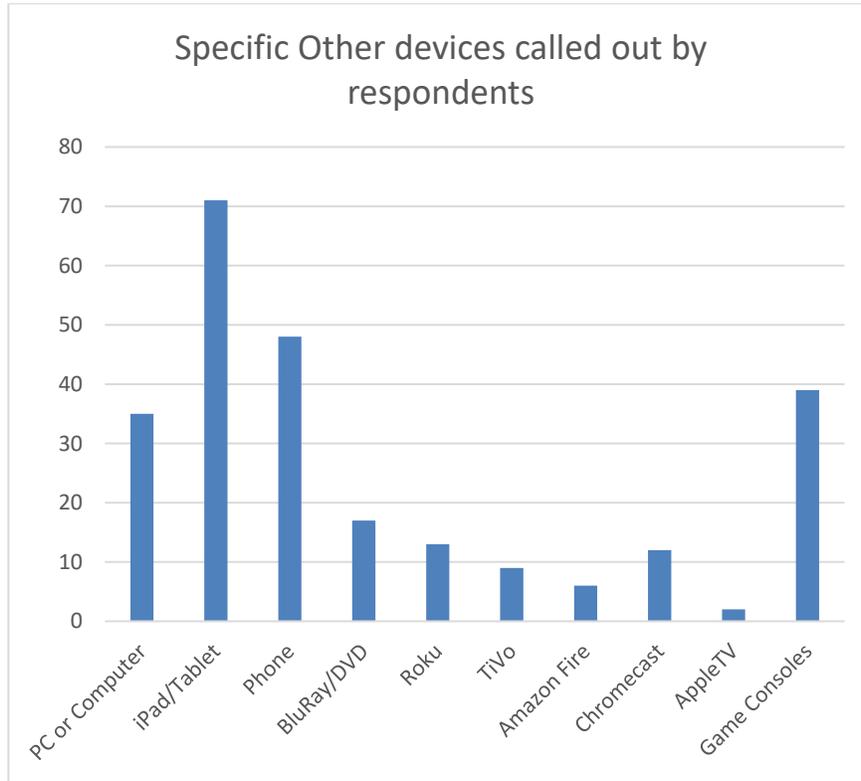
**Figure 37 - Most Common Used Devices to Access OTT Services**

The device split is shown below in Figure 38 with 77% of homes having both an OTT STB and Smart TV, 25% of homes having all 3 (Smart TV, OTT STB) and Integrated in their Pay TV solution.

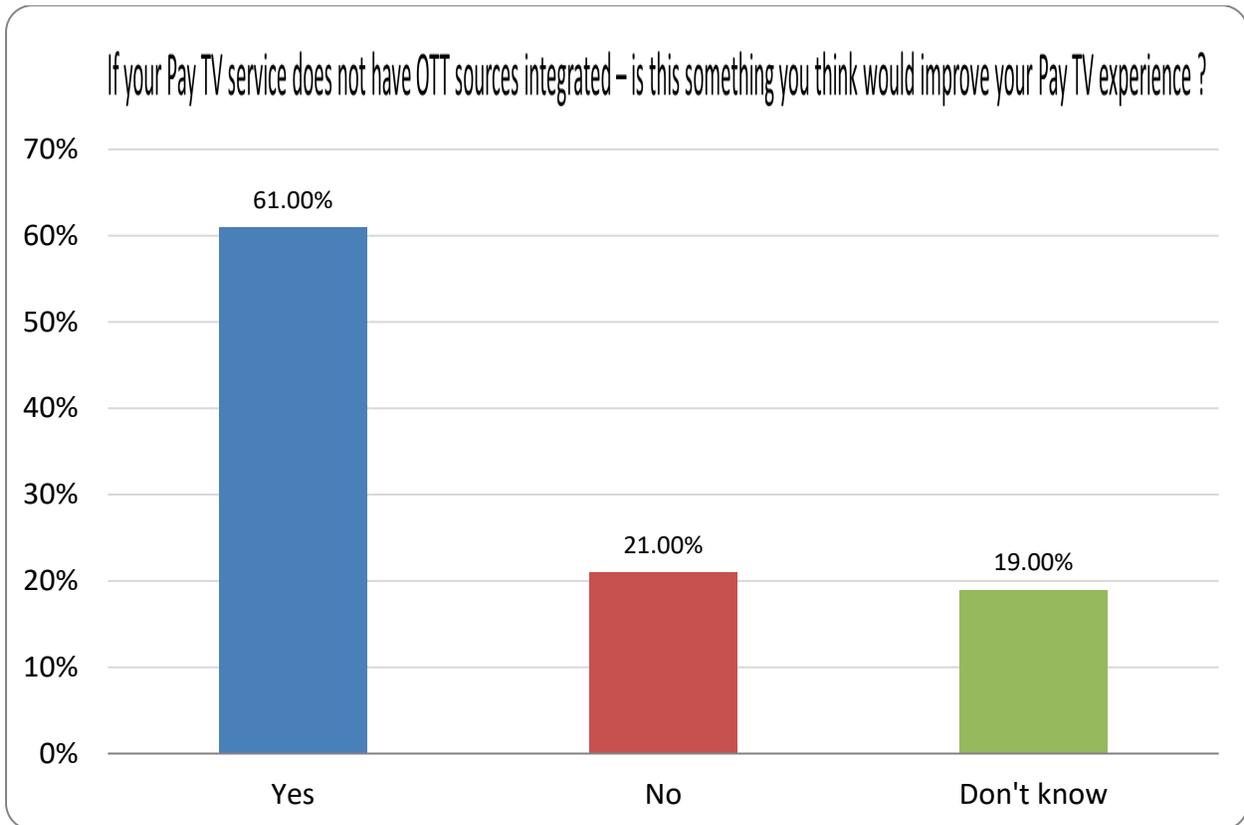


**Figure 38 - Pay TV Users with Multiple OTT Devices per Home**

The most used devices defined as “Other” (27% of respondents viewing devices for OTT content) for watching OTT sources were tablet/iPad at over 70%, second Phone at 48% of people using it consume OTT content, and Game consoles almost 39%.



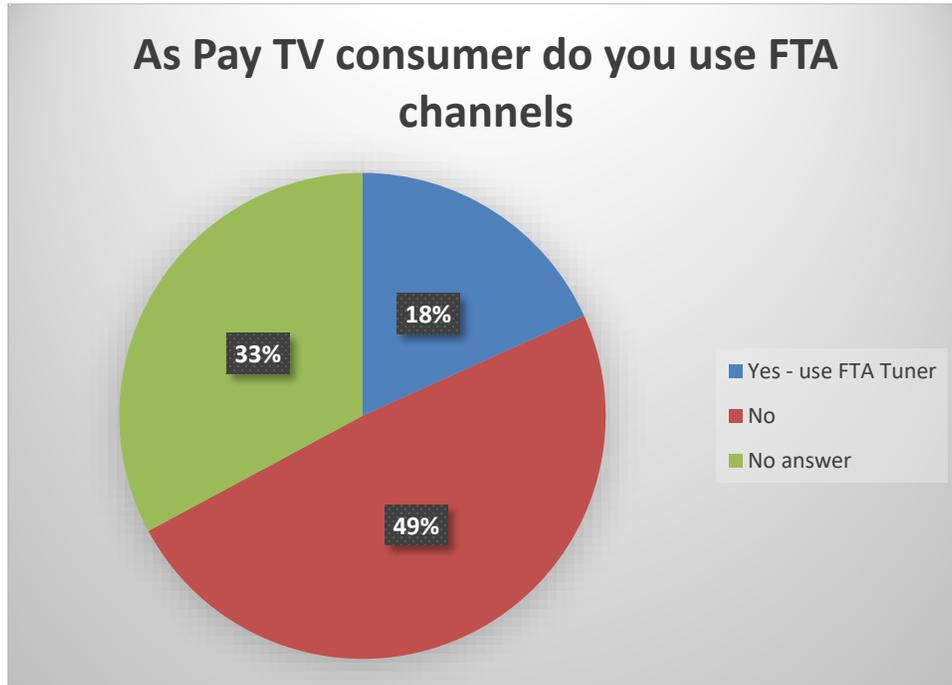
**Figure 39 - The Other Devices That are Used to Access OTT Content**



**Figure 40 - Would Respondents Like to Have Their OTT Sources Integrated in Pay TV Service**

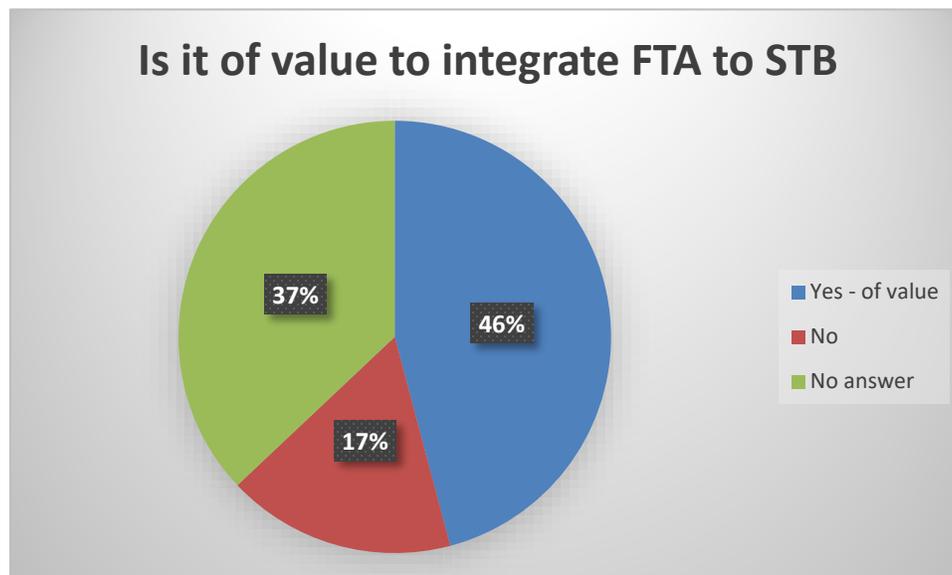
We asked the respondents specifically if they would like to have their OTT sources integrated in their Pay TV UX/user interface (UI) and 61% said that they would — with 21% saying ‘No’ and 19% - not sure/did not know.

For respondents with Pay TV — when we asked if they used “Free to Air Tuners” — 18% of respondents only said, “Yes”, and 49% said explicitly, “No.” The remainder were not sure or did not know (subsequent follow up shows that not everyone is aware what a Free to Air Tuner is). This low use of FTA is expected with people who have local and broadcast channels included in their Pay TV lineup.

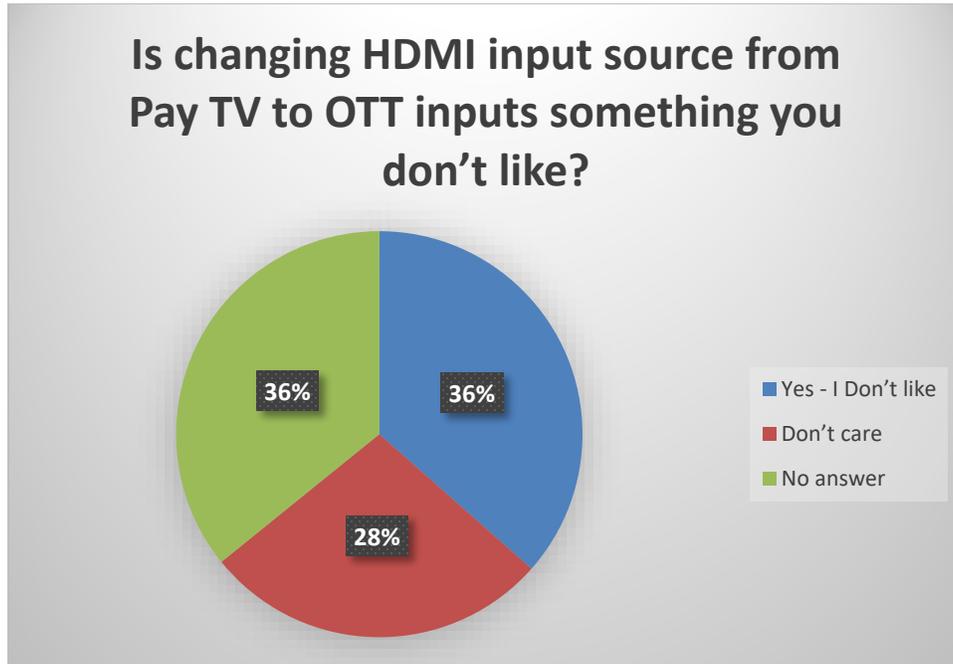


**Figure 41 - As a Pay TV User Do You use FTA Tuner**

Interestingly, when asked if it was of value to integrate FTA tuner into STB– 46% said it was of value with 17% explicitly saying, “No.” 37% of respondents did not answer or did not know.

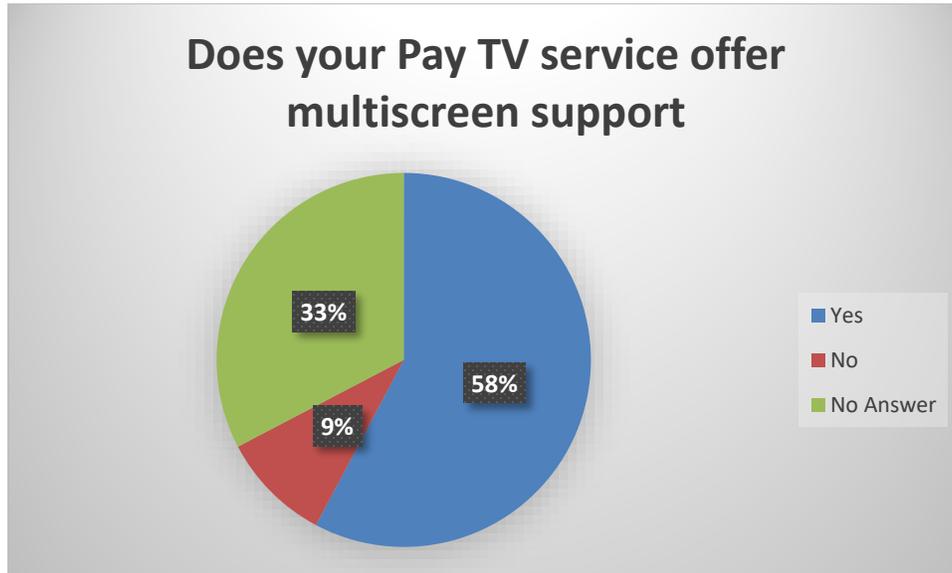


**Figure 42 - Answer to Question if FTA Tuner Added to OTT STB was of Value**



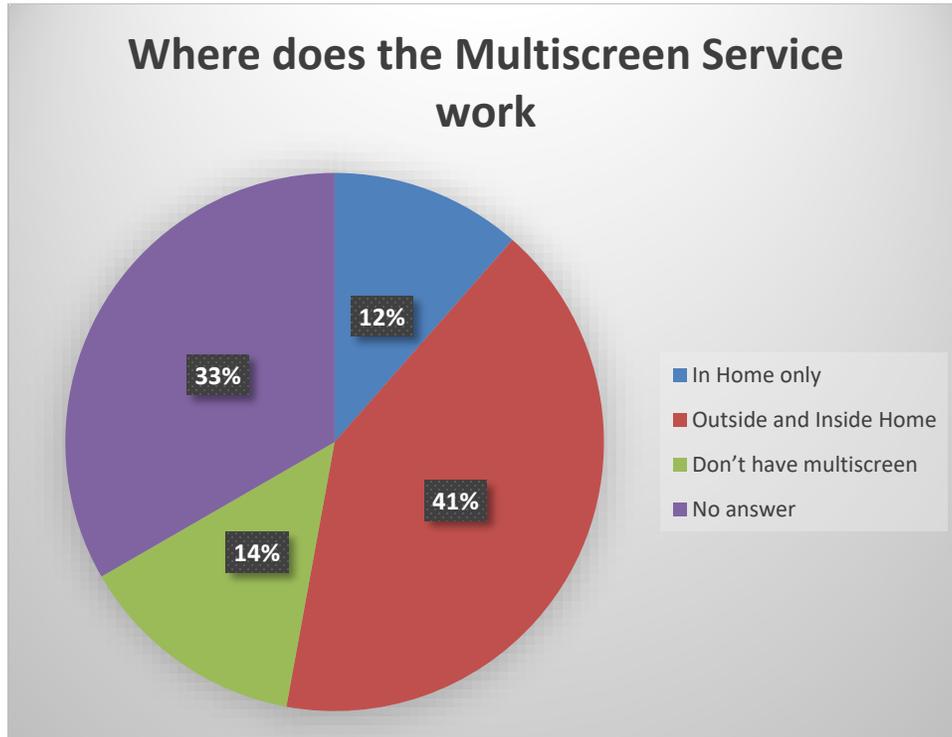
**Figure 43 - Is changing HDMI port for OTT Source Annoying and Something to Improve**

As the HDMI source issue is deemed a constant source of user dissatisfaction we posed the question about respondent's dissatisfaction with changing input sources on HDMI interface. Figure 43 above shows that 36% of respondents replied they did not like switching to other source, 28% of respondents replied — they don't care and 36% of people did not respond or did not know. With a subsequent check of the respondents — the question was not phrased well and it is believed a higher number of respondents would have voted that having a single HDMI source for all video inputs would be a desirable feature.



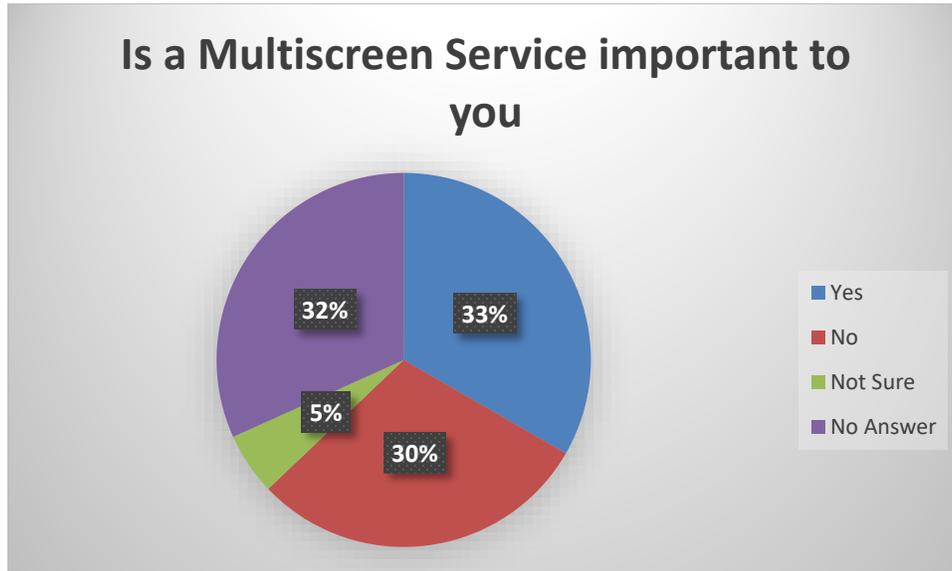
**Figure 44 - Does Your Pay TV Service Offer Multiscreen Support**

From Figure 44 above — 58% of respondents said they had a Pay TV service that also supported multiscreen viewing. 9% said explicitly, “No” and 33% were not sure or did not answer. A subsequent check found that many respondents are not fully aware of the streaming features they also have as part of their Pay TV service — for example, respondents who were checked did not realize that Streampix was available to them as part of their XFINITY X1 service.



**Figure 45 - Where Does the Multiscreen Service Work?**

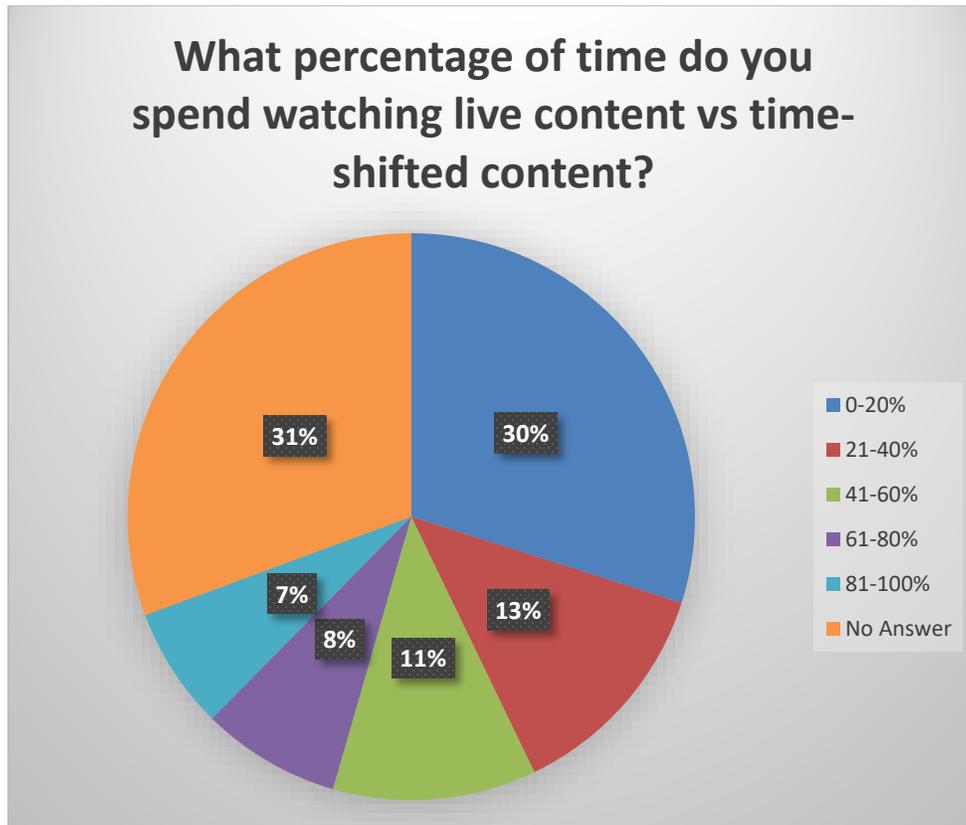
In trying to determine if multiscreen services only work in the home or when mobile — we asked the question in our survey. From Figure 45 above - 12% said it was ‘in home only’ and 41% stating they could use the service outside the home. 14% of respondents said they ‘did not have multiscreen’ (Higher than the original 9% answer) and 33% did not know or did not answer. Figure 46 below showed that 33% of Pay TV respondents said a multiscreen service was important. 30% interesting said, “No” and a high number 32% ‘Did not answer’.



**Figure 46 - Is Having a Multiscreen Service Important to You**

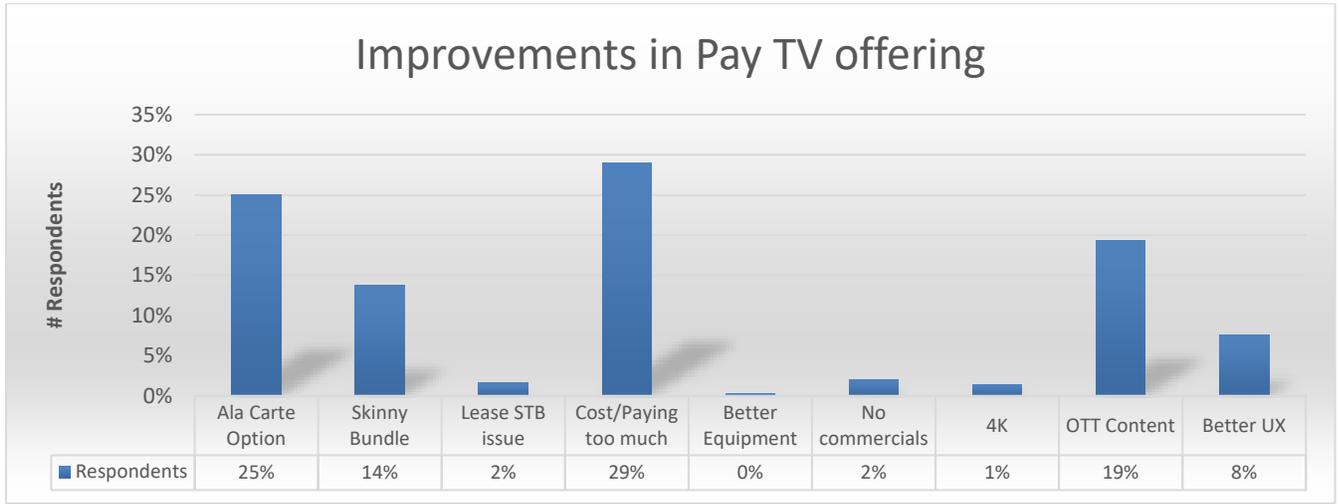
In trying to understand the use of linear or time shifted content we asked consumers ‘what percentage of time do they spend watching live versus time shifted content’ and got the following breakdown in Figure 47. The responses showed that 31% of people did not answer the question. 39% of respondents watched it over 20% of the time — and 30% 0-20% of the time. As stated above from the Nielsen and Kleiner Perkins data — this answer does not fully reflect what ARRIS notes from its analysis of channel usage/time on deployed STB where Linear viewing still accounts for 70% of viewing with 15% DVR and 15% Video on Demand (VOD) being generally what is observed on Pay TV systems. We believe the 70% of linear content is skewed with several factors:

- Consumers like to leave TV’s on for ambient background viewing/noise including channels like Music Choice
- Consumers only standby the TV and not the STB — the STB typically remaining locked on Quadrature Amplitude Modulation (QAM) channel



**Figure 47 - What % of Time Do You Spend Watching Live Versus Time Shifted Content**

Respondents who had Pay TV were asked what would improve their Pay TV offering. Figure 48 below showed the majority of respondents Cost (29%), À la carte (25%), OTT Content integrated (19%), and Skinny Bundles (14%) were the > 10% requests. Significantly, the integration of OTT services and better user experience is something that seems to make a difference in retention of customers.

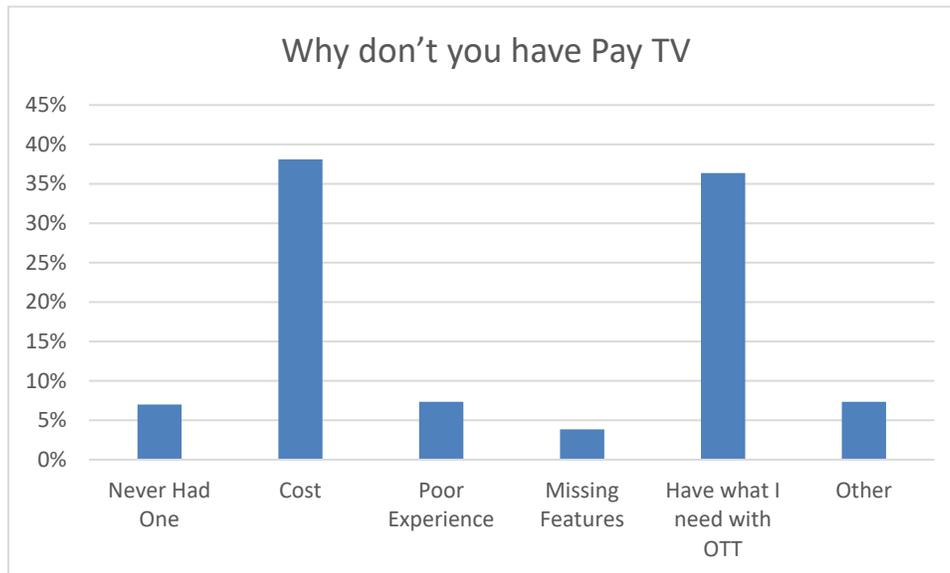


**Figure 48 - What Improvements Would Respondents Like to See in Pay TV Offering**

## 2. Current OTT Video Solutions

### 2.1. Typical Packages and Pricing

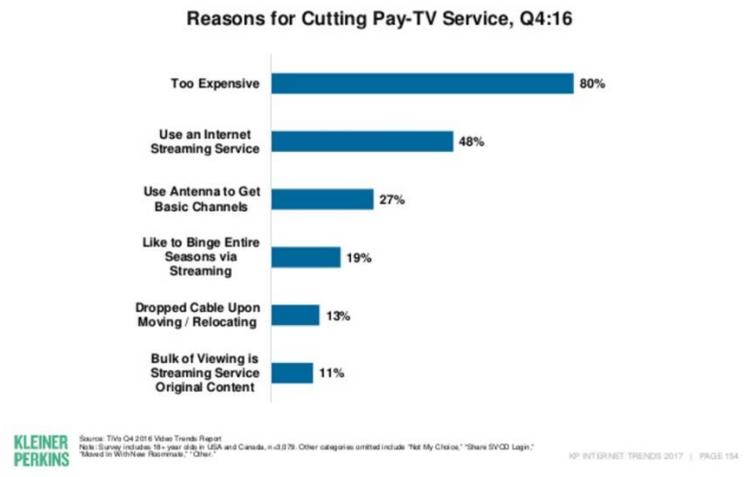
The following sections do a quick analysis of the most relevant OTT packages. As was shown above with the OTT sources that Pay TV subscribers had — the following Figure 49 illustrates the OTT services that they have shaved the cord for .... The data shows that of the respondents that replied they cited Cost and ‘Having what they needed’ as the major reasons why they shifted to cord shave.



**Figure 49 - What Was the Reason You Don't Have a Pay TV Service**

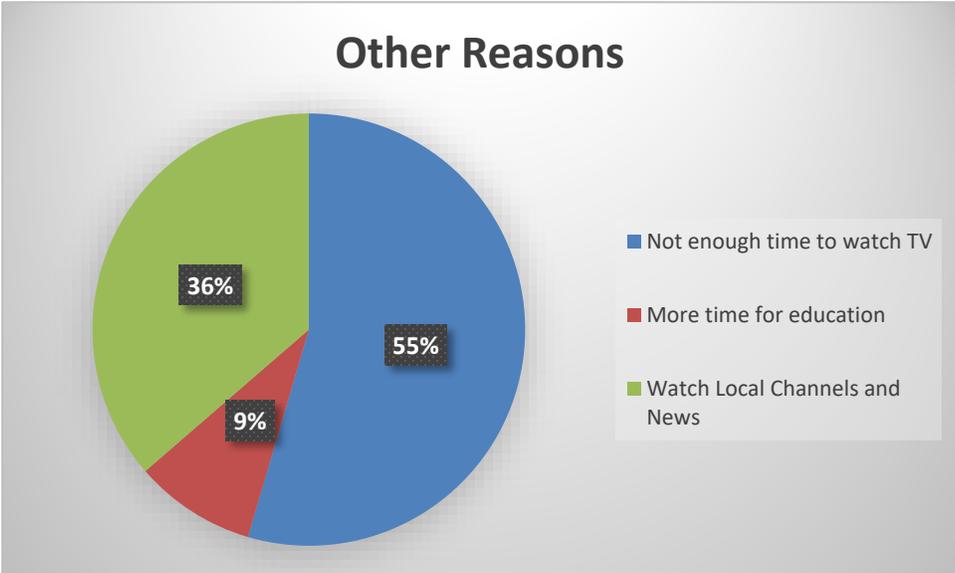
Kleiner Perkins report also highlighted cost at 80% as the principle reason why people do shave the cord and cut Pay TV service.

**Video = Why Cord-Cutting?  
 Lower Price + Convenience**



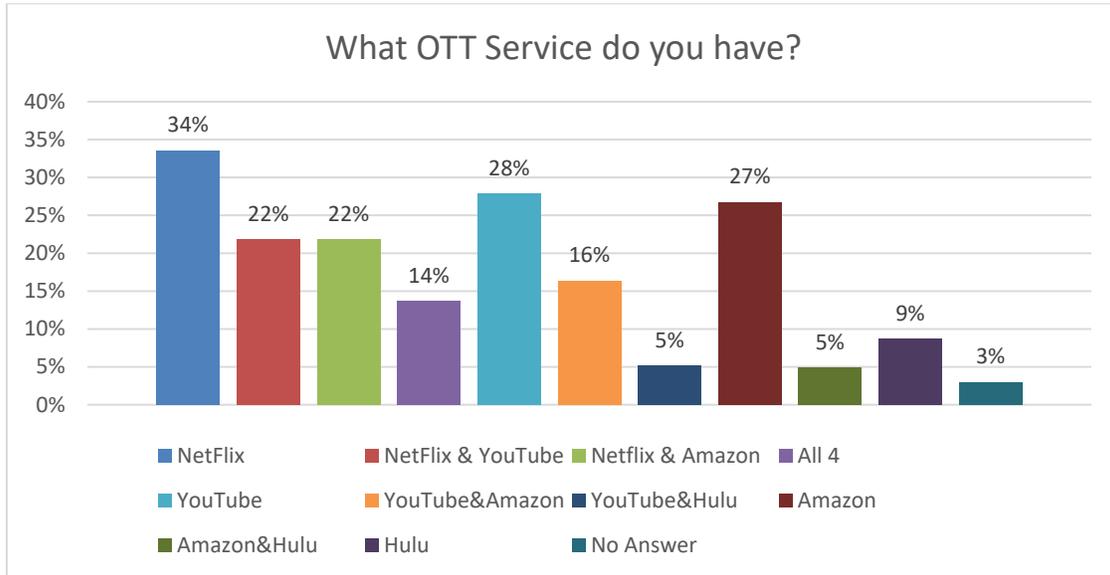
**Figure 50 - Kleiner Perkins - Reasons for Cord Cutting**

Of the ‘Other’ reasons cited in the ARRIS survey — there is a high correlation to consumers who are not active TV watchers and have more of an emphasis on using time for other things. 55% of respondents don’t have enough time for TV. 36% of people watch local channels and news only with FTA solution.



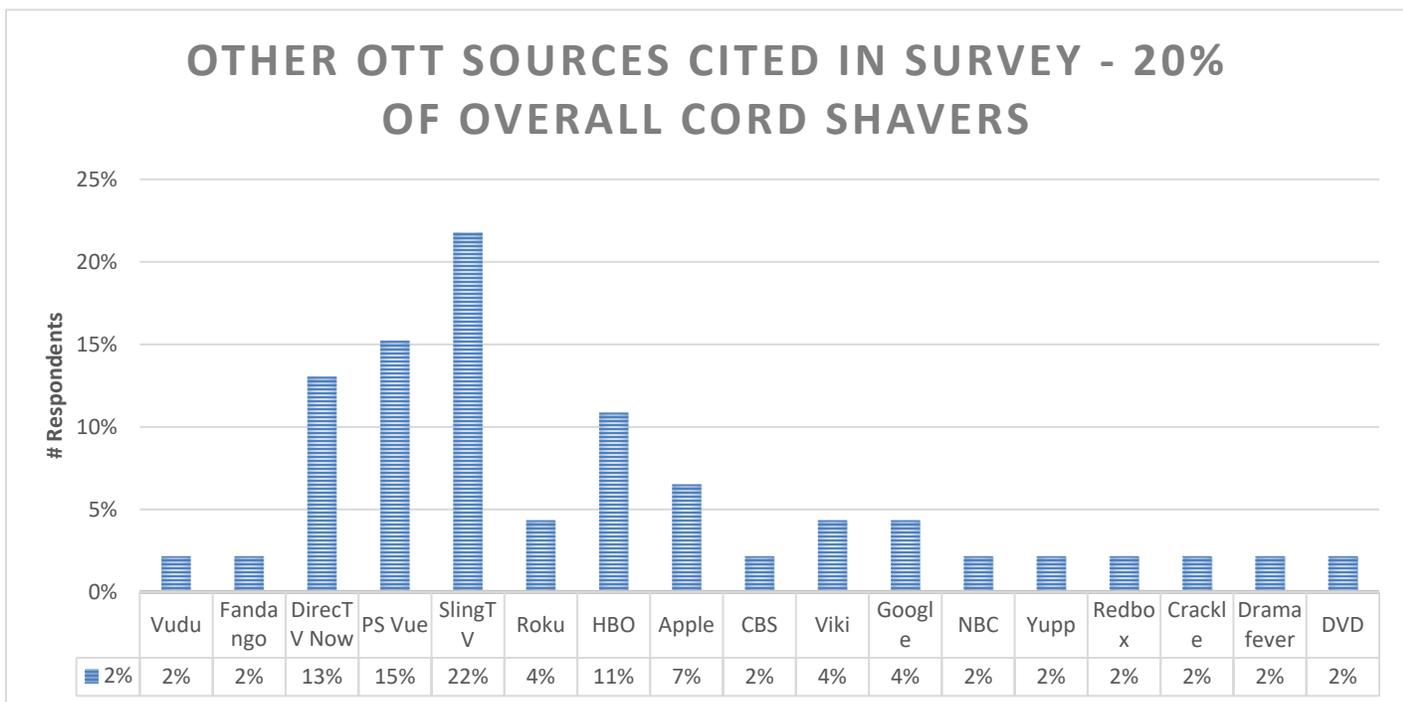
**Figure 51 - Additional Reasons People Cited for Other — When Moving Away from Pay TV**

The OTT services that they are using are details below in Figure 52 and shows that 14% of respondents had all 4 services of Netflix, YouTube, Amazon Prime, and Hulu. Netflix was used by 34% of the respondents, YouTube 28% of the respondents, Amazon Video/Prime by 27% of respondents, with 9% watching Hulu.



**Figure 52 - What OTT Sources are Primarily Used by Cord Shavers**

The respondents had the chance to answer with ‘Other’ sources (which was 20% of the OTT respondents) and the following is the responses recorded. Sling TV (22%) was the highest other source — with DIRECTV Now and Sony PlayStation Vue also registering over 10% the next most significant.



**Figure 53 - Definition of Other Sources Outside the Ones Defined for Answer In Survey**

## 2.2. Overview of OTT Main Cord Shaver OTT Source Packages

Based on the respondents OTT sources — the following sections give a quick review of the pricing for those services as of June 2017.



**Figure 54 - Main Sources Favored by Cord Shavers**

### 2.3. Netflix

Netflix is the most favored OTT source for Cord Shavers. Its monthly packages range from \$7.99 to \$11.99 per month.

### 2.4. YouTube

YouTube is essentially a free video service — but with the increase in advertising in YouTube — YouTube Red has now emerged offering ‘uninterrupted’ video watching at \$9.99 per month.

### 2.5. Hulu

Hulu has several packages starting at \$7.99 per month for access to its streaming library with Limited Ads, for example \$11.99 for no ad interruption. The live TV package is \$39.99 per month. For an additional \$14.99 per month — you can get unlimited DVR and Unlimited screen access.

### 2.6. Amazon Prime Video

Amazon Prime Video service is integrated into the Amazon ecosystem and offers incentives for people who use Amazon shopping. Using Amazon Prime at \$99 per year — you get free shipping on Prime products and access to Amazon Video.

Amazon Prime is a membership program that gives customers access to streaming video, music, e-books, free shipping, and a variety of other Amazon-specific services and deals. Amazon Prime is a no-brainer for those heavily invested in the Amazon ecosystem. And if \$99 per year seems like too much of a commitment, you can opt for the monthly \$10.99 plan or the Prime Video only plan, which costs \$8.99.

## **2.7. PlayStation Vue**

For the basic \$39.99-per-month Access subscription, users get over 45 popular broadcast, cable, movie, and sports channels in complete HD, including AMC, FX, CNN, BBC America, ABC, FOX, and others. For the Core package at \$44.99 per month, subscribers receive access to have 60 channels, including the NFL Network, ESPN U, and ESPNNews. The \$54.99 Elite Package includes 90 channels, such as Telemundo, Chiller, EPIX Hits, the Esquire Network, E!, and more. Finally, the Ultra package priced at \$74.99, includes everything — all 90 Elite channels, as well as the premium channels like Showtime, HBO, etc.

For the cost of your subscription, you also get the ability to use it on up to five devices (only in your home network), and you also have DVR access with unlimited storage for up to 30 days.

## **2.8. DIRECTV Now**

DIRECTV Now is an all-online streaming service with a starting price of \$35 dollars. The introductory package includes over 60 channels, including FOX News, MSNBC, Comedy Central, ESPN, CNN, SyFy, and others, all being streamed live through the device of your choice. However, the price increases after the introductory period to \$60 per month. There's also the \$50 per month package that includes regional sports networks, as well as all the other channels from the first package. The \$60 package includes over 100 channels that include all the basics, but also MTV, Oxygen, FYI, the NHL network, and Sundance TV. And finally, the last option is \$70 per month, but includes everything from basic to premium channels.

## **2.9. Sling TV**

Sling has gained some market share with its live TV service offering account for somewhere between 1-2% of live viewing in the US. There are 2 basic starting packages — Sling Orange starting at \$20 per month — with à la carte programming that you can add on at \$5 per month (\$10 for sport, \$15 for HBO Go) different genre channel line ups.

For \$25 per month — there is Sling Blue. This option includes regional sports and more. You can add à la carte items to the basic tier at \$5, \$10, or \$15 per month.

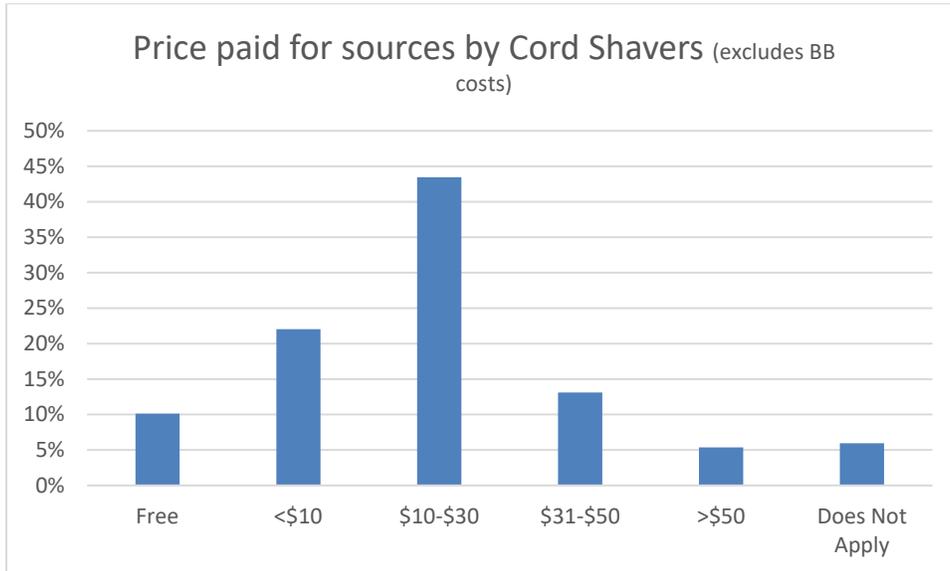
## **2.10. HBO NOW and HBO GO**

HBO offers 2 services — NOW and Go.

HBO NOW is standalone streaming only service that you can buy through a subscription provider (Apple, Roku, Amazon, Android, Frontier, Google Fiber, Optimum, Liberty, Service Electric, Verizon, and Samsung). HBO Go is a streaming service — included free — provided you have a HBO subscription through your Cable or Satellite TV package. HBO Now is typically \$14.99 per month.

## **2.11. ARRIS and Espial Survey – Price Paid for Video Sources by Cord Shavers**

### ***2.11.1. Price Paid for OTT Sources by Cord Shavers***

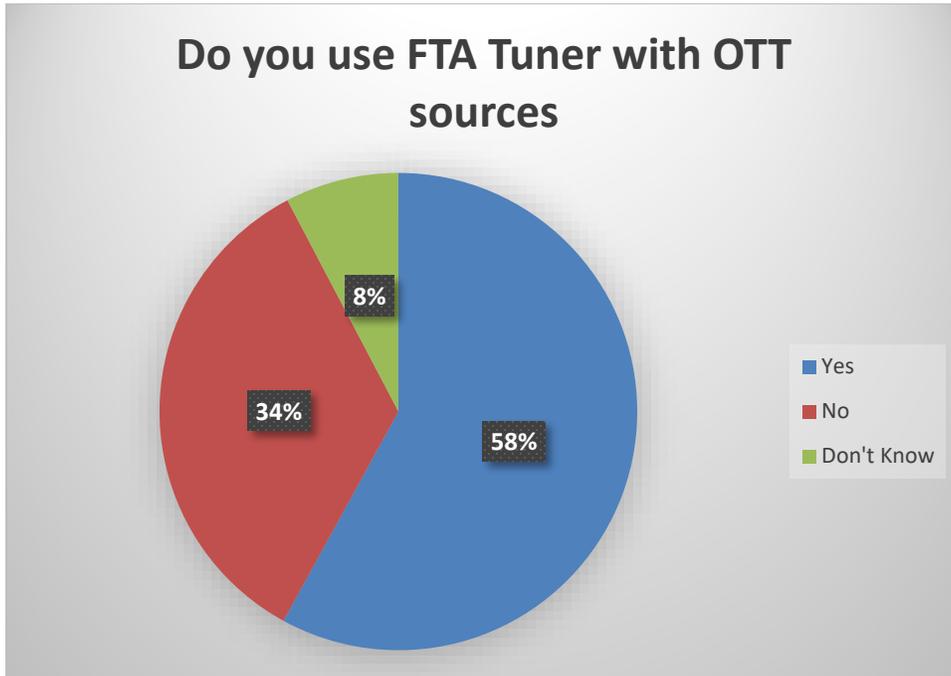


**Figure 55 - Price Paid for OTT Sources By Cord Shavers**

Our respondents showed that over **50% were paying over \$10 per month** with almost **20% paying over \$31 per month on OTT sources.** Only 10% were completely free.

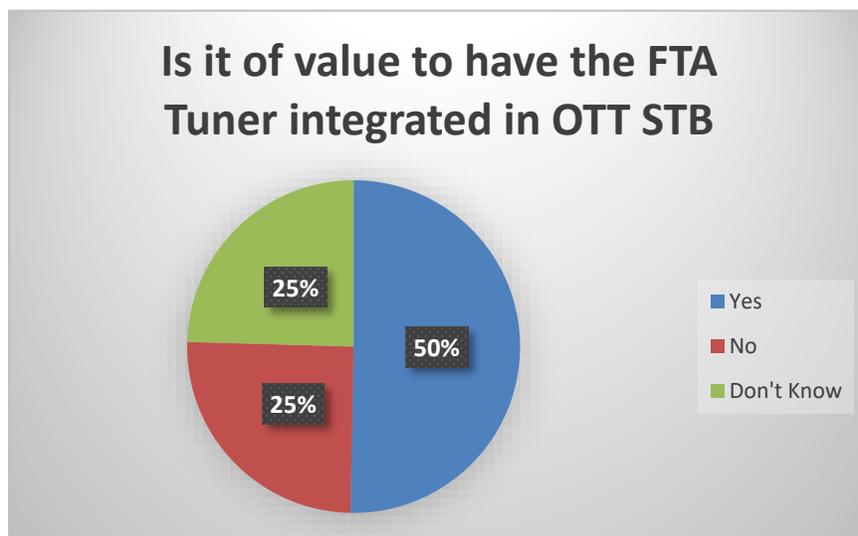
**2.11.2. Cord Shavers and Use of FTA Tuner**

Not surprisingly 58% of Cord Shavers also used FTA tuner.



**Figure 56 - Cord Shavers Use of FTA tuners**

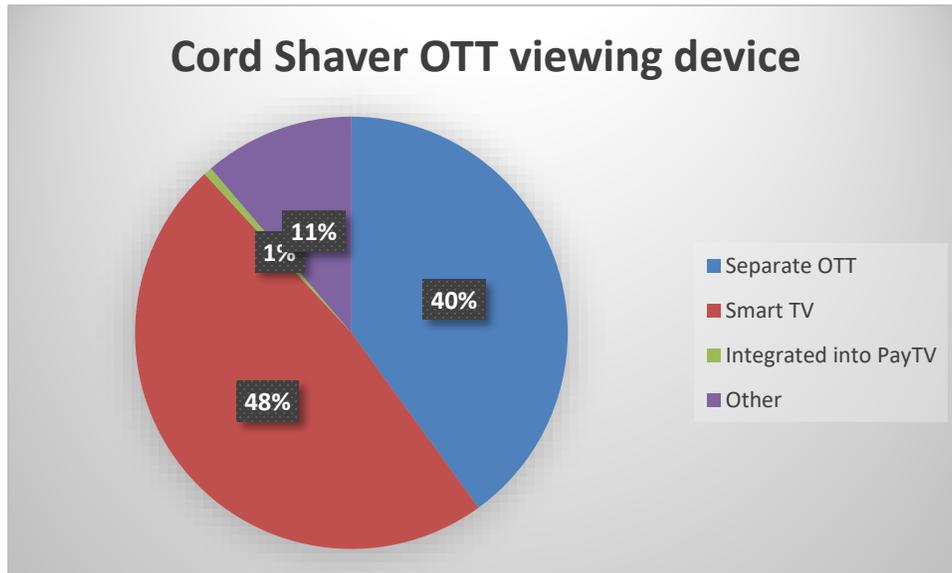
When asked if an FTA tuner integrated into OTT STB was of value — 50% said, “Yes” and 25% said, “No”, [they don’t use OTT STB] and 25% did not have an opinion.



**Figure 57 - For Cord Shavers is it of Interest to Add the FTA Tuner in the OTT STB**

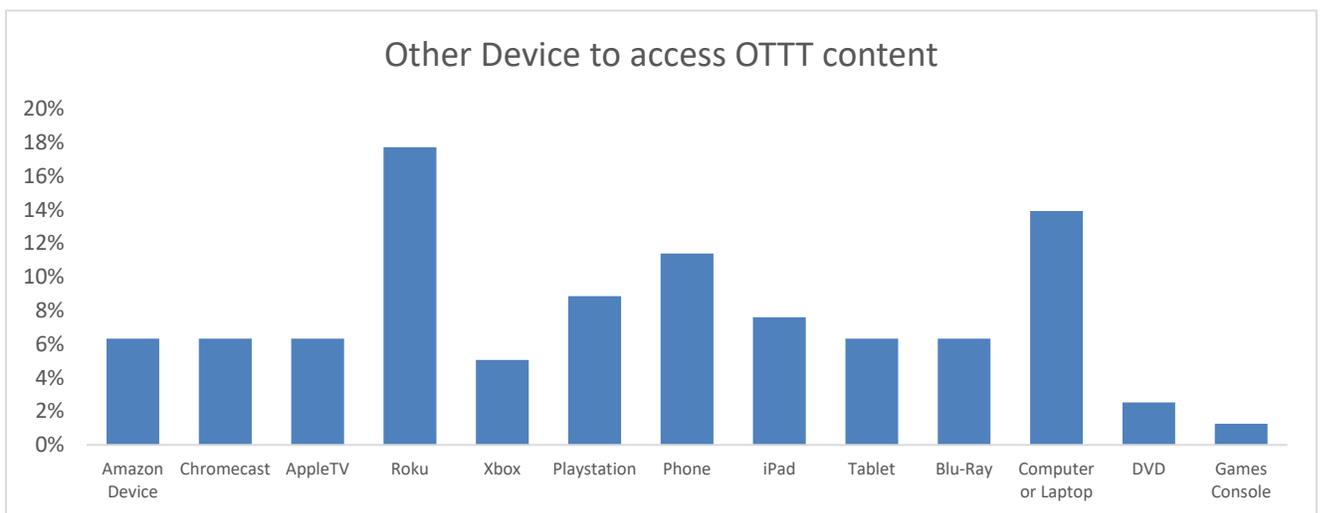
**2.11.3. Cord Shavers Preferred Device to Access Content**

Cord Shavers preferred to access their OTT content on Smart TV (48%) or separate OTT STB (40%). Other devices accounted for 11% of the cord shavers.



**Figure 58 - Cord Shavers - What Device Do You Use to Access Your OTT Sources**

Of the 11% of “other” devices used — the respondents showed that Roku (which includes a separate STB OTT experience) was about 17% of the users and Computer/Laptop was the second most used device.



**Figure 59 - Cord Shaver - Other Sources**

### 2.11.4. Cord Shavers Time Spent Watching Live Versus Non Live Content

When asked what percentage of time respondents spent watching live content — 65% of respondents watch live content only 0-20% of the time.

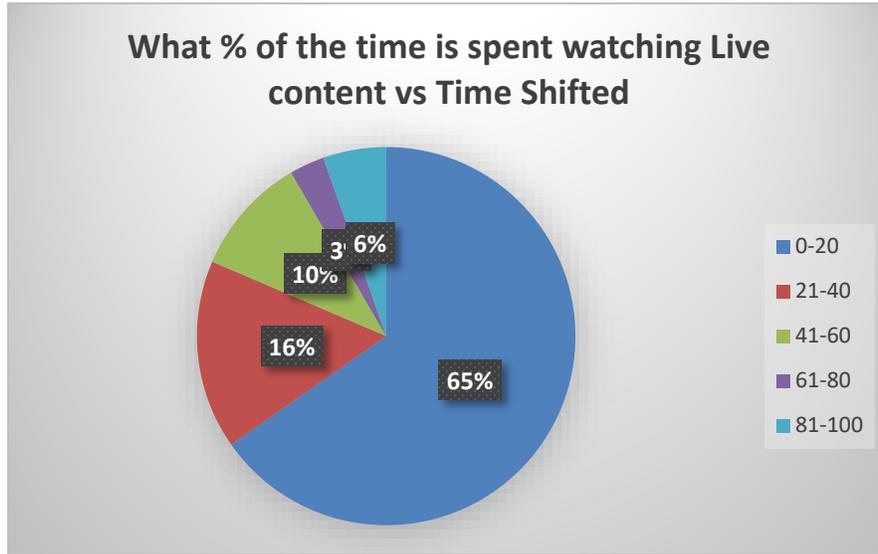


Figure 60 - Cord Shavers Time Spent Watching Live Versus Time Shifted Content

## 3. Market Information on the Consumer Adoption of Pay TV and OTT Video Sources

Kleiner Perkins 2016 report showed the following statistics:

Pay TV household growth was down -1.3% on average for the last 12 Quarters..

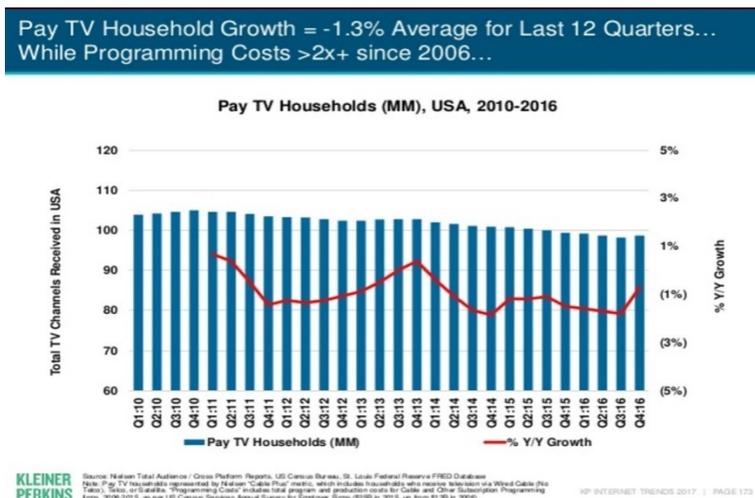


Figure 61 - Kleiner Perkins - Pay TV Growth 2016

The number of channels watched was cited as < 10% of the channels received. Kleiner Perkins also showed the typical cost of Comcast, Dish, Charter, and DIRECTV service on a yearly basis below in Figure 62.

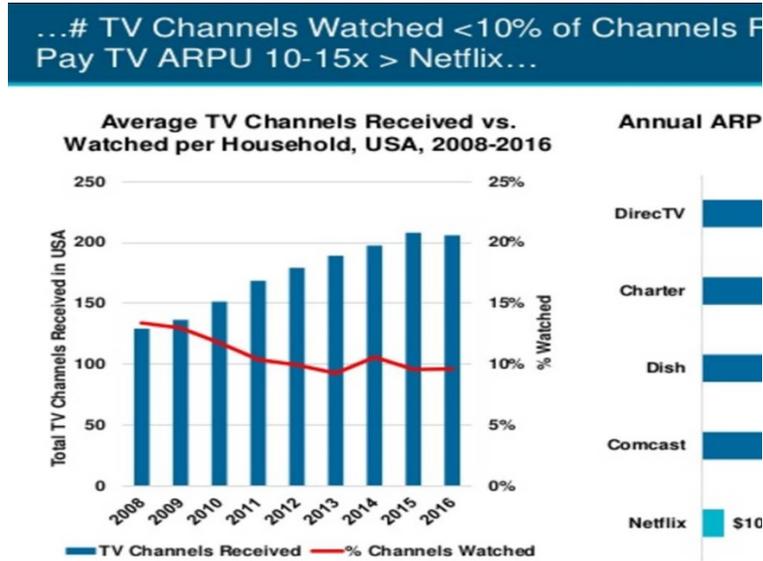
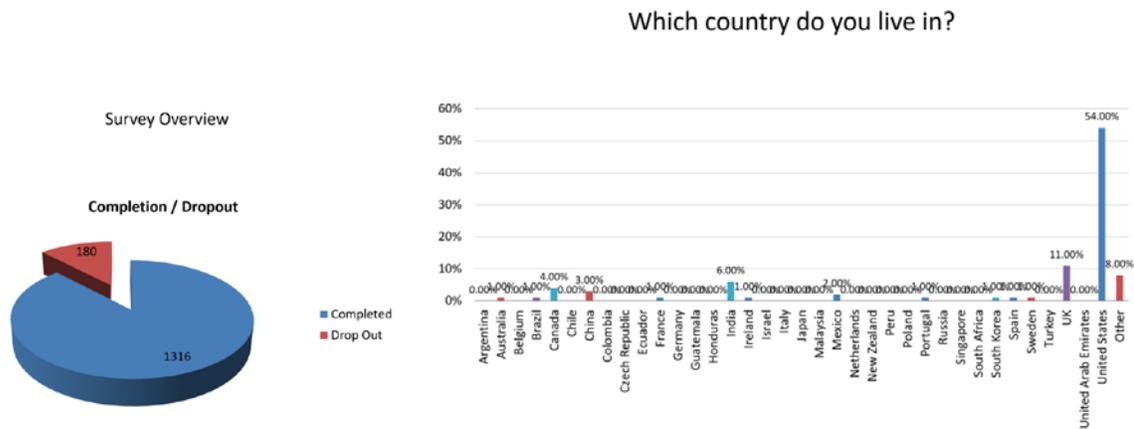


Figure 62 - Kleiner Perkins — Channels Watched and Cost of Pay TV Service — Yearly

#### 4. User Experience Features Used — Correlation From STB Usage and UX Usage Data

To test the theories made in this paper — ARRIS and Espial set up a survey that had 1,316 responses with 180 uncompleted — a lot of which you have already seen in the analysis above. Fifty four percent of the respondents were from the US which gave us a large enough statistical sample — approximately 820 respondents to review the landscape in the US for Pay TV and OTT services.



**Figure 63 - ARRIS and Espial Pay TV/OTT TV Survey — Size and Country of Reply**

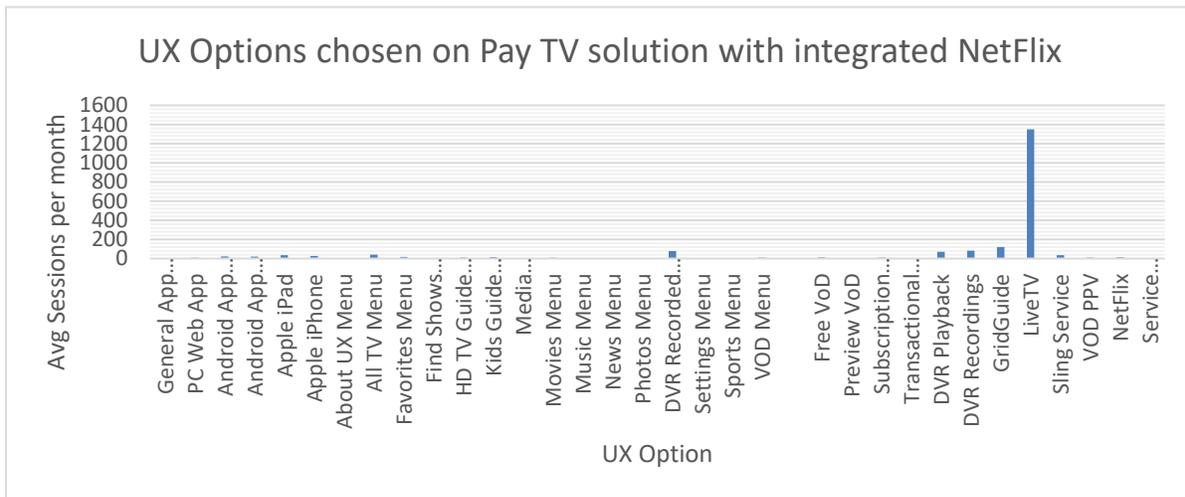
Within the US the survey there were 35 States with respondents with 36 respondents not stating their location. The highest participation was in PA and GA.

This data was used above to correlate against the published and public data that is also highlighted above in this paper and is detailed above in the analysis of Pay TV respondents and Cord Shaver respondents. The paper also added in data from the 2016 Kleiner Perkins — Mary Meeker report as another control.

The following sections take a different input direction further review the UX elements of the TV/video experience, Espial also did a monthly analysis of the usage behavior of their Elevate UX platform and the following sections detail the most used and commonly used features of a modern UX solution for Pay TV. Elevate UX experience also includes content and menu access via remote control, tablets, phones and laptop/Web — and this was also factored into the analysis. Elevate also has Netflix integrated into the primary Pay TV interface — already adding the convenience of a single device, single HDMI input for the most popular OTT source. The following sections go through this — as well as correlating some of the watching trends with the 2016 Nielsen report and additional charts from Kleiner Perkins 2016 surveys. The data was taken from ~140,000 households with the Espial Elevate solution.

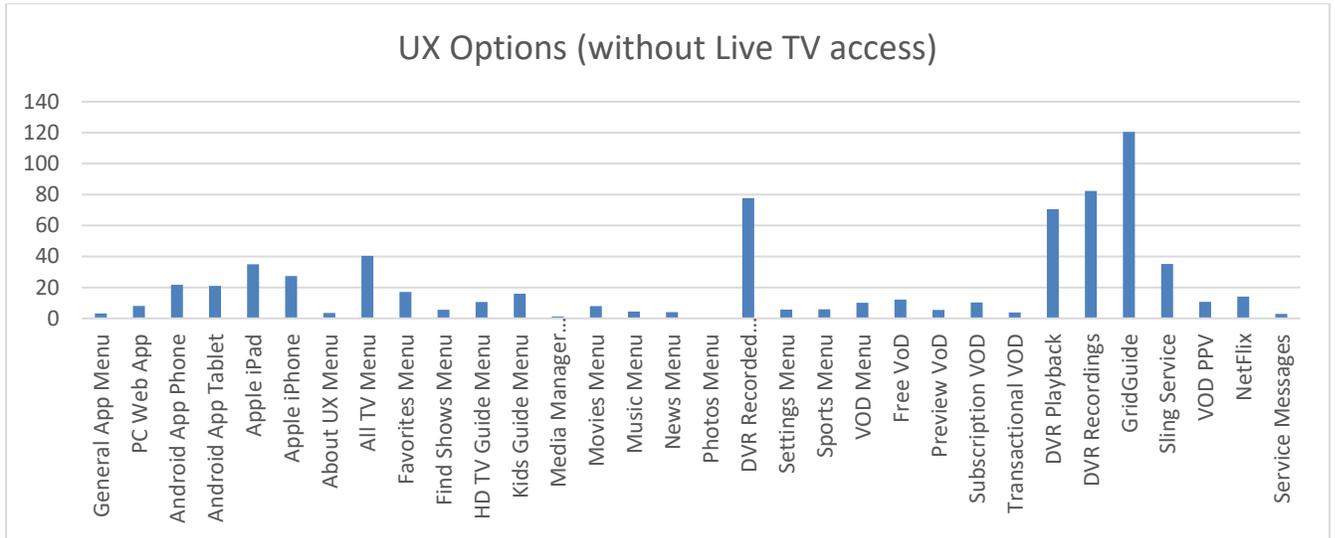
#### 4.1. The Features of a Modern UX that Consumers Use the Most

Using captured session information over a rolling month period on Espials Elevate user experience and tracking the actual sessions (session being the activation of a UX menu option including remote control, tablets, Laptops, and Phones) — the following was determined on what UX menu options users are using on a modern UX with integrated Netflix and other Applications. As you can see below in Figure 64 — the live TV menu had over 10x more session use on average than the next accessed menu — the Grid Guide menu. Users continue to browse the live TV content with the live TV menu giving fast channel look ahead.



**Figure 64 - Frequency of UX Options Chosen on Pay TV Solution with Integrated Netflix**

If we remove the live TV access sessions — Figure 65 — then we can see that the Grid Guide remains the most used single user interface solution on Pay TV system — however, the combined use of DVR menu options is higher. Setting DVR recordings is 10% more than DVR Playback usage.



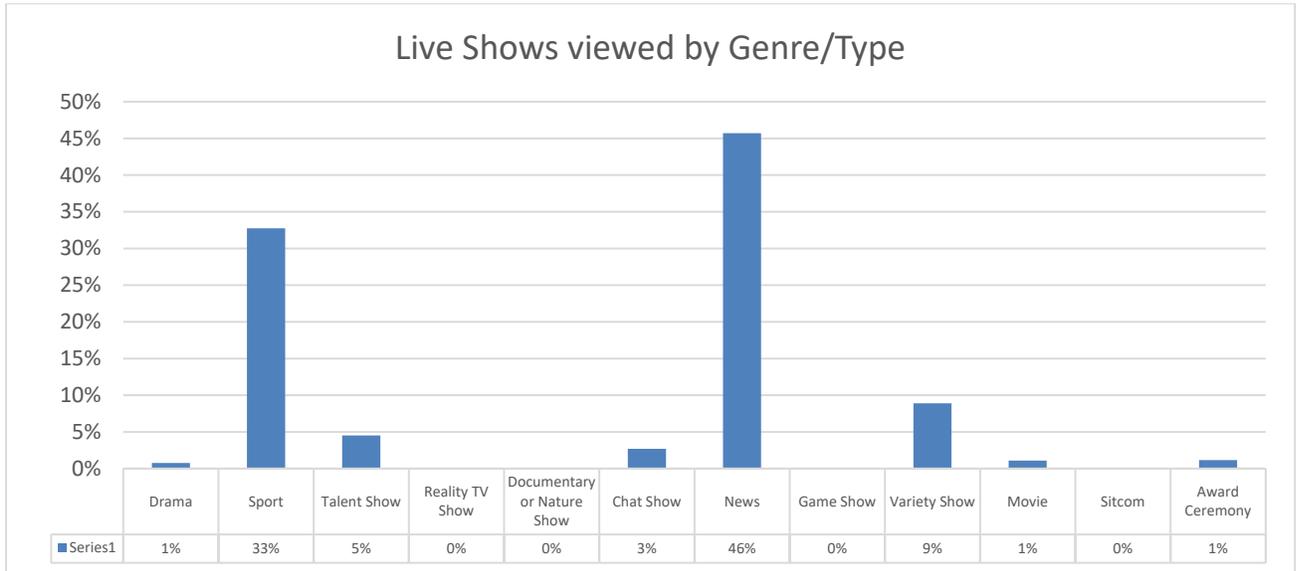
**Figure 65 - UX Options Most Frequently Used — Without Live TV Menu**

“DVR Recording access” — to view what consumers have recorded- was the next most popular — DVR Recordings and DVR Playbacks and DVR Recorded shows. Combined add up to more access than the Grid Guide usage — almost 2x as much. Netflix sessions were on average 16 per month — however, they were longer in duration than many of the other menu access.

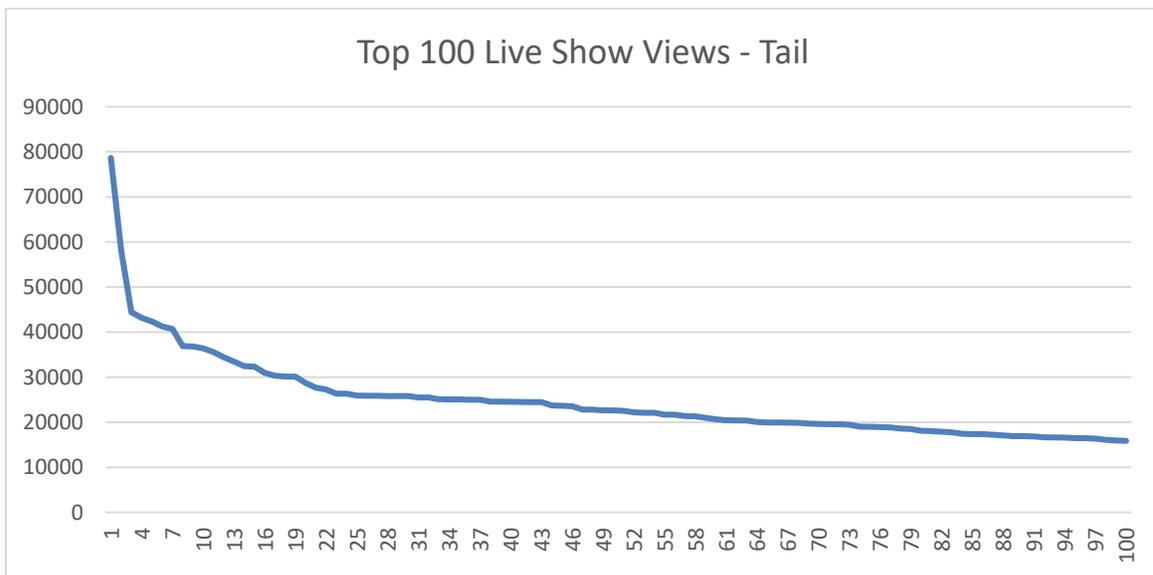
Mobile UX and use of Mobile device — was about 1/6<sup>th</sup> of the use of the Grid Guide — showing that consumers still like to use the TV or the TV remote more of the time than their tablet or phone devices.

#### 4.2. What Consumers View Live

What people view most is also interesting — with more people still tuning in live to watch sports (expected), news (expected), and late night chat shows (function of browsing for that last thing to watch before bed). News and sports dominate the live viewing most sessions — with the odd movie (placed at the right time) and popular shows like America’s Got Talent. Figure 66 below shows the raw data for the top 100 watched live shows — but the Venn Diagram in Figure 66 below — shows that news accounted for 46% of all live sessions and sports 33% — news and sports accounted for almost 80% of live viewing of the top 100 watched shows. The 100<sup>th</sup> show has about 20% of the views of the top show — as shown in Figure 67.



**Figure 66 - Live Shows Viewed by Genre**



**Figure 67 - Top 100 Live Shows and the 100+ Tail**

The following Table 1 shows the raw data for the top 30 live TV Shows viewed and the household viewership and air date.

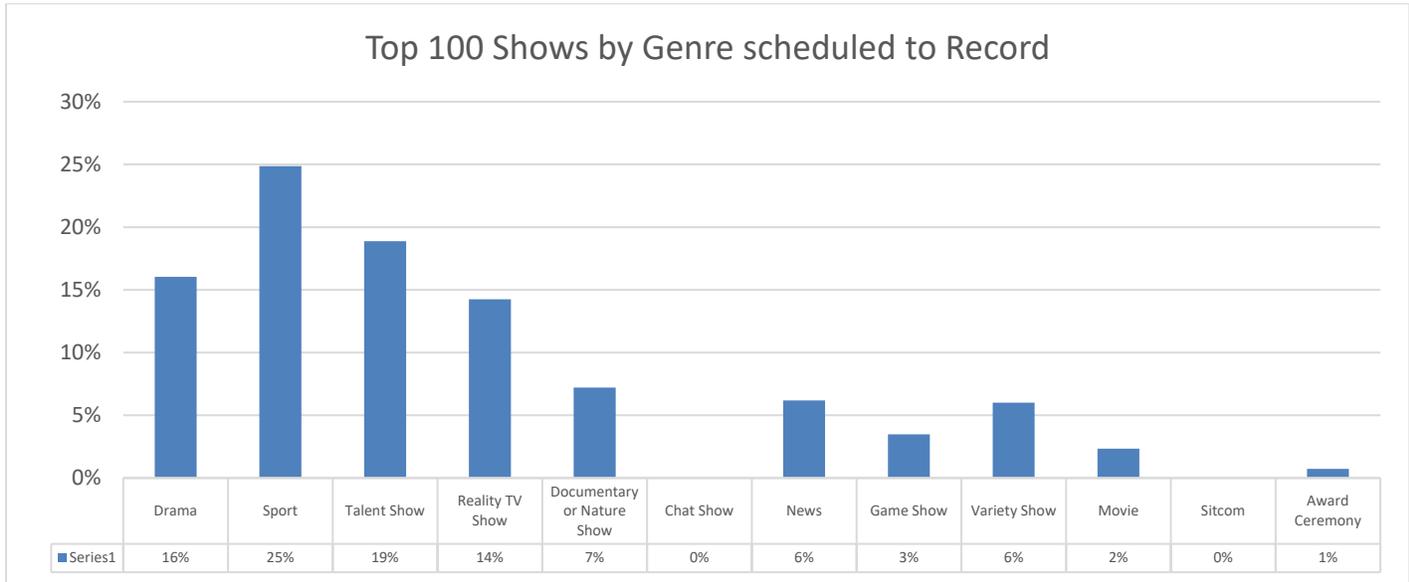
**Table 1 - Top 30 Shows Viewed by Number of Households and Airtime**

Ranking	Households	Title	Episode	Network	Air Date (GMT)
1	78646	2017 NBA Finals	Cleveland Cavaliers at Golden State Warriors	ABC Affiliate	6/13/2017
2	58103	2017 Stanley Cup Final	Pittsburgh Penguins at Nashville Predators	CBC Affiliate	6/12/2017
3	44413	Jimmy Kimmel Live		ABC Affiliate	6/13/2017
4	43174	Anderson Cooper 360		CNN HD	6/15/2017
5	42351	Anderson Cooper 360		CNN HD	6/14/2017
6	41249	Anderson Cooper 360		CNN HD	6/16/2017
7	40703	Anderson Cooper 360		CNN HD	6/13/2017
8	36901	Nightline		ABC Affiliate	6/13/2017
9	36800	CNN Tonight With Don Lemon		CNN HD	6/14/2017
10	36409	CNN Tonight With Don Lemon		CNN HD	6/15/2017
11	35578	Anderson Cooper 360		CNN HD	6/17/2017
12	34418	2017 Stanley Cup Final	Pittsburgh Penguins at Nashville Predators	NBC Affiliate	6/12/2017
13	33452	Sportsnet Central		Sportsnet West HD	6/12/2017
14	32426	2017 Stanley Cup Final	Pittsburgh Penguins at Nashville Predators	Sportsnet West HD	6/12/2017
15	32335	MLB Baseball	Toronto Blue Jays at Seattle Mariners	Sportsnet West HD	6/11/2017
16	30966	CNN Tonight With Don Lemon		CNN HD	6/16/2017
17	30324	2017 U.S. Open Golf Championship	Third Round	Fox Affiliate	6/17/2017
18	30131	Sportsnet Central		Sportsnet (Pacific) HD	6/12/2017
19	30128	CNN Tonight With Don Lemon		CNN HD	6/13/2017
20	28713	2017 Stanley Cup Final	Pittsburgh Penguins at Nashville Predators	Sportsnet (Pacific) HD	6/12/2017
21	27672	The 71st Annual Tony Awards		CBS Affiliate	6/12/2017

Ranking	Households	Title	Episode	Network	Air Date (GMT)
22	27241	America's Got Talent	Auditions 3	NBC Affiliate	6/14/2017
23	26327	Global News Morning		Global BC HD	6/14/2017
24	26327	Morning News		Global BC HD	6/14/2017
25	25925	American Ninja Warrior		NBC Affiliate	6/13/2017
26	25868	Global News Hour at 6		Global BC HD	6/16/2017
27	25868	News Hour		Global BC HD	6/16/2017
28	25823	Transformers: Age of Extinction		Showcase HD	6/17/2017
29	25804	Morning News		Global BC HD	6/16/2017
30	25804	Global News Morning		Global BC HD	6/16/2017

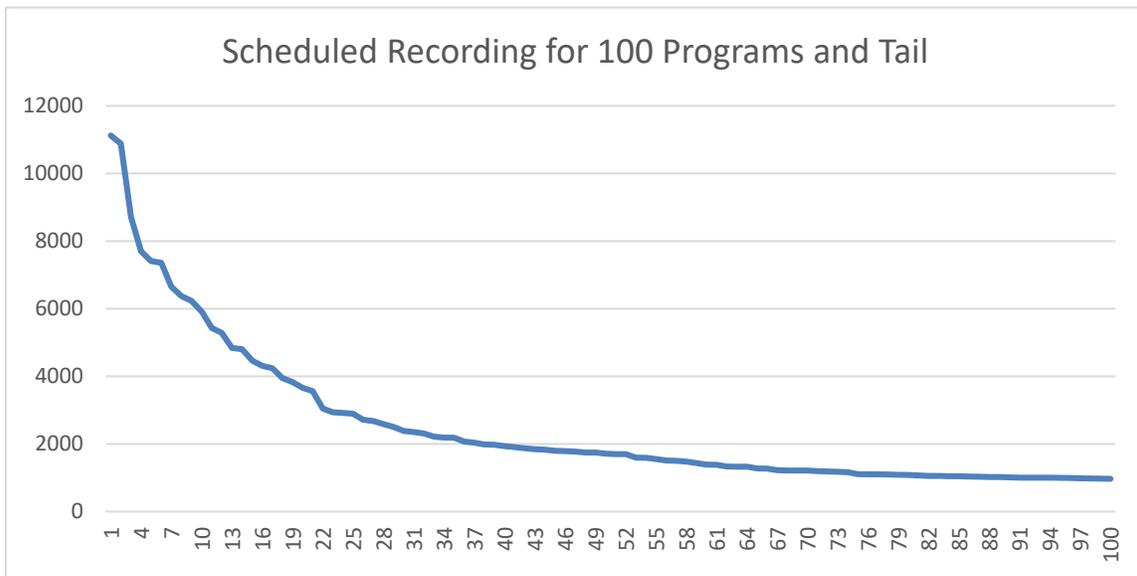
#### 4.3. What Consumers Think They Want to Watch — Scheduled Recordings

It is interesting to review what type of shows people believe they want to watch time shifted or can't miss. The following Figure 68 shows the popularity of scheduled record by program genre. Sport is the highest with 25% of scheduled records set to record (mixture of backup to the live events and also non-live sports shows) and talent shows being number 2 with 19% of the scheduled records. Movies are only at 2% showing that consumers don't generally watch movies recorded from DVR as compared to drama series, variety shows, reality TV, or news.



**Figure 68 - Top 100 Shows by Genre That are Scheduled to Record**

You can see how the top 100 scheduled recordings tails off quickly on popularity — to 100<sup>th</sup> show is 9% of recordings scheduled than the most popular one.



**Figure 69 - The Frequency of Scheduled Recording for the Top 100 Shows and 100+ Tail**

Top 30 Shows scheduled to record in raw form — showing the number of households and air date — Table 2.

**Table 2 - Top 30 Scheduled to Record Shows and Air Date**

Ranking	Households	Title	Episode	Network	Air Date (GMT)
1	11124	Jillian and Justin	Baby on the Way	W (Women's Television Network)	6/22/2017
2	10886	America's Got Talent	Auditions 4	NBC Affiliate	6/21/2017
3	8709	The Gong Show	Will Arnett; Ken Jeong; Zach Galifianakis	ABC Affiliate	6/23/2017
4	7699	World of Dance	The Duels 1	NBC Affiliate	6/21/2017
5	7406	Grantchester on Masterpiece	4725	PBS Affiliate	6/19/2017
6	7360	2017 U.S. Open Golf Championship	Final Round	Fox Affiliate	6/18/2017
7	6648	NHL Awards		Sportsnet West HD	6/22/2017
8	6372	Little Big Shots: Forever Young	Forever Young	NBC Affiliate	6/22/2017
9	6230	Boy Band	Meet the Boys	ABC Affiliate	6/23/2017
10	5914	The Bachelorette	1304	ABC Affiliate	6/20/2017
11	5431	The Night Shift	Recoil	NBC Affiliate	6/23/2017
12	5285	20/20		ABC Affiliate	6/24/2017
13	4838	Dateline NBC	As Night Fell	NBC Affiliate	6/24/2017
14	4807	Jillian and Justin	Baby on the Way	W (Women's Television Network) (Pacific)	6/22/2017
15	4465	The Story of China	Ancestors; Silk Roads and China Ships	PBS Affiliate	6/21/2017
16	4311	2017 U.S. Open Golf Championship	Final Round	TSN HD	6/18/2017
17	4241	Great Canadian Homes		Home and Garden HD	6/19/2017
18	3949	My Favorite Wedding		Hallmark Channel HD	6/25/2017
19	3829	NHL Awards		Sportsnet (Pacific) HD	6/22/2017
20	3662	2017 NHL Draft	Round 1	Sportsnet (Pacific) HD	6/23/2017
21	3565	2017 NHL Draft	Round 1	Sportsnet West HD	6/23/2017
22	3044	So You Think You Can Dance	Los Angeles Auditions No. 2	Fox Affiliate	6/20/2017

Ranking	Households	Title	Episode	Network	Air Date (GMT)
23	2936	Alone	Hell on Earth	History Television HD	6/23/2017
24	2920	MLB Baseball	Toronto Blue Jays at Texas Rangers	Rogers Sportsnet One HD	6/22/2017
25	2896	My Mother and Other Strangers on Masterpiece	4720	PBS Affiliate	6/19/2017
26	2717	Prime Suspect: Tennison on Masterpiece	4732	PBS Affiliate	6/26/2017
27	2678	MLB Baseball	Toronto Blue Jays at Kansas City Royals	Rogers Sportsnet One HD	6/24/2017
28	2591	Kids Who Kill		A and E HD	6/20/2017

#### 4.4. What Consumers Actually Record — Scheduled and By Viewing Guide or While Watching Content

While there are a proportion of consumers that are using the DVR scheduling to record — there is 75% more recording done for a single show versus the scheduled recording. This more ‘on the spot’ or ‘closer to the event’ recording also during the show itself. This also alters the top show recorded, as well as the genres quite significantly.

If you recall — sports was the highest using the DVR Scheduling capabilities — however — drama series (Game of Thrones, Fear the Walking Dead) and reality TV shows as well as late night chat shows all show a tendency for people to press the record button in the guide or while watching the show. This is done 3x more than scheduled recording — and shows the changes in mood and the on the spot decisions to watch and record things — based on live program schedule. Again, recording movies from live airing is very low.

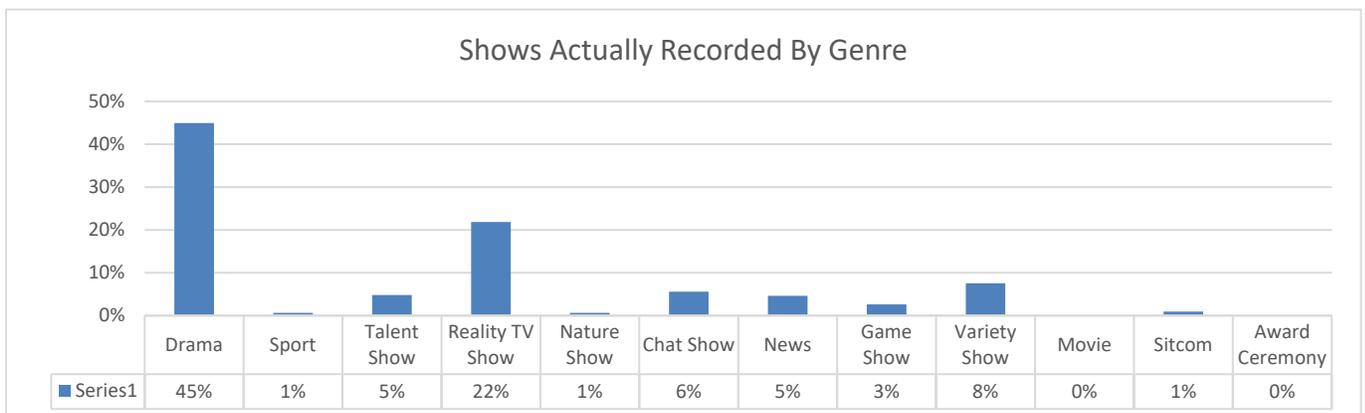
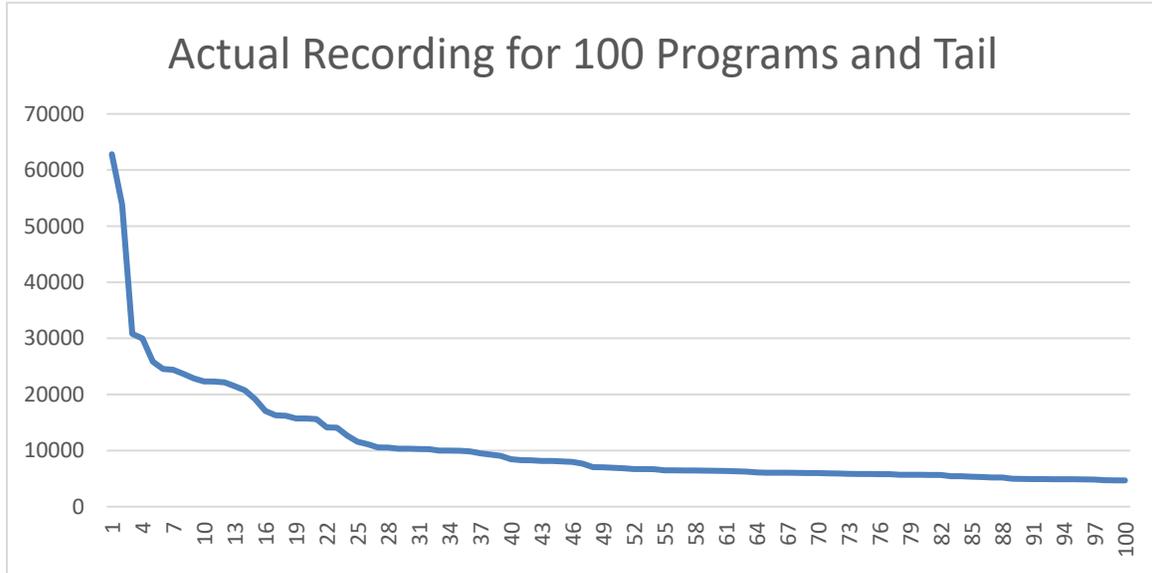


Figure 70 - The Show Types Recorded at the Time of Airing

The actual recording trend skews more to the top 10 programs — with the long tail at 100<sup>th</sup> show being 7% of the recordings of the top show. The first 20 shows accounting for 50% of the recordings.



**Figure 71 - The Actual Recorded Shows in Popularity and the 100+ Long Tail**

Top 30 shows recorded before the air time of the show — including scheduled, select recording before and while viewing the show — Table 3.

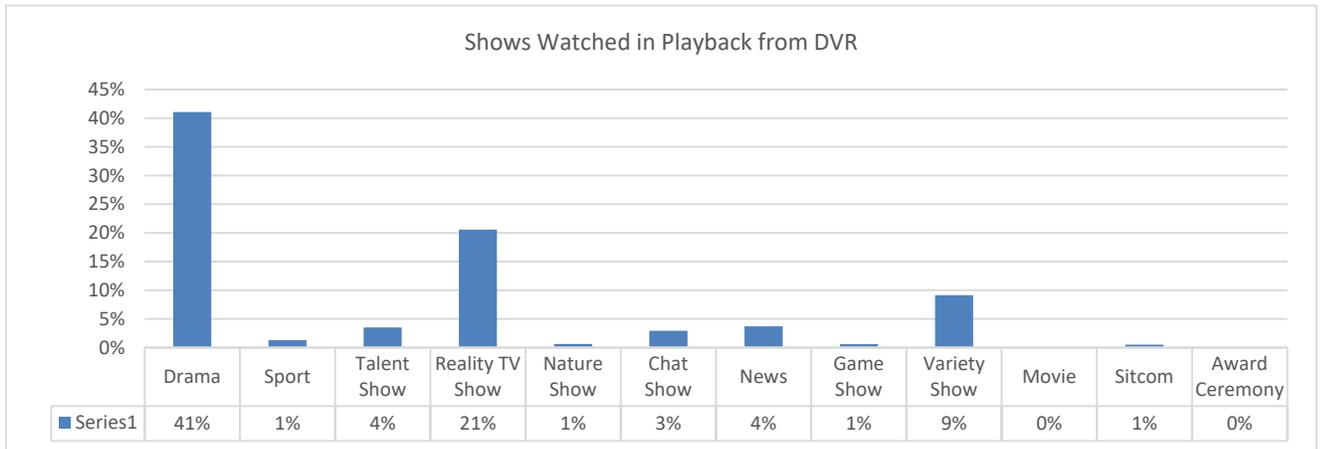
**Table 3 - The Top 30 Shows Recorded By Household and Airtime**

Ranking	Households	Title	Episode	Network	Air Date (GMT)
1	62816	America's Got Talent	Auditions 4	NBC Affiliate	6/21/2017
2	53823	The Bachelorette	1304	ABC Affiliate	6/20/2017
3	30810	World of Dance	The Duels 1	NBC Affiliate	6/21/2017
4	29991	Alone	Hell on Earth	History Television HD	6/23/2017
5	25846	Fear the Walking Dead	100	AMC HD	6/19/2017
6	24526	Dateline NBC	As Night Fell	NBC Affiliate	6/24/2017
7	24389	Better Call Saul	Lantern	AMC HD	6/20/2017
8	23665	MasterChef	Feeding the Lifeguards	Fox Affiliate	6/22/2017
9	22870	Genius	Einstein: Chapters Nine & Ten	National Geographic HD	6/21/2017
10	22318	American Ninja Warrior	San Antonio Qualifiers	NBC Affiliate	6/20/2017

Ranking	Households	Title	Episode	Network	Air Date (GMT)
11	22296	The Handmaid's Tale	The Bridge	Bravo HD	6/19/2017
12	22160	Genius		National Geographic HD	6/21/2017
13	21474	So You Think You Can Dance	Los Angeles Auditions No. 2	Fox Affiliate	6/20/2017
14	20737	Genius		National Geographic HD	6/22/2017
15	19181	Home to Win	Keys to the Competition	Home and Garden HD	6/19/2017
16	17055	Fargo	Somebody to Love	FX HD	6/22/2017
17	16283	Deadliest Catch		The Discovery Channel HD	6/21/2017
18	16194	Nashville	A Change Would Do You Good	W (Women's Television Network)	6/23/2017
19	15730	This Is Us	The Pool	NBC Affiliate	6/22/2017
20	15719	Better Call Saul	Lantern	AMC HD	6/20/2017
21	15613	Fear the Walking Dead	100	AMC HD	6/19/2017
22	14130	Jillian and Justin	Baby on the Way	W (Women's Television Network) -	6/22/2017
23	14076	The Night Shift	Recoil	NBC Affiliate	6/23/2017
24	12658	20/20		ABC Affiliate	6/24/2017
25	11567	Little People, Big World	When It Rains It Pours	The Learning Channel HD	6/21/2017
26	11121	Anthony Bourdain: Parts Unknown	Trinidad	CNN HD	6/19/2017
27	10569	Preacher	Season 2 Greetings From the Set	AMC HD	6/23/2017
28	10521	Nashville	A Change Would Do You Good	Country Music Television HD	6/23/2017
29	10344	The Tonight Show Starring Jimmy Fallon	Will Ferrell; Alison Brie; Shawn Mendes	NBC Affiliate	6/20/2017
30	10322	The Tonight Show Starring Jimmy Fallon	Amy Poehler; Zendaya; Imagine Dragons; Dweezil Zappa	NBC Affiliate	6/21/2017

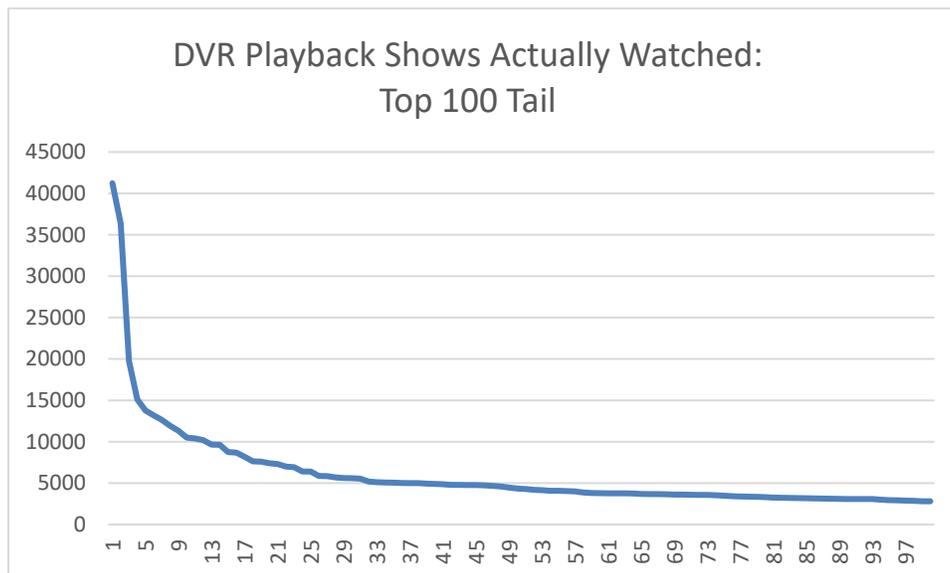
#### 4.5. Top 30 Shows Actually Played Back on DVR Playback

Yet another way to look at DVR usage is to look at the shows that were actually looked at from the recordings during the same month. This shows that genres like Talent shows tend to be forgotten whereas consumers do make sure more to catch up on drama series and their favorite Reality TV shows. These 2 genres account for 60% of the top 100 shows watched back on DVR.



**Figure 72 - The Shows Watched in Playback on DVR**

The top 20 shows account for 48% of the DVR views in the top 100 and the tail at 6.8% of the frequency of the most popular first place playback show.



**Figure 73 - DVR Playback Frequency and Long Tail of 100+ Top Shows**

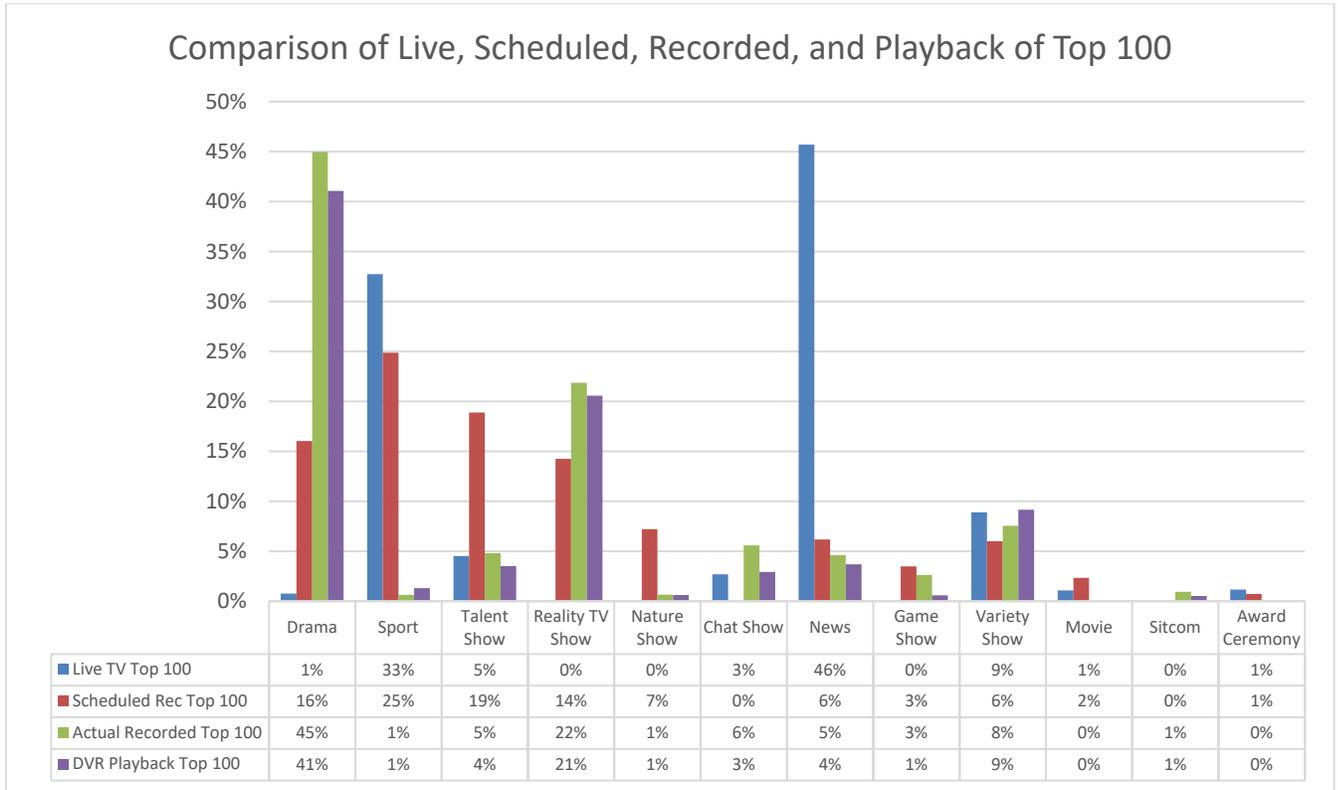
**Table 4 - Top 30 DVR Playbacks by Household and Airtime**

Ranking	Households	Title	Episode	Network	Air Date (GMT)
1	41228	America's Got Talent	Auditions 4	NBC Affiliate	6/21/2017
2	36371	The Bachelorette	1304	ABC Affiliate	6/20/2017
3	19762	World of Dance	The Duels 1	NBC Affiliate	6/21/2017
4	15130	Alone	Hell on Earth	History Television HD	6/23/2017
5	13789	Better Call Saul	Lantern	AMC HD	6/20/2017
6	13183	Fear the Walking Dead	100	AMC HD	6/19/2017
7	12636	So You Think You Can Dance	Los Angeles Auditions No. 2	Fox Affiliate	6/20/2017
8	11916	MasterChef	Feeding the Lifeguards	Fox Affiliate	6/22/2017
9	11329	The Handmaid's Tale	The Bridge	Bravo HD	6/19/2017
10	10496	Home to Win	Keys to the Competition	Home and Garden HD	6/19/2017
11	10408	Jillian and Justin	Baby on the Way	W (Women's Television Network)	6/22/2017
12	10182	Dateline NBC		NBC Affiliate	6/17/2017
13	9660	Deadliest Catch		The Discovery Channel HD	6/21/2017
14	9622	American Ninja Warrior	San Antonio Qualifiers	NBC Affiliate	6/20/2017
15	8741	Little People, Big World	When It Rains It Pours	The Learning Channel HD	6/21/2017
16	8692	Better Call Saul	Lantern	AMC HD	6/20/2017
17	8185	Alone	Divide and Conquer	History Television HD	6/16/2017
18	7630	Genius	Einstein: Chapters Nine & Ten	National Geographic HD	6/21/2017
19	7598	Last Week Tonight With John Oliver	105	HBO West HD	6/19/2017
20	7409	The Real Housewives of New York City	912	SLICE HD	6/22/2017
21	7308	Fear the Walking Dead	100	AMC HD	6/19/2017
22	6990	Counting On	Spurgeon's First Birthday	The Learning Channel HD	6/20/2017

Ranking	Households	Title	Episode	Network	Air Date (GMT)
23	6926	Fargo	Somebody to Love	FX HD	6/22/2017
24	6407	Grantchester on Masterpiece	4725	PBS Affiliate	6/19/2017
25	6403	The Night Shift	Recoil	NBC Affiliate	6/23/2017
26	5868	America's Got Talent	Auditions 3	NBC Affiliate	6/14/2017
27	5836	90 Day Fiance	Jorge & Anfisa: Our Journey So Far	The Learning Channel HD	6/19/2017
28	5698	Nashville	A Change Would Do You Good	W (Women's Television Network)	6/23/2017
29	5605	Love It or List It Vancouver	Laila & Dan	Home and Garden HD	6/20/2017
30	5595	Hollywood Medium With Tyler Henry	Khloe Kardashian and Kylie Jenner, Ru Paul, Elisha Cuthbert	E! Entertainment Television	6/19/2017

Finally — to illustrate the changes in viewership across Live, Scheduled Recording, Recorded, and Playback content — the following Figure 74 puts all 4 categories together to see the difference at each different time in the viewing cycle. Some simple analysis reveals:

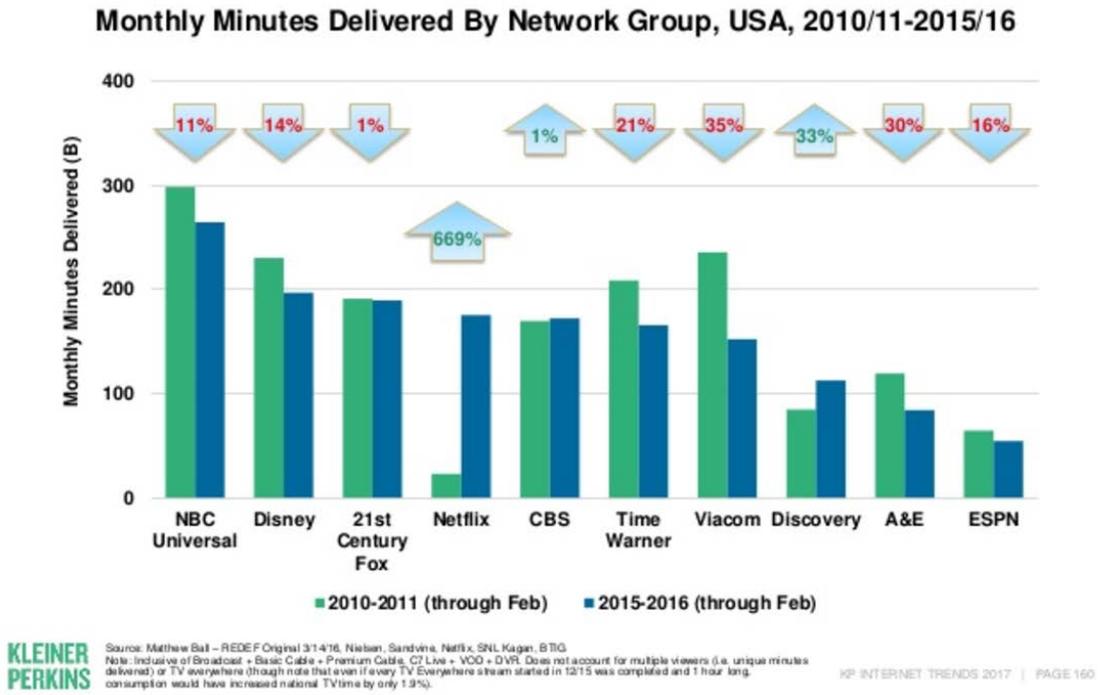
- Drama Series are watched more on DVR than live significantly — 45% to 1%
- Sport is watched live and recorded by rarely watched again
- Talent shows are scheduled to record but not watched often after recording
- Reality TV is not watched live by majority of people but is watched consistently on DVR playback
- News is watched live and rarely recorded or watched on DVR
- Movies again don't tend to be watched live much or while scheduled don't tend to be watched back on DVR playback



**Figure 74 - Comparison of What Consumers Watch By Genre — Most Frequently**

Kleiner Perkins — 2016 Mary Meeker report showed the following change in consumption of the top 5 networks — comparison from 2010-2011 to 2015-2016.

Network TV\* Minutes Delivered = 2011 Top 5 Networks -10% Average...  
 Netflix +669% Over 5 Years, USA...



**Figure 75 - Kleiner Perkins 2016 report — Monthly Minutes Delivered by Top 5 Networks — 2010-2011 compared to 2015-2016**

From the internal survey data, the use of the Elevate Portal to see what consumers are using as part of video user experience and the external public sources of estimating what consumers are doing with Pay TV and new ways to embrace their Video entertainment services in the home — the following section tries to suggest to the cable operator — how to retain subscribers, potentially grow their subscriber base — but at least create the best possible experience to shift the focus from cost — to user experience as part of the home TV experience.

## 5. A Potential Path Forward for the Cable Operator to Own the TV Experience and Create a New Value Proposition

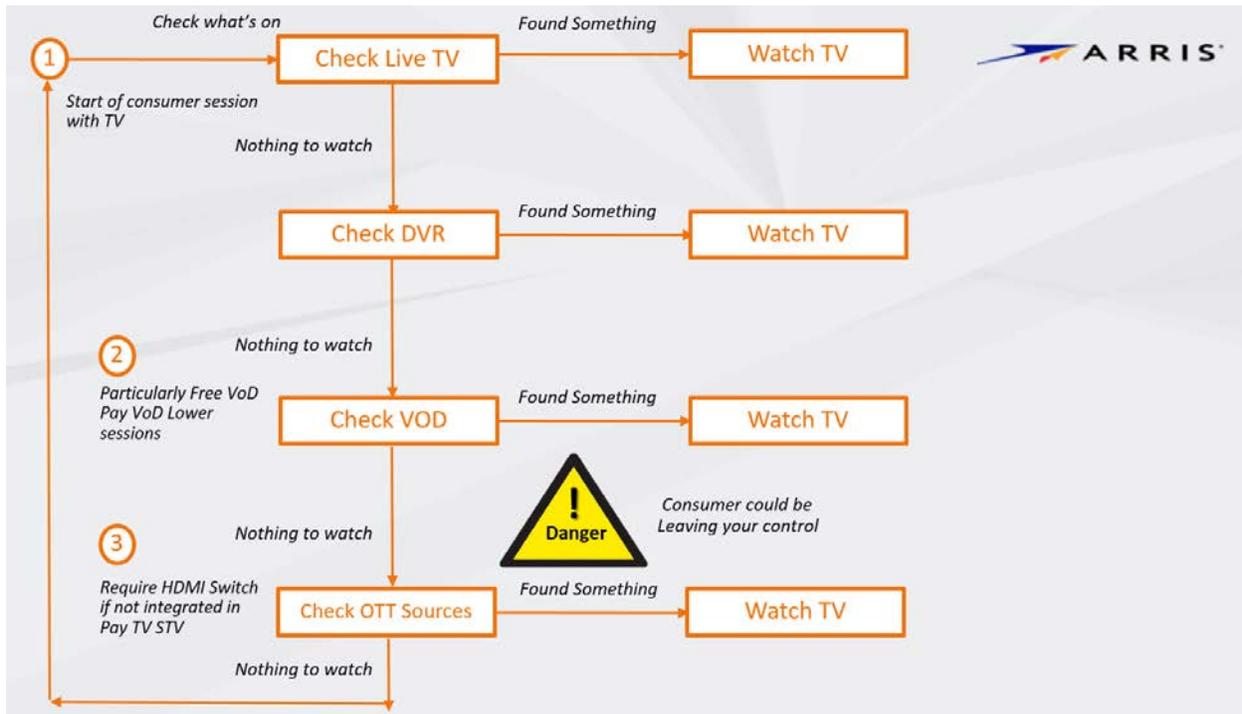
From the data analyzed to this point the following items stand out to form the strategy for the path forward for the cable operator and the next step in Video, Application, and TV experiences:

1. The value proposition for video sources is broken for Cord Shavers especially — and increasingly for existing Pay TV customers. They are actively looking at reducing the cost of Video and Pay TV services.
2. Both Cord Shavers and current Pay TV subscribers see the path to cost reduction via À la carte and skinny bundle solutions. As they typically favor 15-17 channels that they watch frequently they wonder why they need all the other channels and sources.

3. Consumers see the lease cost of the STB device as part of the overall cost problem. The awareness of the lease cost of STB is not as high as just the overall general cost issue. There is, however, a larger awareness from customers with multiple leased STB and inertia for consumers to add additional outlets to their service from the MSO. Additional outlets at no lease cost increases the value — in the cost value equation — so something to consider going forward and discussed later.
4. Customer care also registered highly in the comments from respondents in the ARRIS and Espial survey. Paying a lot of money and feeling that you are not getting good service (reliability, customer care, technician support, with a number of issues per year) is a relevant factor in the ‘Value to Cost’ equation and something that also needs to improve. This is discussed further in the section. For OTT non-traditional Pay TV Cord Shavers — their customer care issues were less concerning based on the cost spent per month on sources. The more money spent per month on OTT sources, the more likely the Cord Shaver was to be concerned with quality issues and the worry about calling poor support lines.
5. There is a large portion of Cord Shavers who really don’t watch much TV at all and value more time for activities and learning. These consumers may never be converted to traditional Pay TV bundles — but can still be targeted by cable operator creating targeted lifestyle bundles.

The first 5 items are the key items to try and address that are clearly at the forefront of a lot of paying Pay TV consumers — however, the following items also suggest that there is a formula and path forward to continue to retain and potentially grow Pay TV subscribers:

6. The user experience (a really good one) does work for distracting the consumer from the overall cost of video services. Without the modern user experience elements — it gets much tougher to retain customer when cost of their service is an issue. The satisfaction level of the user experience is only 69% overall from the survey conducted so additional work there can offset customers wanting to move.
7. Integrating the popular OTT sources is a must in retention of subscribers. This was clearly shown in the respondent’s answers and comments.
8. Having a single HDMI port for all services to aggregate to the TV is desirable on a number of levels for the cable operator in particular with this control of the consumer to the cable operators’ remote control being key to strategy going forward. The respondents to the survey were not as emphatic on the single HDMI source (many did not answer so could be converted) — but the use of a single remote control, the ergonomic improvement of only one device connected to the TV and future improvements to both the STB and remote control — will add value to the cost proposition of the consumer.
9. There are only 4 or 5 other non-traditional video sources that really count in the USA. These are Netflix, YouTube, Amazon, Hulu, and Sling TV. Integrating these solutions covers most of the desires for the Pay TV user for convenience and also potentially can lure back the Cord Shavers with skinny bundle packages.
10. Live vs. Time Shifted — while the press and analysts want to show that everything is going time shifted — the data recorded shows that Pay TV subscribers still do the majority of their viewing live — with sports and news dominating their live viewing behavior. From the Elevate analysis it was shown that live interaction with the TV was 10x higher than other inputs. This is key because the consumer see’s the live line up as an information portal to ‘what’s going on’ and typically will always start out a TV session with a ‘What’s on Live’ request to the STB.



**Figure 76 - Most Common Sequence of Engagement with TV on Pay TV system**

Figure 76 above illustrates what is the most frequent and important sequence in the consumer engagement with the video experience. As we saw from the analysis of the consumers on Elevate platform — their ‘go to point’ is always to check live TV first. They then drift to DVR when there is nothing to view and then split their time between VoD and OTT Sources integrated — Netflix for example. Consumers also value Free VoD and this retains them more on the VoD system. Consumers will drift to Netflix more for movie’s as we have seen in the data. The key thing however is that because the most popular OTT source is integrated on the same HDMI port — the consumer comes back to the MSO after the OTT session has finished and they typically browse live TV again.

11. The way OTT sources are integrated into the overall UX is also something to consider. The best solutions are when the OTT sources are integrated directly into the guide as well as part of the search and recommendation engines. This requires having access to the metadata for the OTT sources — and has been shown to be a win-win for the MSO, the OTT provider and most importantly the consumer experience. This enhances the value proposition of the Pay TV service. As we saw in the respondent’s survey on cost of Pay TV service — we saw that 14% of Cord Shavers had bought all 4 services — Netflix, Amazon, Hulu, and used YouTube with most of the users having 3 (with YouTube) OTT sources. The average cost of OTT for Cord Shavers is between \$20-\$30 — but if you extract out the customers who do not value TV as much it is above \$30 in monthly payments on average. The challenge then is to get Basic Live TV package plus similar experience or integration of these sources into the Pay TV package to bring back the Cord shavers. With the improved UX elements — the Pay TV provider can charge a higher aggregated cost — how elastic this is — is a function of providing some of the other experiential items discussed below.

12. While respondents were a little damp on the importance of multiscreen services — it was more obvious when correlating their answers with their use of phone and tablet and non-TV viewing devices. In particular, for the OTT Cord Shavers — multiscreen was of higher value — as they strove to get content on other non-TV devices.
13. Last but, not least — is the importance of the remote control and the input device/media to the selection of service on the TV. Whoever controls the remote device — controls the TV and more importantly the content on the TV. Consumers don't want to have to use multiple remotes — and will gravitate to the one that provides access to all their services. This is why good MSO remote solutions try to cover the following:
  - a. Allow the remote to perform the same functions as the Smart TV remote — via a programmed mode.
  - b. Replacing Infrared Radio Frequency solutions with RF4CE and Bluetooth Low energy (BLE) to get to a Non Line of Sight (NLOS) capability for remote control usage and to allow other services like audio streaming and voice streaming from/to the remote control.
  - c. Addition of near field microphones to allow Voice input in a very cost effective manner (Comcast XR11 in Figure 77 is an example).
  - d. The addition of hot key buttons for most prominent or promotional OTT sources (see Roku Remote - with paid for quick access buttons for Netflix, Amazon Video, Sling TV and others like Google Play, Hulu, and RDIO).



**Figure 77 - Comcast Voice Capable Remote Control and Roku OTT Services Buttons Remote Control**

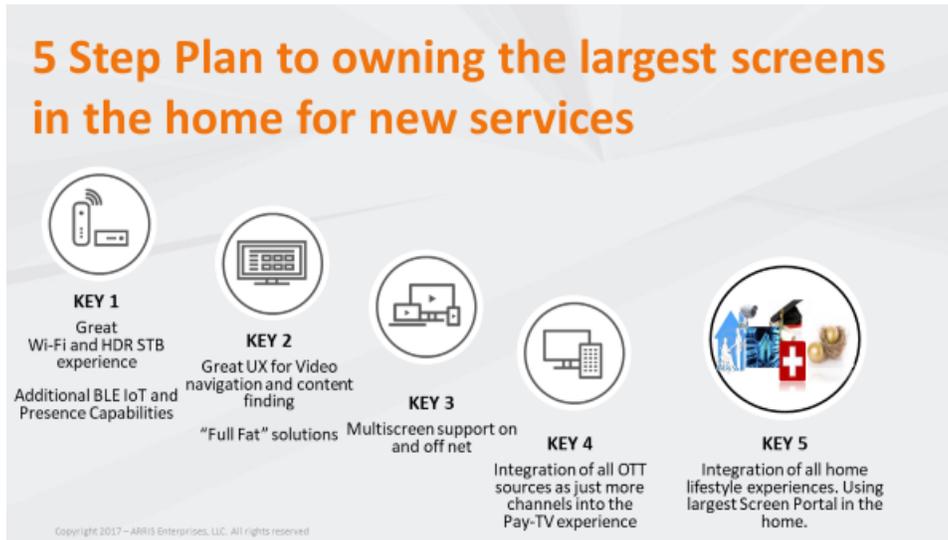
So, the fundamental questions are:

- i. Is the pursuit of Video services to the subscriber still important for direct ARPU contribution or continued control of the largest screen in the home? **The authors think the answer is, “Yes.”**
- ii. The STB — does it create a continued control point that goes beyond just the plain Video decoder and Graphics generator? **The authors think the answer is, “Yes.”** How important are these other OTT and other TV experiences to the overall strategy and future of the MSO? Figure 78. **The authors think the integration of OTT Video services and the future integration of Home Lifestyle services are the key to customer satisfaction improvements.**



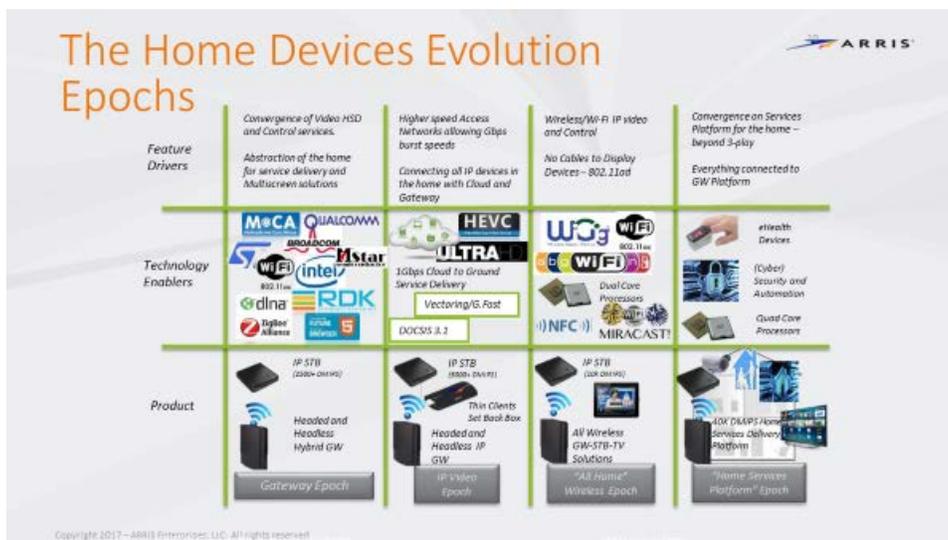
**Figure 78 - Addition of MSO STB to Smart TV Keeps Control With the MSO for All Screen Services**

- iii. Can the cost/value consumer dis-satisfaction be circumvented by the following 5-point plan as illustrated in Figure 79 below:
1. Hardware - Best Wi-Fi and STB HDR decode experience. Additional support for RF4CE and BLE for more IoT and presence driven capabilities and features to the TV. Future considerations for Voice input as well.
  2. Great UX experience — graphics and application features — with Search and Recommendations across broadest range of sources. The user experience should be ‘Full Fat’ — meaning that there is a correlation between user satisfaction and adding in more and more services to the experience. These have to be relevant, easy to use.
  3. Multiscreen support on and off network.
  4. Integration of all the most popular (and relevant) video sources into one aggregated and one HDMI Port environment.
  5. The extension of the STB control point to bring in new Home Digital Lifestyle and Experiential services around the largest screens in the home.



**Figure 79 - The 5 Step Plan to Keep Consumer Demand for Pay TV services**

Figure 80 tracks the Epoch evolution in devices and technologies to line up with the video to new service evolution of the home. Central to this is the relationship between the Cloud->GW->STB to deliver these curated Digital Life experiences.

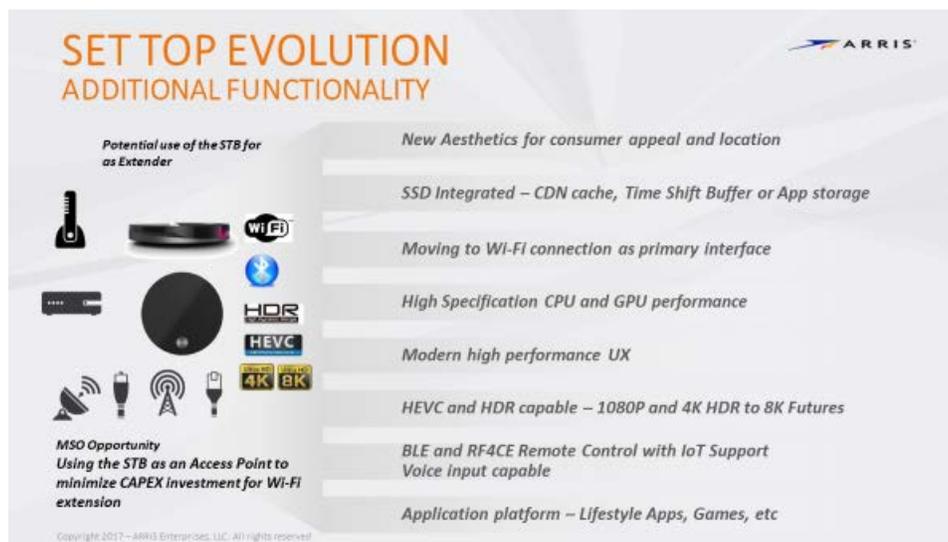


**Figure 80 - The Evolution of Home Devices Tracking Evolution of Service Epochs**

**5.1. The TV as the Home Portal and the Experiences that it Can Drive and Support — All from the Addition of an MSO STB Device**

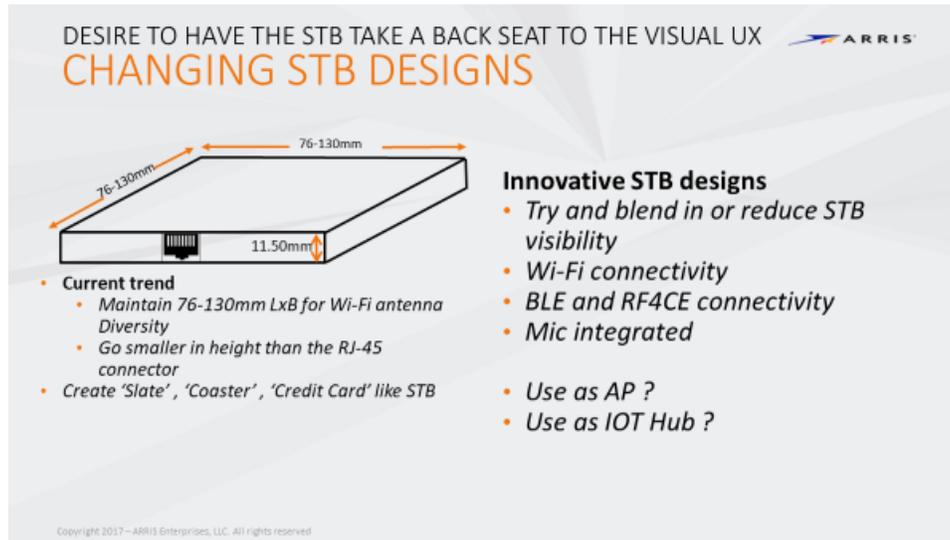
The set-top box is changing and incorporating the changes and capabilities indicated below in Figure 81. The primary function remains to decode video streams — High Efficiency Video Coding (HEVC)->4K->8K and High-dynamic-range (HDR)evolutions — however, it is also now a key demarcation point for the MSO to:

- Improve Wi-Fi — either adding excellent client Wi-Fi at 2x4 or 4x4 or allowing the STB to act as a Wi-Fi extender
- Move to SSD Storage for caching from Cloud DVR or cache points. STB can be extension of CDN
- Change the design to better ergonomics of size and integration with TV or screen
- Higher Graphics processing unit (GPU) capabilities for better Graphics performance. This drives a rich and snappy user Interface including the growing importance of finding content fast for non-Binge viewing. Consider even gaming experiences for casual gamers.
- Add BLE/RF4CE and Wi-Fi for not only Remote Control connection, but also Internet of Things (IoT) Hub capability, presence applications and streaming audio.
- Add Smart Functions — including Voice Input — Smart Assistant — and also presence based applications driven by BLE abilities of the set-top box.
- Add ability to run Home Lifestyle Applications in conjunction with the cloud
  - Home Management Apps — using TV portal as one of the output screens
  - Home Office Apps — using TV portal as one of the output screens
  - Home Health Apps — using TV portal as one of the output screens
  - Home Education Apps — using TV portal as one of the output screens
  - Home Security Apps — using TV portal as one of the output screens
  - Home Self Help Apps using TV portal as one of the output screens



**Figure 81 - The Changing Features and Shapes of the STB**

The current directions for the STB is illustrated below in Figure 82 — where the industrial design is going more towards a slate/coaster design — and trying to keep the Wi-Fi performance as good as possible for behind TV placement. This drives designs at 76-130mm in size — and the ability to get as thin or even thinner than the size of RJ45 connector. The removal of Ethernet to go to an all Wi-Fi drive with a thinner form factor.



**Figure 82 - STB Getting Small and Thinner — Yet Trying to Maintain Best Wi-Fi Performance and Thermals**

There is one new interesting increment in the evolution of the STB that we are seeing today. Figure 83 shows LG's advancement in the TV aesthetic and architecture — with the first product leverage of flexible OLED displays. You will see below the separation of the screen itself from the media processing device. Samsung and other TV manufacturers have also started to separate out the media processing from the screen itself. As can be seen the screen function now is purely for display purposes — and the separate Media Box does the following features:

- STB functionality — Decode, Central processing unit (CPU), and GPU
- Wi-Fi Client functionality
- Audio — the LG W7 shown below is an elegant sound bar as well
- BLE/IR
- HDMI and other inputs
- Providing power and control to the screen matrix

It does raise an interesting question whether the screen to Media Box interface should now be standardized like the HDMI inputs were previous standardized on more traditional TV devices something for our industry to consider.



**Figure 83 - LG W7 Flexible OLED TV System with Soundbar Media Box**

If we peek out a little further from a solution like the LG W7 we can see the natural evolution of mass produced flexible displays to the directions illustrated in Figures 84-85 below. This is the key direction that the MSO needs to track and look differently at the STB and its ability to control these screen portals. There will be primarily one of these all wall devices in the primary living area of the home and it will be almost like the ‘command center’ of the home with the screen offering the ability to display in segments for different services and in full screen mode for entertainment.

Therefore, it is important now to start re-positioning the STB as the anchor point for being able to perform these new services in the future. These additional services — experiential Digital Lifestyle services will.

The next sections will focus on the user experience and what the STB can put on the TV screen — from much better video experience to other Digital Lifestyle services.

## 5.2. The STB Generated Screen User Experience

It was not long ago we had TV UX like the one displayed below in Figure 84. It’s clear that our surveyed respondents did not favor these guys where they still had them for TV service.



**Figure 84 - Old Grid Guide TV UX Solutions**

A smooth and focused UX with compelling graphics that make the UX experience quick and also beautiful and efficient — do make a difference. An example of a concept is shown below in Figure 85. Notice the central program and the way related content — either in program additional segments or related content is shown in a new way — taking full advantage of the STB GPU capability and the ability to render graphics to 4K levels.



**Figure 85 - Compelling New UX Experience With Compelling Graphic Concepts**

Additionally, there can be new paradigms in how to do advertising with a more integrated and less obtrusive experience for advertising — including allowing program sponsorship in new in-line user friendly ways. Figure 86 below is a concept example of this.



**Figure 86 - New Ways to Advertise With Compelling Graphics as Part of Overall UX**

In the context of user experience (UX) let us consider three aspects the MSO should focus on:

- The screens used by the consumers to access content
- The approaches to integrating a broader range of content
- The ability to change the service rapidly to react to market circumstances

The follow subsections will address each of these in turn.

### **5.2.1. UX Screens Enabling the Consumer to Access Content**

When designing a UX for consumer access to content several key principles need to be considered:

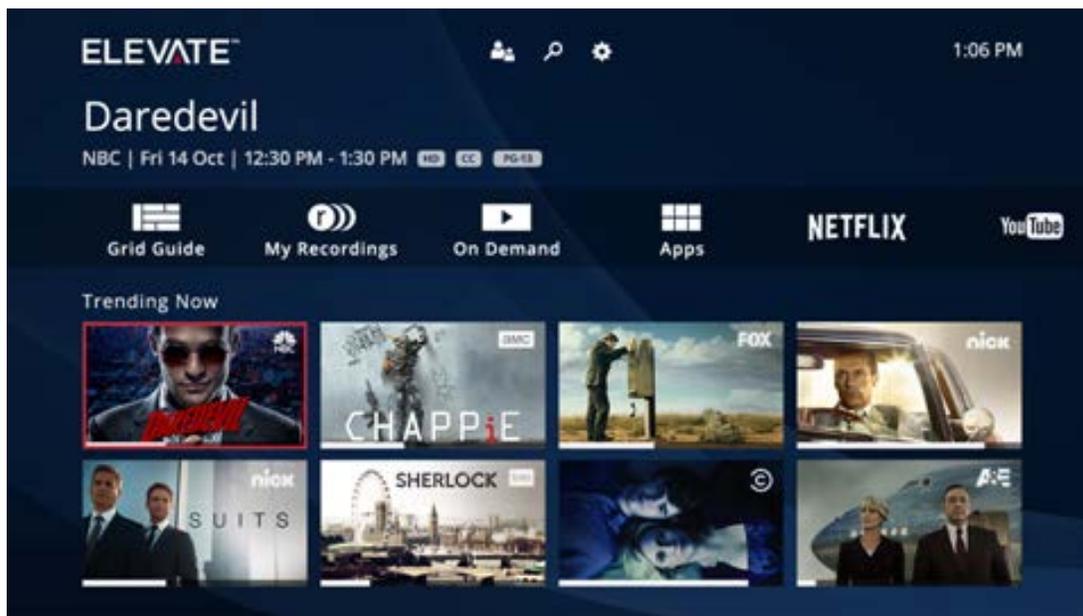
1. The UX should be easy to learn / easy to use
  - a. The user is in lean-back mode, make it very clear what user can do
  - b. Avoid clutter, refine every aspect of design down to minimal information
2. Ensure the user has a consistent experience
  - a. Make actions predictable, re-use similar patterns and behaviors
  - b. If the user can predict what is going to happen, they learn to trust the experience
3. Design for flexibility — changes will occur — plan for these up front
4. Design for usability, strong focus on the users and their user journeys
  - a. Focus on helping the user find and watch content as rapidly as possible
5. Assume users will access content across a range of devices — plan for this
  - a. 10ft experience vs. tablet vs. phone
  - b. Use as a companion device
  - c. iOS and Android expectations (e.g. long touch vs. 3D touch)
  - d. Consider device remote controls — which often have very few buttons e.g. (Figure 87)
    - i. Roku, D-Pad, Back, Options, Play, Pause, FFWD, and REW
    - ii. Apple TV, D-Pad, Back, Search, Play, Pause, Volume



**Figure 87 - Variance in Device Remote Control Options**

What this means is that the UX design is consistent across multiple devices and is flexible to change.

This tends to drive a clean and simple design like the UX from the Espial Elevate service.



**Figure 88 - Example of a Modern UX Design**

Some of the key elements of this design are:

- Easy to learn / easy to use / familiar on all screens and across all devices
- Ability to port easily across multiple devices and handle multiple input devices
- Focus on content first — poster centric, recommendations, broad range of content including OTT content.

In addition to this, today's rich metadata sources permit users to get multiple new ways of finding content.

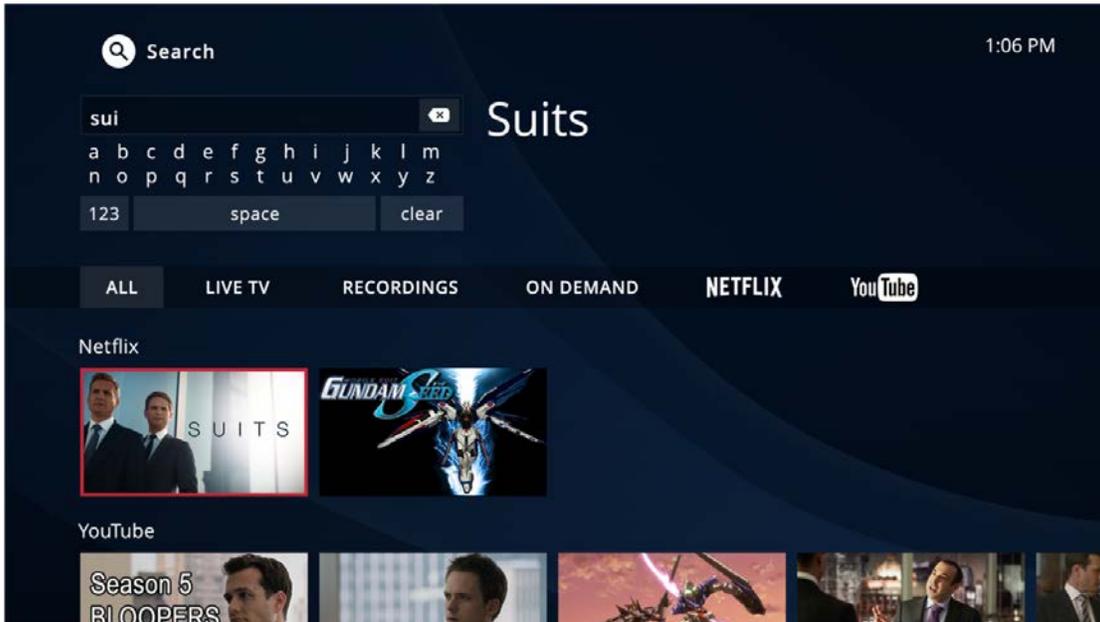


**Figure 89 - Offer the User Different Ways to Find Content**

In this example, cast and crew information allows the user to easily find information about the cast and then to find additional content with the same actors. This example also shows recommendations where the user is always offered additional relevant options with the objective of ensuring the search for interesting content is successful.

### **5.3. UX Screens Enabling a Broader Range of Content**

In the previous sections, we introduced the concept of integrating OTT content to offer and presenting this to the consumer. Often this is initially performed using an “application” model — meaning the user can access the application through the screen. The benefit of this is that the user can access the content through HDMI 1. The challenge is that finding content across live, on-demand, DVR, and applications is difficult and means the user may have to open and close several applications before finding what they are looking for. Increasingly operators are seeking to offer a much easier access to content for consumers by negotiating access to OTT metadata which supports converged search.

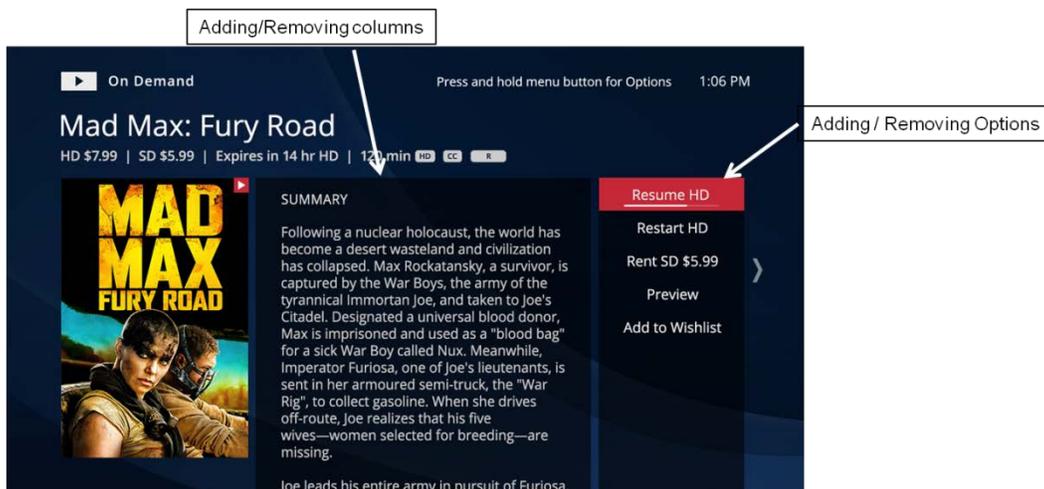


**Figure 90 - User Interface with Integrated Search**

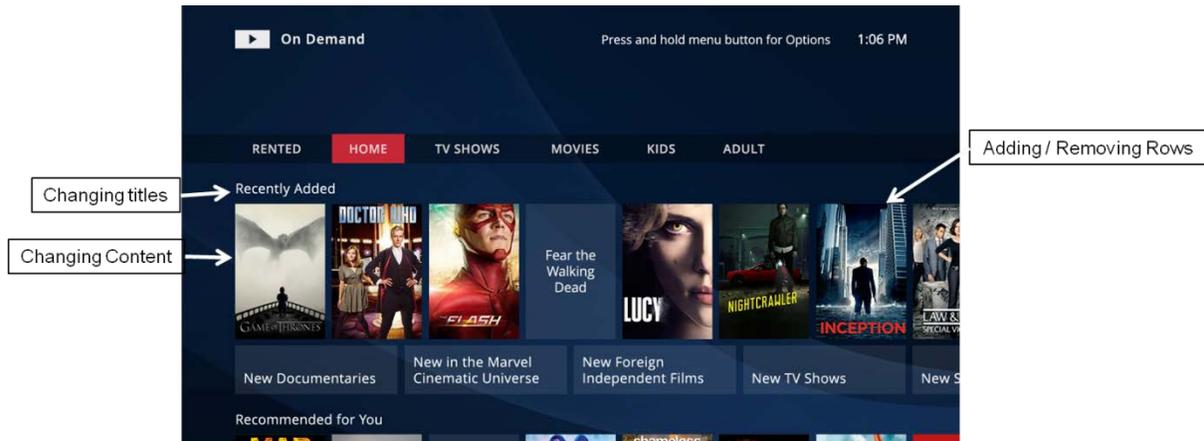
In this model, the user can much more easily find the content they want across multiple sources and directly access it. This offers the consumer much more value from the service.

#### 5.4. Ability to Change the UX Rapidly

The UX design has been constructed so that it can be rapidly changes from the cloud/back-office. Examples of these changes are in Figures 91 and 92 below.



**Figure 91 - Cloud / Back-Office Driven Back Office Changes**



**Figure 92 - Cloud/Back-Office Driven UX Changes**

Of course the UX is also changing with the size of the TV screen and the real estate you have to play with — we already have 100”+ Flat screen TV’s and as mentioned above we are moving towards larger Wall screens.



**Figure 93 - 100" LED Displays to Future all Wall Flexible Displays**

It is this flexible screen that will enable multiple view portals and will require a rethink in how to drive them from bandwidth, clean lines, and the media/set-top box to drive them.



**Figure 94 - Current - Primary TV use of Flexible OLED — Future — Wall OLED Portal With Split to Multiple Virtual Screens**

Today — the mix is something like that illustrated in Figure 95 — where we have multiple generations of screen/TV/STB combinations for different rooms in the home. We have a mixture of HD and growing numbers 4K devices. This combination of cycling TVs to different rooms and the purchase of new TV/screens and STBs will continue to evolve to the first full Wall TV additions.



**Figure 95 - Different Rooms, Screens/TVs, and STB**

This provides new services and ARPU opportunities for the MSO and some of the ideas and concepts are illustrated below.



**Figure 96 - There is an Opportunity to Generate New Experiences and Revenue Opportunities Across All Screens**

New area of Home Digital Lifestyle can be mapped to the screens in the home particularly the largest screens with the addition of MSO STB.

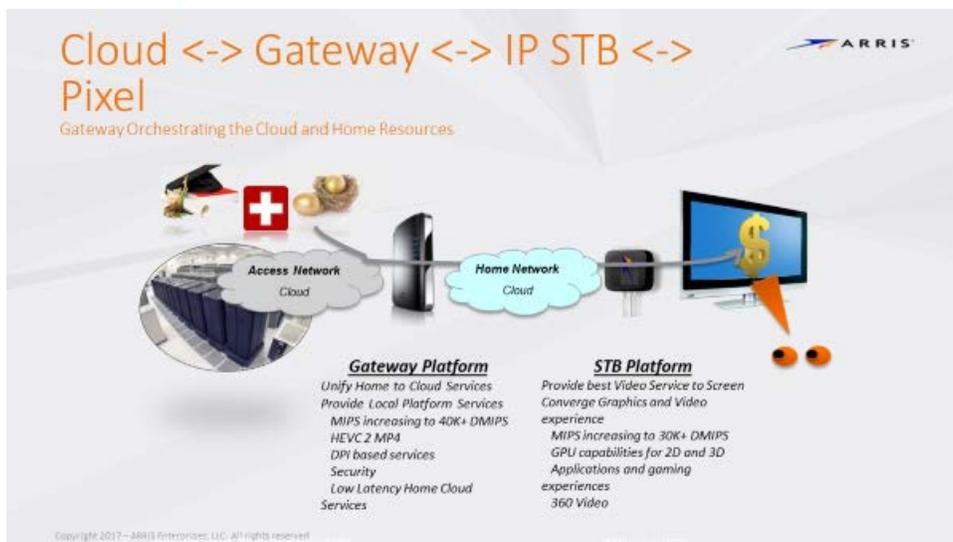


**Figure 97 - The STB Converging New Services from Video to Health Energy Management Wealth**

Figure 98 below shows that the STB is the aggregator of experience and quality delivery for many services, not just video consumption. Allowing (when appropriate for lean back experience) services like commerce (select a dress over your avatar), watch a concert live or in Virtual Reality (VR), select parallel feeds to view the house that you saw advertised, etc.



**Figure 98 - STB Providing All New Experiences on the Screens of the Home**



**Figure 99 - The STB and GW Enable a Whole New Set of Services to be Leveraged to the Largest Screens in the Home**

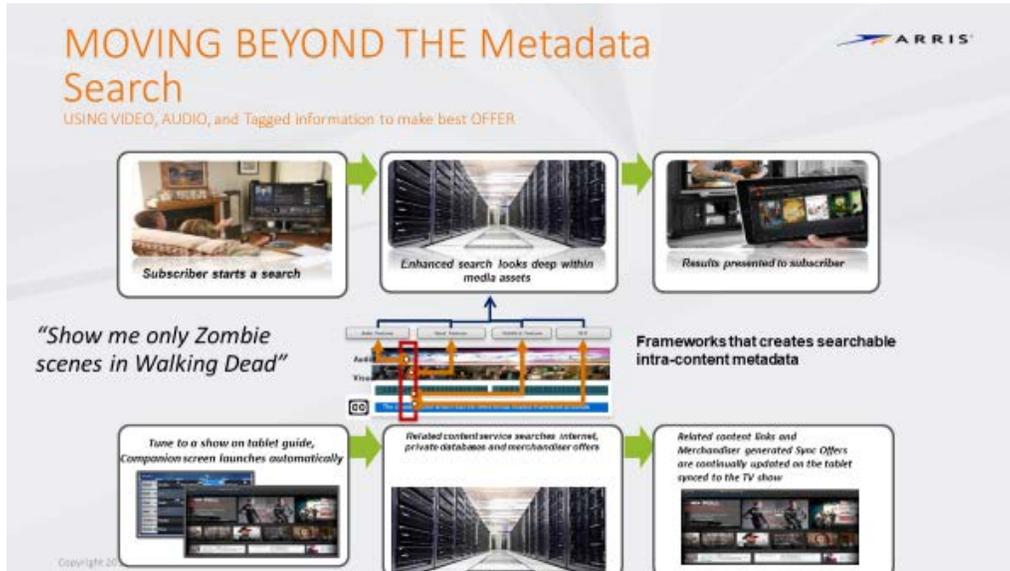
The synchronization between the 1:1 devices (phone and tablet) and M:1 of the large TV — is also an opportunity for leverage and favor the provider of the STB. Figure 100 below shows the use of tablet/smart phone to provide offers for the big screen as well as notifications across both devices. We have already seen how video casting selections from the small screen device to the large screen device is another part of the convergence of screen usage in the home.



**Figure 100 - Use the Small Screen to Send Recommendations and Offers to Show on Large TV Screen**

New additions to recommendations and search can be implemented to allow consumers to find not only full show content, but also specific items within a show or across multiple shows. Not only the metadata, but also the actual audio and video content can be digested and added to improved navigation and viewing experience.

The example below shows a framework that has been put in place to allow the ability to index video/audio content to the point where you can ask for only content in AMC walking dead series that contains zombie scenes! This is a new powerful way to correlate content sources and even to leverage social media trending items.



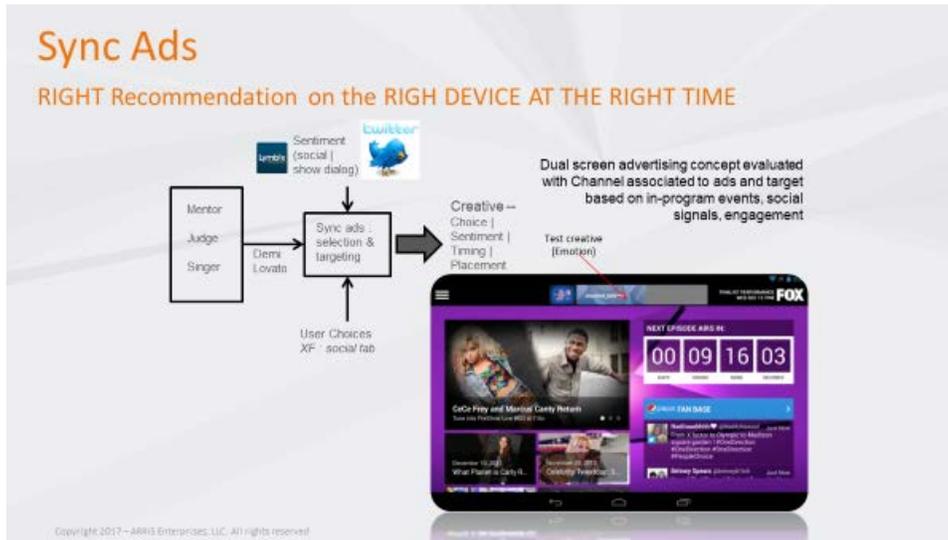
**Figure 101 - Media Analysis Framework — Allowing Very Granular Search on Words, Video Scenes and Other Tags**

As we showed above, even advertising can be enhanced to be a positive source of information for the consumer vs. something that people actively seek solutions to skip. It is clear that the correlation between small screen (personal) and TV screen (communal) is a key part of new advertising directions that users can see as beneficial to their commerce experience.

Figure 102 below illustrates some of the concepts in the advertising space to synchronize small and large screen. It can leverage new technologies such as parallel feeds and control between small and large screen — where the small screen (mobile/tablet) as a personal device can react with the context of what is happening on the larger screen in communal multi-person mode. This is very powerful and an extension of the STB presence capabilities.

The Cloud can recognize the content being displayed on the large screen at the same time using presence based features that could be added to the STB — also control the content on the tablets or phones present in the home. The cloud also knows if MSO application is running on the companion device and use this to send notifications — update context of display etc. This can be extended to other services — examples include

- Recommendations and next content to watch — can be pushed to the secondary device
- IoT applications can be synchronized across the STB/TV and the companion small screen device(s)



**Figure 102 - Multiple Screen Synchronized Advertising**



**Figure 103 - New Media Control Plane to Allow Synchronized Parallel Activity Across Main TV and Companion Devices**

New services can be built up from the parallel feeds architecture — where for example friends living in different locations with the same MSO — can order a movie together as a group — using a “Together TV” concept — where they can also open audio connections and also share social media comments. This service may appeal to Cord Shavers as they share a lower cost when group sharing the watching of video content.



**Figure 104 - Group — Together TV — Offers New Social Ways of Watching TV**

Integrating social media into the TV experience has been somewhat clunky to date. We know that typing and using lean forward applications like Facebook does not work and small screen devices are better. We do know that Twitter tags and feeds are now part of trending content that people want to share and participate in — so finding ways for users to link segments of video content they see on screen — with the ability to post and comment quickly seems to be of value as people feel compelled to give their opinion on a specific short form segment of video or comment made. There is still work to do to find the best way to integrate social media on the large TV screen (notification for sure) but again using parallel feeds to sync to both large screen and companion device may be the answer.



**Figure 105 - Social Media Applications Need to be Split to Work on Large and Small Screen in Parallel**

Personalization of the UX with the ability for the consumer to set their home screen feeds — and allow background images and streamed feeds — will become more important as we get closer to the all wall TV. There is already a lot of investment going into adding status (weather, stocks, your orders) to smart assistants and routers — however, there is already a TV driven by a STB in the home — so an

opportunity to make the existing TV through STB drive these information feeds for the home owner. See Figures 106 & 107 that show personalization tools concepts for the UX widgets including background and streaming feeds and menus.



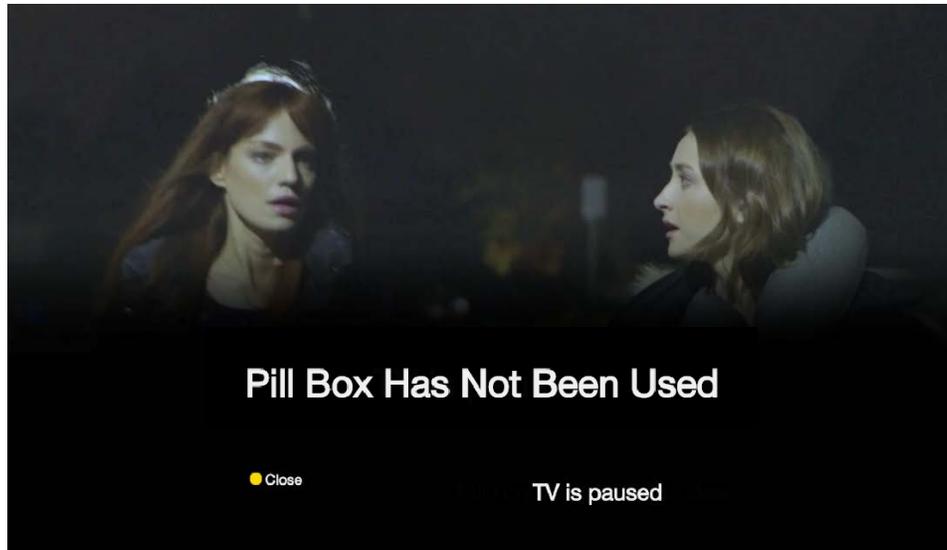
**Figure 106 - Personalization Screens and Menus for Dad**



**Figure 107 - Personalization Themes for Halloween**

Another simple example is to leverage the STB (with BLE) for health applications. Most medical devices and wearables have BLE connectivity and they connect to BLE hubs to send patient readings to a secure cloud care portal. The STB acting as this secure hub seems like a logical extension of potential STB capabilities — for aging in place applications as many elderly or infirmed people spend so much time in front of the TV. This allows simple but powerful applications to be built — to allow reminders to patients to take readings, prompt multiple times, and even pause TV use until vital daily readings are taken. See

Figure 108 below — where a simple notification to remind stay at home patient to take their pills (smart pill box has not been opened) using TV notifications.



**Figure 108 - Health Notification Example of Patient not Taking Their Daily Pill**

Finally — a quick comment on the potential new ‘other’ STB — the VR Renderer — and the associated Head Mounted Display (HMD). There are new experiences the HMD offers particularly for immersion. However, there does seem to be value in also synchronizing the largest flat screen with VR and AR experiences.



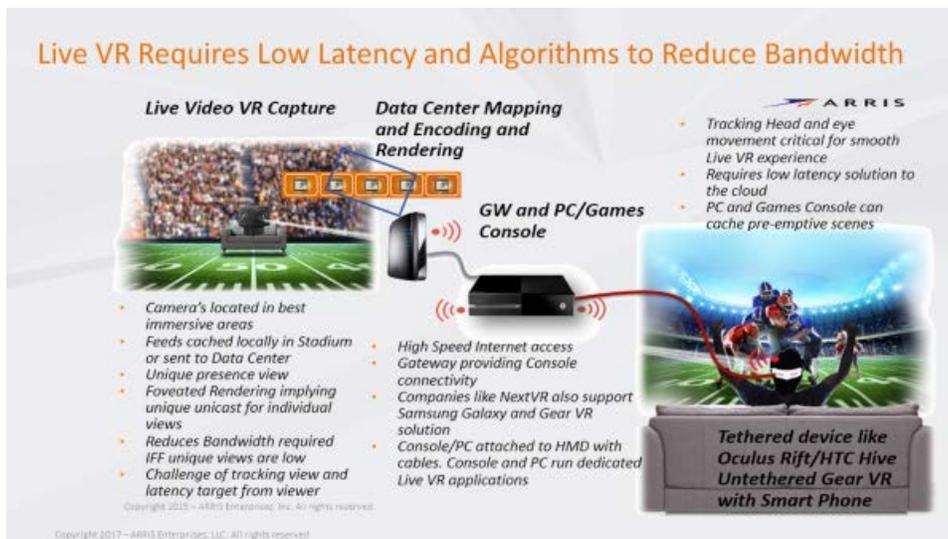
**Figure 109 - The Technical Parameters that Must be Met for Full Immersive 4K VR**

The blend of live TV and HMD experience — switching back and forward in the HMD (watch the live event and the specific thing you want — and then switch to live for replay or zoom in) — is an experience that enhances the VR live viewing experience. One consideration that will be played out is whether in a

home with one VR HMD live viewer — is it a worthwhile application — to also have the viewer’s HMD view synchronized to the TV screen using the 360 degree videos capabilities of the current generation of STB SOC’s. This may be an application that gives some shared experience in the home — allowing a single HMD wearer to also navigate the 360 experience for others — Figure 110/Figure 111.



**Figure 110 - Will Live VR Bring the Best Seat In the Sporting Event to our Living Room Chair?**



**Figure 111 - Low Latency Networks and Low Latency Connectivity in the Home via Gateway and Rendering Device Key for Live VR**

Should the MSO consider being the VR aggregator and renderer for a new class of entertainment that is both HMD and TV based? A potential VR home architecture is shown below — in Figure 112 — where future STB add to their ability to do 360 video but also perform full stereoscopic VR rendering to HMD as well.



**Figure 112 - Could the Gateway and Future VR Rendering Capable STB Using Wi-Fi and 60 GHz be a Future Solution?**

## Conclusion

The Pay TV sector has a bright future ahead of it with consumer desire for entertainment at the right bundle and price and the right user experience. While consumers will always be looking for a better deal and value for money — they will stay with the provider who can offer them a path to a convergence of not just “TV”, but a new convergence of all home experiential services. As the screens change to get larger in the home — and as the interaction with the large screen home portal and personal small screen devices — starts to integrate and find its killer applications — the device that converges these experiences to the pixels remains a key part of the MSO architecture and devices.

It is clear that the home gateway and Wi-Fi (and possibly 60 GHz) remain the key transport to connect cloud services and experiences to the home — and it is also clear that the device that terminates them and also aggregates them into a simple and cohesive user experience on the largest screens in the home — is also key. This device is the set-top box, though its name does not fit its future role in the home. Inserting this device in front of the screen — ensures ownership by the MSO of all the experiences, Wi-Fi quality, and the overall quality of the consumer experience. Letting this end point go to a third party device or application on a third party device — seems to give the control up — before the real convergence happens.

It is also key that unless there is an investment in cloud services to bring more and more of the new services to the larger screen pixels then the users — will continue to see the cost of their service — as the video experience only. The fundamental message of this paper and the surveys done show the path forward for the MSO as

- Continue to invest in your own physical set-top device
- Expand its role as a termination of all services to present to the largest screens in the home
- Develop the next level of new services around the leverage of the largest pixel real estate, easiest to use interface — the remote control — and even add smart assistant voice inputs

- Look to drive things like:
  - Customer Self-Healing — why not use TV to take people through problem resolution since 50% of all customer calls require customer education?
  - Health, Commerce, Security and Home Automation, Energy Management, and other services — all of which have reasons to be on the largest screen — even if for notifications
  - Advertising — rethink how it's done with large screen and synced to small personal screens
  - New video experiences like Together TV, with live streaming from new live streaming sources
  - Live VR synchronized to the largest 360 degree viewing capable device
  - Presence based applications — detecting consumer's presence to simplify and improve automated decisions and context for decisions

The set-top box and the user experience it drives remain the key element for retaining customers and growing with them as we see screen technology evolve with flexible wall screens being added to the home. While it may not be a “set-top” box anymore — maybe one day it will look like the image below where it's integrated into every room as the wireless connectivity micro-node serving all video and wireless and experiences to that room. This is the control point to ensure that these services get delivered e2e by the MSO and not by some third party.



Figure 113 – Future in Room MicroNode Media Device

## Abbreviations

BLE	Bluetooth Low energy
CPE	Customer Premises Equipment
CPI	Consumer Price Index
CPU	Central Processing Unit
DBS	Direct Broadcast Satellite
DIY	Do It Yourself

DOCSIS	Data Over Cable Service Interface Specification
DVR	Digital Video Recorder
FCC	Federal Communications Commission
FTA	free-to-air
GPU	Graphics processing unit
GW	Gateway
HD	High Definition
HDMI	High-Definition Multimedia Interface
HDR	High-dynamic-range
HEVC	High Efficiency Video Coding
HFC	Hybrid Fiber-Coax
HMD	Head Mounted Display
IoT	Internet of Things
MSO	Multiple System Operator
MVPD	Multichannel Video Programming Distributor
NLOS	Non Line of Sight
OTT	Over the top
QAM	Quadrature Amplitude Modulation
RF4CE	Radio Frequency for Consumer Electronics
S/W	software
SD	Standard Definition
STB	Set top box
UI	User Interface
UX	User Experience
VoD	Video on Demand
VR	Virtual Reality
YoY	Year-over-Year

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