

FTC Fall Technology Series: Smart TV Workshop
December 7, 2016
Segment 1
Transcript

KEVIN MORIARTY: Good afternoon. On behalf of my colleagues here at the Federal Trade Commission, I'm happy to welcome you to our workshop on smart TV, which is the final installment of the fall technology series. My name is Kevin Moriarty. And I'm an attorney with the Division of Privacy and Identity Protection here at the Commission. And my co-organizer for today's workshop is Megan Cox, who's also in the Division of Privacy and Identity Protection.

Before we get started with our program, I need to review a few administrative details. Please silence any mobile phones and devices. If you must use them during the workshop, please be respectful of the speakers and your fellow audience members. Please be aware that if you leave this building for any reason during the workshop, you will have to go back through security again. Please bear this in mind and plan ahead, especially if you are participating on the panel so we can do our best to remain on schedule.

The restrooms are across the hall just outside the auditorium. The plaza east cafeteria is located inside the building. So you can use it without going through security again. And it is open until 3 PM. Most of you have received a lanyard with a plastic FTC event badge. We reuse these for multiple events. So when you leave today, please return your badge to the event staff.

If an emergency occurs which requires you to leave this room but remain in the building, follow the instructions provided over the PA system. If an emergency occurs that requires the evacuation of the building an alarm will sound. Everyone should leave the building in an orderly manner through the main 7th Street exit. After leaving the building, turn left and proceed down 7th Street and across the East Street to the FTC emergency assembly area. Remain there until instructed to return to the building. If you notice any suspicious activities, please alert building security.

Please be advised that this event may be photographed, and it is being webcast and recorded. By participating in this event, you are agreeing that your image and anything you say or submit may be posted indefinitely at ftc.gov or one of the Commission's publicly available social media sites. We're happy to welcome those watching via the webcast. We will make the webcast and all workshop materials available online to create a lasting record for everyone interested in these issues. For those of you on Twitter, FTC staff will be live tweeting today's workshop at the hashtag #smartTVFTC.

Both panels of the workshop today will leave time at the end for questions. You can ask questions. You can submit questions by tweeting them with the hashtag #smartTVFTC. Or you can fill out a comment card, which was available at the desk walking in. Or Matt Smith will be patrolling with blank comment cards that you can get from him. And he'll also pick up completed comment cards with questions on them and will bring them to the moderators.

Finally as a reminder, the public comment period will be open after the workshop through Friday, January 6th, 2017. I urge anyone giving thought to these issues to submit comments by visiting our website. Lastly I want to thank our panelists for taking part today. We are grateful for your time and consideration of these evolving technologies and consumer issues.

Aside from the folks you will see onstage today, this program will not be possible without the great work by Crystal Peters, Fawn Bouchard, and Bruce Jennings, alongside our paralegal support today from Carrie Davis, Matt Smith, Jonathan [INAUDIBLE], Bianca Morris, Joseph Kennedy, and Jennifer Yadu. Thank you all. Now it is my honor to welcome the director of the FTC's Bureau of Consumer Protection, Jessica Rich.

[APPLAUSE]

JESSICA RICH: Well, good afternoon. And welcome to the Federal Trade Commission's workshop on smart TVs. This is the third installment of the FTC's fall technology series, following our events on ransomware in September and drones in October. We thank you for joining us in person and through the webcast. Just got to get this mic right.

So consumers are increasingly turning to the internet rather than traditional television services for video entertainment. Long gone are the days of watching only the major TV networks. And even cable is fighting for its share of the pie. Still adjusting the microphone here.

Today we're also watching Netflix, Hulu, YouTube, Amazon Prime, Crackle, Vivo, iTunes, Google Play, and many others. And I'm sorry if you're in the audience and I left you out. Millennials in particular seem to be migrating to these newer services at a very rapid pace.

Among those that watch internet video, a full 40% of time in front of the television is spent on these streaming services. And 30% of that time is spent watching ad supported streaming services such as YouTube. Streaming devices like Apple TV or Amazon's Fire TV deliver these internet services directly to consumers' TVs rather than their computers.

Manufacturers have added internet connections to their TVs-- now called smart TVs-- to allow them to display these streaming services. And now the innovation is happening in the other direction too, with purveyors of traditional TV services providing their subscriptions over the internet. For example, Comcast's Xfinity app allow subscribers to display their traditional TV subscriptions through streaming devices like Roku.

These changes provide enormous benefits to consumers. We're all using these devices. Consumers now have access to a diverse array of content from a variety of TV providers. Internet connectivity also permits fine grained audience measurement, which can help niche video content programmers get ad dollars for programs that may not otherwise have registered as popular using more blunt measurement tools. The tracking of video content also allows services like Netflix to record where you are when you pause a video on one device so you can start it up on another.

However smart TVs are also testing the privacy expectations that consumers developed in the era of traditional television. Many consumers have a fundamentally different relationship with their TVs than with their computers. From the moment we bought our first personal computer, there was data collection and data driven advertising. Internet use and online data collection evolved simultaneously. And consumers have come to expect some level of data collection when they use their computers.

By contrast the television industry did not evolve with data collection as a critical component. Broadcast signals traveled to households anonymously over the airwaves. Unlike the internet, which requires two way communication, consumers' TV viewing information the something that remained inside the home. So it matters whether consumers think of their smart TV as a computer or a television, and whether they recognize that today it may be both. The incredible number of choices consumers now have in their TV viewing also raises privacy issues.

In the 1950s when TV first became prevalent in American households, consumers could only watch two or three channels. As a result there wasn't much to learn about individual consumers from their TV viewing habits. With the arrival of cable and VCRs in the '70s and '80s, consumers had a variety of choices about what to watch on their TVs. And the choices they made became much more interesting to marketers.

This information also became much more sensitive as it could provide insight into consumers religious beliefs, political views, and other potentially sensitive topics. In the 1980s Congress recognized that consumer viewing habits were sensitive and passed two laws to protect them.

In 1984 Congress enacted the Cable Privacy Act. Then in 1988, following the disclosure of Judge Robert Bork's video rental history by his local video shop to a reporter-- some may remember this-- Congress enacted the Video Privacy Protection Act. These statutes were drafted to apply to the media providers of the day-- cable companies and video rental stores-- and they required consumer consent before any of these entities could control disclose personally identifiable viewing information. I hope panelists today will address the implications of these laws for smart TVs.

So what is the role of the FTC here? One role is to highlight the benefits and risks of smart TVs, which is what we're doing here today. Another role for the FTC is to bring law enforcement actions against manufacturers of smart TVs that engage in unfair or deceptive practices. We've been watching this area since its infancy. And we've made clear that basic consumer protection principles apply, just as they do in other sectors.

For example, back in 2001, a US Senator asked us, the FTC, to investigate the data practices of TiVo following a public report that raised concerns about the types and amount of information that TiVo boxes were collecting. In a letter to the senator, our then Chairman Pitofsky stated the collection of customers' TV viewing information in a manner that's personally identifiable could raise serious privacy concerns, especially if the practices are deceptively represented. The letter declined to take action, concluding that TiVo either received consent or collected and stored information in a manner that was not personally identifiable.

More recently in a comment to the FCC, we highlighted the FTC's potential role in preventing unfair or deceptive privacy practices in the set-top box marketplace. The FCC had proposed a rule making-- I'm sure this crowd is very familiar with this-- to require cable and satellite TV providers to allow access to their content by third party set-top boxes. As part of its proposal, the FCC suggested requiring the third parties to commit to abide by the same statutory privacy requirements that applied to the cable and satellite companies.

In our comment, FTC staff stated that if the set-top box companies made their commitments to the public, the FTC can enforce them under its authority to prevent deceptive practices just as we enforce other commitments companies make to consumers.

Now let me turn to today's terrific program. This afternoon, we'll explore the benefits and risks as the internet and television continue to merge. And we've got a number of top flight panelists to help us do that. We'll start with a presentation about the marketplace from Justin Brookman, policy director of our Office of Technology Research and Investigations.

Then our first panel will examine the current and potential benefits of advanced analytics in the smart TV ecosystem and efforts to provide transparency and choice. Finally the second panel will examine consumer protection concerns and how these issues are addressed by the current regulatory landscape.

Before we turn to Justin's presentation, I've got another round of thank you's. I want to thank staff from the FTC's Privacy Division and Office of Technology Research and Investigations for their work in organizing today's hopefully amazing event. In particular, Kevin Moriarty, Megan Cox, Justin Brookman, Joe Calandrino, Aaron Alva, Tina Young, and Ian Klein. And I'd also like to thank all of the speakers who are here to share their insights. So thanks again for joining us. And enjoy the program.

[APPLAUSE]

JUSTIN BROOKMAN: Thank you very much, Jessica. Thanks to all you all for coming out today and for watching on the webcast. Joining me on stage today is going to be Ian Klein. Ian Klein is a grad student researcher at Stephens. He worked with OTEC this summer and spent a lot of his time in our tech lab looking specifically at smart TVs.

So a quick summary of what I'm going to cover. First I'm going to generally describe what smart TVs are, what they can do, and some of the different types of entities in this ecosystem. Next, I'll tee up for discussion some of the consumer protection issues that we are specifically thinking about here at the FTC with regard to smart TVs, focusing primarily on privacy and security. That may thinking about a couple others as well.

And then Ian is going to walk through some of the research that we did this summer and then on into the fall actually looking at smart devices in our lab for first, what they disclosed to consumers about data collection, what sort of controls and defaults were available. And then the data flows themselves will be actually observed in the lab about the TVs transmitting information back to manufacturers or to third parties.

So what is a smart entertainment device? When we say smart TV or smart entertainment device-- and I'll probably use those terms interchangeably-- what we're generally talking about is something that allows a television to take advantage of internet connectivity, either to display internet content through the applications or to add features to broadcast television like easily sharing screen shots on social media.

For at least a decade, consumers have been able to access streaming content over the web. YouTube was founded in 2005. Netflix started streaming video around the same time. At least in my experience, it was a gaming consoles there were some of the first devices that, at scale, let consumers access internet content on their TVs. I remember using mind Nintendo Wii to access Netflix in 2010. So these sort of things have been around for a while.

So that the potential benefits of smart TVs, Jessica mentioned some of these. And I think a lot of times, they're pretty obvious. First and foremost, to get access to just an order of magnitude more content on a smart TV, and putting user generated content on open platforms like YouTube and the web. I think this democratizing effect is good not just for consumers, but also for artists who have more opportunities to reach an audience at a larger screen format.

Many smart entertainment devices also are developing interactive features to allow viewers to engage more with what they're watching. It could be voting in online polls, learning more about actors in a particular scene if you're curious. If you're like me and you miss VH1 pop up video where they would occasionally insert little facts and snippets in the screen as you're watching, this could be a desirable thing.

Personalized recommendations, if you watch and maybe rate things on a particular service, it can develop a knowledge base about you. It may offer recommendations for shows or movies you might not otherwise have known about.

And then these last two are alternative options depending on how these platforms evolve. One, it may just be that people see fewer commercials on streaming applications. A lot of streaming services are paid today. There was a recent study saying that kids today actually watch 150 fewer hours of commercial, because of relying on streaming content instead of Saturday morning cartoons.

Alternatively if the ecosystem does become more ad supported like the web, perhaps consumers might start paying less for content. Or maybe there will just be clearer options that consumers can make a choice about what sort of experience they'd prefer.

So the focus of a lot of today's workshop is going to be on some of the new ways that smart devices can collect and leverage consumer data. So this is a very high level summary of some of the reasons that companies might want to take advantage of increased data collection.

Some of them, I think, are fairly obvious, others maybe less so. Delivery is probably the most straightforward. When you ask a service to show you a movie, they're obviously going to be able log the fact that they showed it to you. Research and product improvement, a service might want to know how you're navigating a menu to see if it's intuitive for consumers. They might want to

learn why the device might crash, all the name of making the service more efficient and work better.

Measurement is a big potential reason for data collection. We're seeing new models for recording and reporting what content is being watched. This can be challenging as entertainment options get a lot more diverse. That's, I think, a good thing for consumers. But from a ratings perspective, when the offerings are more diffuse, it can be more challenging to get reliable ratings.

Companies that engaged in targeted advertising online since the '90s, like Jessica was talking about, for a variety of reasons developed them so much slower for television advertising. For at least a decade, we've been reading press reports about bringing behavioral and other targeted ads to TV. We're starting to see some of that. I think we'll probably talk about that in some of the panels. And then cross device tracking, we'll talk about that a little more specifically later on.

So how does tracking on smart devices work? To visualize this, I've constructed a smart entertainment den here. I'm going to walk through some of the various entities and talk about some of the data use cases, and some of the related privacy concerns as these devices get a little bit smarter.

So we'll start with smart TVs. Now historically, TVs have just been a passive screen that just delivered the signal sent from your cable box. Now in addition to making more entertainment options available, smart TVs, in many cases, have the ability to actually monitor what you're watching on the screen in new ways and potentially report that back to the manufacturer or to others.

So for example, the last several years, a number of smart TV and manufacturers have embedded chips that allow the TVs to engage in automated content recognition or ACR. And what they do and one way to do it is they can periodically take little snapshots of what is playing on the screen and then send it back to their servers or maybe to a vendor services for them to try to figure out what it is. And so in this way, manufacturers sometimes have the ability to log all the things you're watching on your TV, whether it's delivered by a cable box, an application, or even potentially a DVD or Blu-ray disk.

Cable providers have long known what shows they delivered to the households. Increasingly they're looking for ways to leverage this and other data to more precisely target content and ads. Traditionally when a cable provider showed you an ad, it was the same to everyone in the geographic region.

Now newer cable boxes have the ability to deliver specific ads targeted at a household by household basis. This is what people refer to as addressable TV. It's probably something we'll hear more about today. This could be based on cable viewing habits, could also be based on offline data. So cable providers tend to have names and addresses and emails with their customers. An advertiser could simply provide the cable provider with a list of who in the area they want to reach. And then the cable provider could deliver a specific addressable ad just to those households.

Smart peripherals, so even if your TV is not particularly all that bright, you can sometimes access streaming content through other peripherals like smart Blu-ray player-- that's what I use-- a gaming console, or a dedicated streaming device like Roku in this image. And these really range in how much they facilitate data collection and use. Some, like my old Wii and I think like my current Blu-ray player, they don't really seem to be designed with that in mind. Others have a really fully developed ad framework, including standardized device advertising identifiers for a third party ad ecosystem.

And then smart TVs and the peripherals then allow us to access a wide variety of applications. These are like websites and the web, or applications or apps on a mobile device. And these apps can use data for a variety of operational purposes. They also might embed advertising or analytics from third parties. And those companies may have the ability to generate user profiles, potentially across different applications, potentially across different platforms and different devices.

And so here is an image based on the classic LUMAScape. These are some of the companies that may be engaged in data collection in the smart TV ecosystem. This was put together by Wide Orbit, which is a company that's trying to take some of the internet targeting techniques and applying them to television. There are other companies who have made similar graphics. I know TubeMogul has one as well. And I include it here to show you that this is not as intricate as the web space. The web LUMAScape has maybe an order of magnitude more companies. But there are a lot of ad tech companies are definitely interested in getting involved in this phase.

Some of these companies may not just partner with applications. It could also be smart TV companies who have to rely on an ACR vendor or maybe an ad or analytics provider. It could also be cable companies too. Measurement companies like Rentrak are often embedded at the set-top box level.

So what can be collected about users? One initial question is how do companies keep data on users over time? Do they create and use cookie files like you see on the web? Can they leverage persistent device identifiers, like you often see in the mobile operating systems? Do they have to rely on other things like IP address? Obviously things like viewing habits are one of the things that might be interesting to marketers and measurement firms.

There might be other sensors on the device as well. So a lot of smart devices have cameras and microphones built in for video calling or for voice commands. There might not always be a commercial reason to access that data but access to those sensors could potentially constitute a sensitive security risk that vendors may have to consider. And we'll talk about security specifically a little bit later.

A smart device might also be able to probe a local network to see what other devices are connected to it. This could be for cross device tracking. It could just be looking for Bluetooth speakers or some other plug and play device to make consumers set up a lot easier.

Companies also might be interested in trying to tie what you do, what you watch on TV to offline data about you. So for example, someone could use a data broker service to look up

demographic attributes associated with a name or email address, or even potentially an IP address in some cases, to try to maybe target ads that might be of more interest to a user or maybe just to assign that household a particular demographic profile for measurement purposes.

They also might try to tie viewing data to offline data to see if an ad was effective. If I see an ad on TV and then go to the store two days later to buy that, the marketer might want to know that, to know that their ad was effective.

And then offsetting all that, what sort of countervailing policies and procedures are in place to mitigate some of the privacy concerns around this new data collection? How identifiable are the data sets? Are there data deletion schedules in place? What sort of controls do users have to make affirmative choices about how their data is used?

And so just like some companies are interested in correlating smart TV data with offline activity, companies are also interested in linking TV data to what you're doing on other devices. So some of y'all may have been here last year around this time for our crossed device tracking workshop, where we went into a lot more detail about how some of these things work.

I think it's fair to say that this is certainly a focus of a lot of ad tech companies now that user activity is fragmented over more and more devices. Some are certainly very intuitive, like the example that Jessica gave about watching a Netflix device across different devices and picking up where you left off. There's also a lot of potential third party use cases.

Re-targeting is something that we've seen a lot online over the past few years. If you abandon a product in a check out online shopping cart, you might see that product following you around on the web in ads the next few days. Companies are looking to find ways to incorporate that sort of targeting into smart devices. Purchase attribution, similar to merging offline data, if you see an ad on your TV and later by it on one of your other devices, people might want to know that. And then just linking behavior across devices can just give a broader, more holistic perspective into the user.

There are a few different ways this can be done. We're not going to get into them in any great detail. The methods people generally refer to are probabilistic or deterministic. Probabilistic is based on similar attributes that devices share, if they maybe share the same local network or location. There have been industry reports of smart TV apps that are serving ads to users based on the browsing behavior on another computer sharing the same IP address. Alternatively this can be done deterministically, if you log into two different devices using the same email or login credential.

So I think one fundamental question that Jessica started to raise was how do we think about consumer expectations for smart TV privacy? The ability to automatically monitor activity is relatively new. Before, TVs just passively transmitted information, kind of like a computer monitor does. If this is changing, how does that need to be messaged to consumers? Is it sufficient to put information in a privacy policy? Should it be some sort of standalone notice or permission?

Online you've seen ad tech companies using the ad choices icon to signal that an ad may be targeted. How could something like that work on a TV where there's not really controls set up to allow people to interact with logos online? And then how the controls structured? Are there straightforward ways to control data sharing, both at the device level and then the application level? What are the defaults? And then how should those controls apply across different devices and platforms?

So security, so like with a lot of other internet of things devices, security is an incredibly important issue for smart TVs. Think about, do smart devices regularly get firmware updates to account for new threats? How can we make sure that gets done? How frequently are devices updated? And for how long after sale should a consumer reasonably expect to get security updates?

TVs can last for a pretty long-- apologies. TVs can last for a long time. My last TV was one of those CRTs. I had it for 15 years. My flat screen monitor I've had for about 10 years too. can we reasonably expect to retain that longevity of consumer devices when there's software and connectivity and security involved?

There's also a lot of different kind of threats to account for. An attacker could try to intercept communications with a device. An attacker could try to exploit a vulnerability to attack a network and get access to maybe other devices that are attached to that network. A smart device to be used as part of a distributed denial of service attack, as was in the news this fall with DDOS attacks through IOT devices on security researcher Brian Krebs and the Dyne domain name service.

This is obviously an area where the FTC has done a tremendous amount of work with several dozen data security cases. Security is a major focus of our 2015 internet of things report. And last summer we announced that we are doing a study with the FCC on how security updates get developed and deployed for smartphones. So I think this will continue to be an important issue here as well.

And then another support question is how long should consumers expect that they will be able to access applications through their smart device? So this is actually a picture of my own smart Blu-ray that I use to access things like Netflix and Amazon. And it's a pretty old device. But you see that some of the apps in the upper left corner are just grayed out. There used to be things there when I bought the device. I remember YouTube was one. I can't even remember what other one was.

But at some point, because the API has changed or because the tech requirements changed, or someone stopped supporting Flash or something else-- I don't know-- I stopped being able to access those services. In some ways maybe this is more predictable, because TV operating systems are pretty fluid right now. They're not as standardized as certainly the web or mobile operating systems. But I think it's important to think about what expectations and maybe obligations should be to continue to make apps supported like the apps that are advertised on the box that you buy over time for devices that could potentially last for a while.

This is another area where the FTC has a continuing interest. We recently sent a closing letter to Revolve, a smart device manufacturer, that sold a smart home hub to consumers. Then 18 months later, after its last sale, they shut off server support for the hub. So it just didn't work anymore. In that case, Revolve offered a complete refund to anyone who had bought the product. We declined bring an action in that case. But I think this is going to be a real important challenge for how connected devices in the future and for how consumers expect them to last.

So just a couple of words about the legal framework here, some the laws that apply. Section Five of the Federal Trade Commission Act, prohibition on deceptive and unfair practices, it's the core statute that we work with in the Bureau of Consumer Protection. It's been applied to privacy, security, support substantiation, a whole range of issues.

The Children's Online Privacy Protection Act may apply, especially given that it's easier to collect personal information and to collect persistent device identifiers. And obviously a lot of television content is aimed directly at children. Cable Privacy Act, Communications Act, civic rules for cable providers and IFPs in the ecosystem. Jessica mentioned the Video Privacy Protection Act passed in the 1980s, before internet streaming was really a thing. We're seeing a lot of emerging and sometimes contradictory case law about how that should apply to these sorts of services.

And then ECPA and the Wiretap Acts. You have all these different entities in the ecosystem that have the technical ability to monitor a lot of communications. Are all those entities always entitled to the view every transmission? Or might it be unauthorized in some situations? And with that, I'm going to turn it over to Ian to discuss some of the things that we saw in the lab when we looked at the smart devices.

IAN KLEIN: Thank you, Justin. And thank you to the Federal Trade Commission's Office of Technology Research and Investigation for letting me do research with you this past summer. I had a great time.

And so for all of you guys who don't know, basically I looked at three different smart TVs in our lab. And what we wanted to look at was what information was made available to the consumers about privacy and how it was displayed to them. And also to look at what actual data flows were available and were coming off of the device, like internet traffic and things of the like. And we also wanted to see what kind of controls the consumer had over these types of data collection.

So with transparency and control, we saw that the privacy policies that these TVs-- they all reserved extensive rights to collect information about the television viewing habits of the user, including for the purpose of delivering targeted ads and sharing information with third parties. When setting up each TV, the default settings were in favor of that type of data collection and usage. But the way that the TV's policies were displayed to the user varied.

One of the TVs had a dedicated screen during set up to display the specific behavior. One had it mentioned in the process, albeit the user had to scroll pretty far down to actually see the privacy policy. And for one of them, it was mentioned in the privacy policy or in the settings. But you had to go there specifically to see it.

Now they all offered different controls to limit the device level data collection and targeting. But they didn't have a mechanism like limit ad tracking or controlling data for controlling data sharing from third party apps to their respective third parties.

Now this third party data sharing is not as widespread as it is on the web or through a mobile device. But there was some third party data sharing that we were able to see. When we set up the TVs in our lab, we used Wireshark to monitor the internet traffic to see what was going on from the TV under various different conditions.

For example, when we decided to watch some DirecTV on the televisions, we didn't really see any calls to third parties to their servers at all through Wireshark. But for two of the three TVs, we did see regular communications back and forth to and from a manufacturer's server, which could potentially be for something like content recognition, which Justin talked about previously. It could have been for something else, some sort of cloud based function.

The other TV, the one that didn't do that, despite reserving the right to monitor viewing behavior we didn't see any evidence of this type of data collection being sent back and forth to and from the manufacturer of the TV. It is possible that this data could have been batched or sent after the test that we conducted. Or it was sent to a proxy that we just didn't detect. But nothing that we saw indicated that they were sending anything to the manufacturer themselves.

Now it is also possible that once data was sent to the manufacturer that the manufacturer themselves could be sending things to the third party. But there's obviously no way for us to detect that, since we don't have access to their servers. And all three of them did offer somewhat controls for data collection. And when the data collection controls were on, there was pretty much-- two of them just completely cut off regular communication to the manufacturers themselves. And for one of the other ones, it was just dramatically reduced.

So if you look at this graph of our findings, as you can see the left side, the y-axis is packets per second of internet traffic. And then the x-axis is over time in seconds over 40 minutes. So this is actually Wireshark capture from one of the TVs specifically.

And there's two different colors there. There's red and there's blue. The red packets are strictly to a server that has the name ACR, which we think is likely that it could stand for Active Content Recognition or Automated Content Recognition. And then the blue packets are all other traffic out and to that TV specifically.

So as you can see, every 60 seconds, there's these little bumps. And then when you would do something drastic like turning on the TV or pausing a DVD or switching the input of the TV, there would be bigger spikes. And if you look, the red outweighs the blue completely. And the ACR server, it looks like, was getting more traffic than anything else.

Now this chart was from the summer. And interestingly enough, when we reran these tests last month, we no longer saw communications to that specific domain name that had ACR in its name. Although there was still some traffic to the manufacturer, it was certainly less regular. It is

possible that they renamed the server or found a more efficient way to do content recognition. Or they could have just stopped doing ACR altogether.

So we did see from the smart TV apps embedding communication with the third party ad companies. But it was generally a lot less traffic than you would typically see with web or mobile applications, like I said earlier. For example, one of the popular applications connected to 27 third party applications on the web, four on mobile and none on the TV.

So we've only looked at a handful so far. So there's only a couple of outliers that we saw. But there was one outlier that did connect to more third party services on the TV than on web or mobile. But for the most part, it seemed like there was less sharing directly from the TV applications. It is possible that there will be additional sharing down the line that we just couldn't see. But there's definitely less as of now.

As mentioned, none of the TVs we looked at had platform level controls to limit how apps share data with third parties like you can see on mobile devices. And most of the traffic we saw for the apps to and from third parties was completely encrypted.

Some of the smaller third parties, we did have questions about whether the encryption was sufficiently up to date. But it is possible that they were commenting for controls that we just couldn't evaluate. Also it was interesting that a lot of the applications that we looked at were using cookies to keep state on a user instead of device identifiers. This is possibly because of the operating system environment for smart TVs might be more diffuse. Or there's less of a standardization on these operating systems, which could be the reason for this. So I'm going to hand it back to Justin, who's going to talk about the future of this technology.

JUSTIN BROOKMAN: So I think from, given what we've seen, we're still in relatively early days for some of these smart TV platforms. Obviously data collection and use might get more web-like, if the content then becomes more web-like. I think it'll be interesting to see how this market continues to develop, what sort of controls we'd be able to expect. What sort of self-regulatory structures might begin to evolve? And how will consumer expectations in understanding evolve as well, and whether we'll start to see maybe some pushback like we've seen in the web ad space, in order to block some kind of tracking.

So with that, we're a little bit over time. So I will now invite our first panel to come to the stage. Kevin and first panel, come on up. And thank you very much for your time.

[APPLAUSE]

KEVIN MORIARTY: Thank you. Thanks to Justin and Ian for that. There you are, right there. Thank you for that presentation. That was great guys. Welcome to the first panel of the day, New Frontiers in Media Measurement and Targeting. In this panel, we're going to talk about what's new in measurement, analytics, and ad targeting. We'll also talk about the challenges of transparency and notice in this area and talk about some preliminary self-regulatory efforts.

So I have a few questions that I'm going to ask to get the conversation going. As I've mentioned before, we are planning to take questions from the audience. So you can tweet at us, #smartTVFTC. And also Matt Smith is going to be patrolling the audience during the panel. And he has blank comment cards. You can fill them out with questions. Hand them back to Matt. And Matt will make sure that I get them for the end of the panel. And we'll try to ask some audience inspired questions.

So we are very excited to have a great panel of experts to weigh in on these issues. We're very, I think, lucky to have the actual folks that are thinking about these issues, that are doing the data collection, that are doing the using consumer data. And we are truly grateful that you guys have taken the time to come to the FTC to speak about your work.

So I want to start, maybe we can just start with Mark at the end and have each of you introduce yourselves and talk about how your work relates to this area.

MARK RISIS: Thanks Kevin. Mark Risis, up until November, I was head of strategy and business development for TiVo research, which is a subsidiary of TiVo that specialized in working with set-top box data and using a set-top box data and first and third party data to improve the way television advertising is planned, bought, and measured. And I spent a total of eight years at TiVo. So a lot of that was spent on interactive television and advertising and other dimensions. But the last three was specifically focused on the data side.

ASHWIN NAVIN: Hello everyone. My name is Ashwin Navin, co-founder and CEO of Samba TV. We're a company headquartered in San Francisco with about 180 employees across five states of the US and four countries outside the US.

Our company is a software company. We develop applications for smart TV that provides content, content recommendations, content recognition. We're supported by advertising. We provide the service free to the consumer. Excited to share more details about what we do, both for consumers as well as for businesses.

SHAQ KATIKALA: Hi my name is Shaq Katikala. I'm privacy counsel and data scientist at NAI. We're a self-regulatory group. And we focus on privacy and online advertising. Our primary role is to create and enforce codes of conduct that protect consumers' privacy. We're focused on third parties, so the pipes in the ecosystem and interest based advertising. And we, in the past year, we've been focusing on smart TVs more and more. And we started a working group about half a year ago. So I'm relatively new to this space. But I've been working with a lot of big names in the industry.

We've been discussing how to tackle a lot of the privacy issues from compliance standpoint and from self-regulatory guidance point of view. So I hope to provide you with some of my insights that I've gained from a diverse group of players in the industry.

JANE CLARKE: Great, I'm Jane Clarke, CEO and Managing Director of the Coalition for Innovated Media Measurement, or CIMM, as we call it. CIMM is a coalition of buyers and

sellers of advertising media, including all the broadcast and cable networks, all the big media buying holding companies, and the Association of National Advertisers.

We have two sides to our mission. So one is to basically push along innovation and speed the pace of innovation through proof of concept pilot tests, through RFPs, in the area of cross media measurements. So being able to add up, particularly for video, the total size of an audience unduplicated across all platforms. Because the audience measurement is not only how content providers figure out what content to make for consumers, but how their rates for advertising are set, depending on how many people saw an ad.

And the second area is bringing more granular, or should I say census-based measurement to television. So we can talk a little bit more about the way that television has been measured up until now. But CIMM is really pushing for more census-based measurement to be more fully representative of everyone across the country.

JOSH CHASIN: Hi, my name is Josh Chasin. I'm a Chief Research officer at comScore. I've been a comScore almost 10 years. You probably know the name comScore as the digital information/audience measurement source.

Earlier in the year, comScore and Rentrak integrated, became one company. Rentrak was mentioned. Justin mentioned Rentrak earlier in his presentation. Rentrak was in the business of TV audience measurement, the ratings, generally based on collecting and projecting audience estimates from set-top box data. The Rentrak brand name has essentially been retired. So now the Rentrak TV measurement is comScore TV. So I'm a chief research officer of comScore, which includes both comScore and what used to be known as Rentrak.

KEVIN MORIARTY: All right, well thank you again for being here today. And I thought it might be helpful. We got a bit of an overview from Justin, which was great. But I thought it would be useful to have the folks here on the panel talk about what are the new analytics that we have. And Josh, you're from Rentrak. And comScore's integrated into set-top boxes. And Ashwin, your ACR technology's integrated into smart TVs. So I thought the two of you could give us that overview of the scope of the data that's being collected and the type of data that's being collected. Josh do you want to start?

JOSH CHASIN: Sure, just going to write down scope and type so I remember it. So once upon a time, the TV landscape was simple. There were three networks. And we all had the Nielsen ratings, which told us how many people were watching one of three networks. And it was simple.

And you could do a really good job of creating the ratings, measuring audience, describing the audience in terms of age and gender, which was all that you needed to do to facilitate the commerce that was necessary, with a sample, a panel, a group of people impaneled with meters on their sets to tell us how many people were watching. But as with all things, digital technology tends to fragment TV viewing.

I remember in the '90s, we heard talk about the 500 channel environment. Now 500 channels sings charmingly quaint. So you can no longer measure television audiences robustly or accurately with a sample or with a panel of people.

So what I often say in the audience measurement business is that technology takes with one hand and gives the other. So at the same time, the technology has led to fragmentation of platforms and fragmentation of content sources. It has also created tools that facilitate measurement.

So Jane talked about census assist. So on the digital side in internet measurement, publishers tag for comScore. And that lets us collect a census view of all the activity at that publisher's website. If I visit cnn.com, which tags for us, whether I visit it from my phone or my tablet or my computer, that visit will send a ping to comScore's server. So we get a census of activity at the site.

In the television business, set-top box data and now increasingly smart TV data has become the census version or the census style version. What I've often said is that if you were going to zerobase, a TV measurement service today, and say how can I measure and report on television audiences today with no legacy. In other words, I'm not going to be burdened by the conventions of industry that have come before. Without question, you would begin that system with these census style assets, with a MVPD or cable satellite operator set-top box data, and increasingly with smart TV data.

At comScore, formerly Rentrak, we use set-top box data from about 22 million households around the country to create television audience ratings in each of the 210 VMAs. And then the 210 VMAs are additive. So we report on the total US by summing up the audiences in the individual markets.

KEVIN MORIARTY: Thank you.

ASHWIN NAVIN: I guess I thought it was a very, very good introduction. The types of things that we see looking forward for the audience measurement business predicated on the idea that samples are showing signs of weakness. Advertisers are finding it challenging to address an audience which is no longer consuming media the same way that they have in the past. And a lot of the devices that we have available to us for consumption are decidedly difficult to measure within a pound.

For example we've observed that the audience for a prime time TV show that's watching the show outside of the television on a mobile device, on a tablet, could be as high as 25% for a popular prime time show. Because the broadcasters made a mobile app or website available with their shows or might have licensed that show to a third party for consumption.

The audience might not be watching it live. In fact, most of the audience isn't watching it live. And the industry is built on a standard of consumption within a window of time. The audience for that show might be consuming that show for months after the broadcast. Also difficult for legacy measurement approaches to capture.

And then it's really no secret that people really aren't paying attention to commercials that much anymore. While you're watching commercials, you've got the ability to do other things. You're multitasking. You're checking email. You're looking at the hashtag #smartTVFTC to see what people are saying about what's going on. That sort of division in your attention presents a lot of challenges to advertisers.

And so one of the most compelling things that our clients say about the analytics that Samba TV provides is that we're trying to describe the audience much more holistically. We're much more content centric and not governed by legacy arbitrary lines in the sand on when someone can be consuming something for the broadcaster to get credit for it.

JANE CLARKE: And just to also give a little bit of color to this discussion with a couple of examples. So on the set-top box side-- and these data have been in the market for a little while now with the operators starting to use it themselves back in the '80s. But it wasn't until really in the last 10 to 20 years that the technology has been upgraded. So more and more of them can do this.

But for instance in the New York market, extremely diverse, the panel that's operated for the Nielsen television measurement that's the currency by which all the advertising is bought and sold and all the content is measured, it has about 1,000 people in the New York market, I think. This is a market with like--

JOSH CHASIN: Households, not people.

JANE CLARKE: Yes households, 1,000 households. And then this is a market with just 8 million people in the five Boroughs of New York and 20 million in the surrounding area. So basically the two providers the set-top box, the cable providers put their data together in the market and standardized the way they did it. And this is not an easy task, also I should say. And they discovered that over a third of the viewing was to non-English language channels not measured by Nielsen.

And so you can really see the implications here for how we really don't understand the diversity of what's happening in terms of viewing across the country and the kinds of content and the kinds of advertising that could be developed that's not being developed, because it can't be measured. And people don't know about it. So Cablevision, one of these providers, has 400 channels. And 160 of them are measured by Nielsen. So you really start to see why this more census based measurement is really critical in terms of getting an accurate representative picture of really what Americans are viewing.

KEVIN MORIARTY: Ashwin, can you just give us a little more detail on how-- Samba's obviously not selling televisions. So how do people end up with Samba software in their house?

ASHWIN NAVIN: Yeah, good question. So we, as I said before, we're a software company. We license our software to hardware companies who bundle the software with the hardware and sell that as a bundled product into the marketplace. Our software resides on that television latent until the TV is plugged in, connected to the internet, at which point consumers can activate it. It's not

activated until a specific action of the consumer to opt in to turning Samba on. At which point, we can provide recommendations to the consumer based on past viewing behavior.

That's our path to market. It is bundled with nine different brands of TV manufacturers. Brands like Sharp and Toshiba are brands that are sold in the US. But they're also sold in Europe. They're sold in Asia, South America. We've seen traffic from many different countries.

Our handling of data is informed mostly by European law, where there's fairly clear rules of the game. And we've done a lot of work to make sure that we believe we're in compliance with European data privacy rules. And that's been helpful, because it's informed even our policy here in the United States.

KEVIN MORIARTY: So is the nature of how the software works to identify what's on, does that address the kind of problem that Jane just mentioned, which is the only 160 channels versus 400 available?

ASHWIN NAVIN: Yeah, it absolutely does. Because we're able to recognize content based on its visual characteristics, we can actually increase the amount of content that we can recognize, simply by increasing the size of our database of what we can recognize. Currently we're focused on the most popular things on television. But we could add. For us, that would be the top several hundred channels in the US. But in total, we were approaching 1,000 channels, because we do this in other countries as well.

On demand programming are things that we try to recognize the most popular shows, things that may have been off the air, things like Friends, which are those titles that are perennially popular even years after broadcast. We would like to be able to describe that audience for both consumer recommendations, but also for the benefit of the media industry that is measuring that audience for sponsorship.

JANE CLARKE: And the advantage of the smart TV did is since they see everything that hits the screen, as long as it's in their reference database, they can measure Netflix. They can measure anything on an [INAUDIBLE]. So if it's a video game, as well as linear television.

KEVIN MORIARTY: So we started to get into this a little bit, but comparing what this world of TV analytics to the traditional age, gender, Nielsen panel approach. I was wondering if we can get a perspective from Mark on what is possible with this approach that wasn't possible before.

MARK RISIS: Sure Kevin. Just a quick aside, though. The fragmentation that the rest of the panel is referencing and certainly the presenters before really pointed to smart TV and streaming content. But I would say that the fragmentation happened a decade before the launch of streaming apps, which was about 2007, with the advent of the DVR. The ability to time shift television, record a program while watching another program, really is the point at which simultaneously the viewers became empowered and the programmers and distributors began to rapidly expand the options available, because there is now a mechanism for consumers to consume more.

And so I think that's the point where all the things that we're talking about really started to come to fruition. And the byproduct or nice coincidence with DVR technology is the devices had to be smarter than the traditional cable boxes. And so there was a duality that the set-top boxes start to get smarter and more powerful, faster chips, and the ability to process more data. And that opened the opportunity to do more with that data.

And the use cases, specifically I'm going to speak to the advertiser perspective, the sellers of television media and the buyers of television media, as Jane said, the old Nielsen panel and the measurement of an audience based on how many people watch, worked for a long time. But with the improvement in measurement and targeting in digital media, certainly internet, there's massive data sets being utilized every fraction of a second to track where consumers go, what they do on sites or mobile devices, project the intent of the consumers and try to predict what ads should be served to them.

It just makes what happens on television pale in comparison to a staggering degree. And the gap simply can't be sustained, given the fragmentation and the decline in ratings. So there is a need to improve how television-- linear television-- its simpler and smart TV OTT apps because of the infrastructure and certainly video on demand. But there's a need to improve how television is planned, which programs are better for advertisers, given what they're experiencing in other digital channels.

So some of the things that we looked into is can we connect what viewers tend to view. And just an aside, everything is done in a privacy compliant manner. And there is a complete separation between the individual identity and the viewing behavior. And the two shall never meet, if you will.

And we connect-- or TiVo connected-- viewing behavior from TiVo devices and devices from several cable companies with other data sets, such as what products certain consumers purchased, what locations they visited with geolocation data, what they purchased through their credit cards through certain credit card aggregators. And we were able to utilize this information to help sellers of media look at their inventory through a lens that's much closer to the objectives that advertisers truly have with their media investment.

Advertisers, at the end of the day, are interested in selling more of their products. They're not really interested in reaching numbers of viewers. It's based on the return on their investment. And so the ability for sellers of media to now express their inventory, which is under constant duress through ratings decline and fragmentation, in a much more nimble and much more relevant way really helps stabilize the market.

And the ability for advertisers to look at their media investment through the lens of the actual consumers that they want to go after, as opposed to a proxy based on age, sex, demographic or a number of people that watch, is a very powerful and additive force to the market. It aligns well with what was said earlier, as far as aiming towards a census like nature of measurement. And that really can only be accomplished if you're, from the get go, using a large set of viewership data as a starting point.

Can I amplify?

KEVIN MORIARTY: Please.

JOSH CHASIN: So I want to build on Mark, what Mark's saying. So traditionally television is planned and bought and sold based on age, sex demography, women 25 to 54. And again in the '60s, when you had three networks to choose from and maybe five stations in a local market, that was great.

So my premise going in is that more money in television is good for consumers. Because somebody's got to pay for all these programs. And who better than advertisers? So what happens is there's clearly a migration in the television business away from age and gender demography and towards what we call advanced targeting or advanced demographics, which are things like Mark is talking about, purchase preferences.

In election season, you see that advertising is targeted based on voting. So what happens is a program-- so before, here's a program with this much audience and a program with this much audience. This program has very little value compared to this program because of the sheer number of eyeballs. And you cut you cut it from persons two plus to women 25, 54. But they're still going to have roughly the same ratio.

But what happens is all of a sudden, a piece of inventory, one impression, one ad served to one box or one household has different value to different advertisers. If the women 25 to 54 in this small audience, if 80% of them own foreign cars and half of that 80% are going to buy a new vehicle in the next six weeks, all of a sudden they're extremely valuable to marketers who are selling foreign cars.

So the more we understand the more we understand about consumers, the more demand there is to reach them. You're stimulating demand for the advertising. Information facilitates commerce. I think that's a really important point. The more information we have about audiences, the more demand is created to reach those audiences. So we bring more information. And more advertisers are now competing. And the value of that audience can be articulated in many more ways than just raw size and age and gender.

SHAQ KATIKALA: If I can build on that, so from a consumer's perspective, there's a study by someone named Catherine Tucker, who looked at optimizing advertising and found that there's essentially two mutually exclusive ways to optimize click through rates. One of them is to serve obtrusive ads. This is mutually exclusive. So either go serve as many ads as you can. Just be dumb about it. You're just caring about the sheer numbers. So non-standard ad formats, annoying sounds that play when the ad loads, that's one strategy.

The other is to make the ad relevant. So there you can have standard ad formats, side of the page, top of the page. And the more information you know about the consumer, the more value you get from that ad. So in that sense, you have a battle between do you make ads annoying? Or do you make them more relevant? And I think consumers, more often than not, would choose the latter, just speaking on the consumer side.

JANE CLARKE: Yeah, and I think we'll get into this in a little bit, Kevin. But I just wanted to point out something really important that Mark said about this is all being done in a privacy compliant manner, obviously. So the industry is very aware of not doing this in a way where PII is separate from segmented and from information that can be used to segment consumers into meaningful groupings for advertisers.

So on the cable operators side, they have one file that has your name and your address and your billing information. And they use that for-- that's all the PII. The viewing information is in another file. And that's the file that goes to Rentrak, for instance. There's an ID for the household that can be used behind these privacy compliant firewalls, if you want to call it, with third party companies that can match those IDs against each other and append this information that can be used.

But we're talking about data that's, really, then anonymized, aggregated, grouped together in meaningful groupings for advertisers. So industry is trying to do it in the way where they really, in a self-regulatory way, feel that they are not violating privacy concerns and trying to make the advertising more relevant.

KEVIN MORIARTY: So this gets to a question that I was watching Josh after an IAB comScore event. And it was a discussion of what they had discussed at the town hall. And you were having an interesting discussion, where you observed that at the town hall, they had discussed had more money in digital ad buying is focusing on age and gender, where television is going rapidly in the other direction to try to go away from that and trying to get into how digital has been doing ad buying.

And I'm wondering as people who are collecting the data and selling the data, how do you distinguish between more information and better information? And is there-- I guess the follow up question is, is there a bias for just always wanting more information with the expectation that you'd be able to get something out of it that maybe you don't have now, without considering the implications of collecting all that information? I don't know if you want to handle that or anyone. That's to anyone.

JOSH CHASIN: I can certainly address it. I'll speak to it. I'm sure other people want to speak to it as well. There's a bunch of stuff in there. So A, I do think it's ironic that at the same time that TV is moving past the age, gender to advanced demography, digital is moving from advanced demography to age, gender.

Part of that is because in the digital space, publishers are trying to go after TV money. And there may be a year and a half or a three year lag year, because they're trying to go after TV money. And they see that TV money is spent on age and gender. So they think they ought to do that, too so they can study [INAUDIBLE] that spend. So if they keep going after the TV money, pretty soon they'll hit on the fact that they should do what they were doing all along, which was selling off advanced demography. But they're probably 18 months behind that.

I'll answer the second part of your question by sharing something that I said recently on a panel also, which is I worked at Arbitron in the '80s, TV and radio ratings. And when I was at Arbitron

in the '80s, we used the term data as a disparagement. When we talked about something-- when we said that's just data, that was an insult. We looked at our job as to turn data into insight, data into information, information into insight, and then to have that insight drive action.

So I do think there is a bias. Quite frankly-- and I'll see what you guys think. I do think there's a bias towards the direction of data. and we talk so much about big data that we lose sight of the question of good data. So I'm constantly urging people not to get-- yeah, it's great to have big data sets. But don't think that you can remove human beings and thinking and strategy from the equation and just let the algorithms do your job and punch out early and have a beverage. The data is a tool. And let's make sure that we're interested in good data, not just big data.

MARK RISIS: I want to build on that, because I remember some months ago being at an event for a large data management platform. And this is a data management platforms are companies that aggregate data from different first and third party sources and combine them together to make it easy for primarily digital buyers and sellers to transact. And they underscored that they have a serious quality problem with their data. That is, they have massive amounts of it. But they don't know how much of it is valid and how much of it is real.

And what happens when you use bad data, no matter how good your algorithm is, you're throwing rocks at a wall. And it makes no difference. And so I think one of the trends affecting this embrace of more traditional demography on the digital side is the quality and stability of it. Stability is one of the key attributes that advertisers seek for their investment. These are large Fortune 500 companies that can't function in environments that are unstable and lack quality and lack transparency.

And so I think the digital ecosystem is embracing something that has proven long ago that demography works. Demography is stable. And I think it's a narrowing of the gap and that TV has for too long neglected the advanced demography. And at the same time, digital was too fast because of the underlying infrastructure that allowed it to just grab everything under the sun without much regard for, what does this really mean. And is it even useful to layer on 20 data sets for a single campaign? What does it actually get you when it comes to the ROI for your dollars? And I think a lot of folks are finding out that more data doesn't mean more dollars spent by consumers. It just means more data.

JANE CLARKE: CIMM's all about accuracy, transparency. There's a lot of-- the regulatory bodies are concerned about what the consumers know. But also just the buyers and sellers of all these services are very concerned amongst themselves about the accuracy, the transparency, the data quality issues. And also I should say that the overall picture here is as all media are starting to be bought more in an integrated way, the industry is searching for these common networks and these common measurement tools that can be used across media.

So there's a lot of-- CIMM plays in this area. And there's a lot of work being done to standardized the metrics and standardize the measurement, because it's all grown up in these silos. And so that's another reason why digital is looking to how television's measuring. And television's looking to how digital is measured.

Because an advertiser comes in, and they have an integrated campaign. They want to run across all media. And they want to basically get a number for, did I reach my target audience across all this in an unduplicated way? And then what happened? What was the result? So putting all that together is quite a complex task and involves a lot of issues related to data quality, data comparability, comparable measurement, comparable metrics.

ASHWIN NAVIN: Maybe I'll add just to your question, Kevin. As the panel was set up, before we came on stage, the lines between television and digital, between TV and other devices is getting very blurry. You may start the experience on one device and continue it on a different device. The media industry has actually a pretty significant gap between digital and television. That exists within the media production and distribution business. It exists in the agency and sponsorship community. Teams are different. Measurement is different. And that line is quite distinct.

We think that needs to change. And what I think you may have read into Josh's statements earlier was that there's a bit of envy. The digital players want the magnitude of media and advertising that's happening on television. Television is still primarily how the world is informed and how it's entertained and, by virtue of that, gets maybe double the amount of sponsorship dollars, if you exclude search compared to digital in the US and even more in other countries.

And then the digital guys want to get a piece of that. But the TV guys now see digital coming. And they look at search. And they look at social and different forms of sponsorship online. And they see the way that digital platforms sell advertising. They sell it on a performance basis. They say, you only have to pay for what converts into traffic for your website or what converts into business for your product. And by virtue of that, their revenues are growing really fast.

And so what I think the TV guys want to do is be able to position their TV advertising much more accurately. They want to be able to position it on an ROI basis so that advertisers feel like TV is a good investment and that they want to be able to justify the magnitude of those dollars.

JANE CLARKE: Which gets to the census data, because if you can link these data across all platforms and you can do it in a privacy compliant manner that works for everybody and provides a good experience for everyone, because obviously consumer experience is huge here. These media companies and these advertisers want to keep good connections with their consumers. So they obviously, the consumer experience is a major aspect of this.

But if you can do all of that, the way the advertisers look at it, they would love to be able to plan their media buy their media, and evaluate their return on their investment using the same data set across all platforms. It's not there yet. There's issues. But that's what they would love to see.

KEVIN MORIARTY: So just to shift gears a little bit, we'll accept the premise that it's good for consumers to have more efficient allocation of ad dollars. What else do consumers get out of this increase in the amount of data that's being collected from smart TVs and set-top boxes? And this is really a question for anyone to answer.

ASHWIN NAVIN: Do we have any Arrested Development fans in the audience? A handful. Mindy Project? These are shows that were canceled from broadcast television and picked up by companies that had better data, Mindy Project picked up by Hulu and Arrested Development by Netflix. And that's simply because they're looking at the content. They're looking at the popularity of those shows across a broader set of end points, devices, and saying, well, maybe the Nielsen ratings were low. But we think that there's a real business in having those shows.

That's a clear benefit to the consumer. If there is better data, we'd have better programming, better investment, more conviction behind that investment. Speaking to our heritage as an app developer, what we decide to show first in the list of search results on a TV interface or what we show first in a gallery of content that you can play is entirely dependent on the quality of our data to recommend you know shows that we think you might like.

And the most stressful-- it's funny. I appreciate Josh's statement that I remember when I was a kid, you could find all the content on television by twisting a knob on your TV. It was all broadcast or VHF UHF. And today we've gone past scrolling through 500 channels. And now we have these search boxes. And I think that's the most stressful thing is having to search with your thumb. It's actually quite a terrible experience.

JANE CLARKE: Or type it in.

ASHWIN NAVIN: Typing with your thumb, it's quite annoying. And so with data, you can start to get past that. You can start to surface things that matter to people much quicker with less intervention through these clunky interfaces.

MARK RISIS: The original use of data that TiVo had from its inception was actually to inform TiVo suggestions. So all the hard drive space on the TiVo boxes that wasn't utilized by recording's that the consumer set, the TiVo device would actually record things that it thought that the consumer would enjoy. And to many people's surprises, they found things that they didn't expect and very much enjoyed discovering and then become loyal fans of because of the data that was used to analyze the recording pattern that folks set.

So it was immediately a massive consumer benefit that had helped navigate this increasing mass of choice, without the consumer having to scroll through everything and read TV Guide or its successors and figure out what it is. It helped them figure out how to navigate this massive amount of choice.

And I think the other dimension to it is something that the Shaq mentioned earlier, which is as advertisers continue to have the need for television to reach their audiences and drive their businesses, with declining ratings, we've seen an increase in the commercial loads that networks pump into their programming. The commercial loads are now approaching up to 18 minutes per hour, if not more. And I think that's a horrible experience for the viewer to sit through that.

And conversely if you look at somebody like Hulu, they're peaking out at about two, maybe three minutes from a commercial load. And they're able to do that because of the precision with which the ads are served. They're much more relevant they're much more aligned with the

viewer. And they control for the frequency. That is, you don't see the same thing over and over and over again.

And I think from a consumer standpoint, use of data and improvement for the way that the ads are planned and bought and sold, and in turn measured based on the return of investment would ultimately lead to a reduction in commercials and improve the overall experience for the viewers. Because as, I think, Josh said earlier, the advertisers still underwrite a large share of content production and distribution. And so if you give them tools to get to their business objectives more efficiently, they won't have to run the tonnage that we currently see on television that's driving viewers away. So I think there is a duality to it.

JANE CLARKE: And it gives more options for the content owners too. So subscription models can work for the content owners as much as advertising models. So with improved sorts of data, you can have a variety of ways of delivering your content to consumers. You can have much more niche content for much more niche groups, who might be willing to pay a subscription for it. It gives you so many more options when you have intelligent use of better data.

SHAQ KATIKALA: Aside from content discovery and advertising benefits, there's also benefits in once you find the show you like, being able to interact with it in more ways. So my TV has a Twitter box on it. So if I watch a football game, I can see what people are tweeting about. And so it makes the whole experience a lot more funny.

JANE CLARKE: One of the things that Ashwin hasn't really talked about-- and maybe he could-- is that by making the television content aware, it also enables second screen experiences. So you can then-- see right now, it takes Nielsen 15 days to figure out what was on the television to report those ratings back to the buyers and sellers so they can make their trade on the media. It's unbelievable in the world of digital advertising.

And a lot of that has to do with the fact that they don't know the programs that are on. That programs don't call out to them as they're going to the Nielsen box. What they do is that meter collects the time and the station that it's on. And they have to do this elaborate process of mapping back to the program logs to get what was on. And then they have to calculate the minutes that had commercials. It's this incredibly legacy process.

Whereas with automatic content recognition, you can actually get real time ratings. And you can have the content, that ACR on another device that can deliver some secondary content as well, some additional content or even related to the ads. So I don't know if you want to--

ASHWIN NAVIN: Shameless--

JANE CLARKE: Did I say it all?

ASHWIN NAVIN: Shameless plug here. So if you do go to samba.tv, our home page, we do have real time data. There's actual real time ratings of the most popular shows on TV right now. You don't have to wait until tomorrow to figure out what the rating will be. We'll tell you what the rating is at this moment, instantaneous, with a few seconds delay. And that relies on having

basically a connected device, basically being able to pull millions of households and aggregate that data for the benefit of the audience at samba.tv.

We have an application, as Jane mentioned, that's called Spotlight. I think we've all been in front of a television watching a movie or watching a TV show, and there's an actor or actress onscreen, and you just can't remember her name or his name. Or where did I see this person? Or what else have they been in?

Spotlight is a mobile application-- it's in the iPad app store-- that lets you, for any show that you're watching right now, see the full cast and crew, episode synopsis, photos that they've posted recently to social media. It's a much more immersive experience across screens. So you don't feel like you have those moments when you're wondering. It's all there. It's pre-integrated. So it's nicely connected to your television. You don't even have to search on your iPad.

KEVIN MORIARTY: So based on some of the early questions I've gotten in, I think there's a lot of interest in moving to our transparency and choice section of the panel. And so I just wanted to start by just asking Shaq to talk a little bit about what NAI is up to in this space.

SHAQ KATIKALA: Sure, so for the past year, we've been hearing a lot about addressable TV, smart TVs, from the online advertising ecosystem. So we start investigating it. And I'm going to distill down a lot of working group talk just to shorten it. But basically what we've seen is a convergence of three separate industries with different personalities. So there's the cable TV industry and addressable TV. The set-top box, that's number one.

Number two are the app companies or companies that have experiences creating app ecosystem. So Apple with iOS, Google with Android, Microsoft with Xbox and Windows phones, Samsung, Amazon, those type of companies. And then TV manufacturers, who are like Panasonic and Sharp, and they may include apps too. But they don't really have the same history of creating app ecosystems that the app category does.

So from these three categories, each one has a pretty unique history with privacy. So the cable industry has been dealing with the FCC for a long time. And the rules there are fairly onerous and different than what the mobile sphere's been dealing with. So they have one approach. And the technology is also a bit different there. So they deal mostly with households as opposed to individual devices.

And then in contrast, there's the app the app category, where it's a fairly mature group. And they've been guided a lot by the FTC. And so they have advertising IDs a lot of times and robust notice and choice mechanisms that fit along the guidelines of what the FTC's looking for, from what I've seen. That's another category.

And then the TV manufacturers their focused on different law all together. Right now, I think a lot of them are focused on the Video Privacy Protection Act, which is really in flux. And it really affects a lot of what ACR is possible and what kind of notices need to be given in that atmosphere. So each one of these companies, they all have very different approaches, different

identifiers, different ways of dealing with things. But at the end of the day, the weird thing is that they're all competing.

So Netflix-- I think Comcast most recently is going to start including Netflix into their set-top boxes directly. But you can also download Netflix onto your Apple TV. Or your TV you might have Netflix built in. So essentially they're literally providing the same content in three very different ecosystems of laws and regulations.

So there, I think, what we've heard is there's a strong appetite for self-regulation here, just because I don't think one regulatory body can operationalize how to deal with all these things. And keeping in mind that these categories are fairly arbitrary. There's a lot of companies that fit into multiple categories at the same time.

So we've been thinking about notice and choice in a few ways. And as a disclaimer, I'll tell you a few things about it. But it is a work in progress and things are subject to change. But first I'll say from a smart TV standpoint, I don't think there's any surprise that TVs are connected nowadays. When you switch from an analog to digital TV, it's pretty jarring to see a privacy notice for the first time on your TV and click through, and terms of service and those types of things. And the app ecosystem is not a secret.

I think education's the main piece remaining, where consumers may have questions about what types of data are collected. And the along the lines of consumer expectations, I think people are gathering a lot of expectations from the mobile app world. So from what I've heard from a third party ecosystem, they are looking to draw models from there and hopefully apply them to smart TV space. I'll throw it to the rest of the group.

KEVIN MORIARTY: So just to follow up, what is the goal? What is the dream of the workshop? What is the end result?

SHAQ KATIKALA: So just to give you an idea of what our process is, so going back, say, to mobile. So we started a working group first to investigate what the technologies are, what are the best practices in the industry, and coalesce around the rules that would work for the majority of players without excluding certain business models arbitrarily. So that's what we're doing right here is figuring out what would work as a set of privacy principles.

And we're drawing-- in this case it's unique, because previously there's a lot of FTC related guidance. And now you're looking at three different regulatory bodies. And it's a little more complex. But I think the goal is the same, is to provide some sort of guidance to the industry to. I think in this case, ideally find a way to bridge these three distinct players and put them on the same equal footing in terms of privacy. I think it's an aspirational goal. But that's something that you would hopefully try to do in at least two out of the three or one out of the three, and provide rules on how they could communicate with each other.

KEVIN MORIARTY: So Ashwin, you were saying that your software, you're integrated into a lot of different manufacturers' television. So you don't-- well tell me if this is wrong-- but I would assume you don't own the interface with the consumer. How do you address the fact that

you're working with different companies that have different ways that they might want to get a consumer on board?

ASHWIN NAVIN: It's a good question. I guess to address Shaq's point, there is, I guess, a price for a consent form that shows up on your television. That is jarring. But what's more jarring, I think, is if you show up to the US Senate for a confirmation hearing, and they know what you've rented from Blockbuster Video or something like that. Not a price I think-- I don't know. Maybe America, I don't think-- I think a good number of Americans do care about that stuff. And I think they would like to have that disclosure.

Although we don't make TVs and we don't own a TV platform, we insist that there's sufficient levels of disclosure. If a manufacturer wants to pre-load our software into their TV, we want to see that they're willing to take the steps necessary to make sure it's clear, that our software is there before it's activated, and that you have a clear choice to turn it on, and that the data will be handled by us with some care. And that if we aren't providing sufficient value to the consumer, that they have a very easy way to turn it off.

That, I think, is table stakes. It may not be clear in the US, in terms of either rules that we've set as an industry or rules that we've set as a country. But when you put yourself in the consumer's shoes, we just feel like that's just common sense.

And not only that, but if the data that's been collected in the past isn't providing value to me then I should be able to clear that, not only from the manufacturer's servers, but anyone else that may have it. In fact, I would even go further and say that before that data can be pressed to anyone else, there should be disclosure of the consumer at the time that that data becomes available to any third party and consent from the consumer.

So that, I think, is table stakes to do business in Europe. And it's certainly what we expect of our partners in the TV manufacturing business when they want our software. And we've negotiated ways that that appears within a screen that doesn't become too intrusive, whether it's branded by the manufacturer or branded by us. We don't really care. But the core principles have to remain intact.

SHAQ KATIKALA: I agree with you. I just think that with notices, they can get a little bit complex. So you want to provide education to consumers as a key goal and make sure they understand what's happening. But too much information can be hard to process.

And I've seen recently that ad blockers have started including blockers from EU cookie notices. So people just find that intrusive. So they are just blocking the notices altogether. I don't know. So that's a result we don't want either. We want people to just be aware.

ASHWIN NAVIN: Awareness is good. And we don't use jargon much. We try to avoid. I have a jar on my desk for anyone that uses the word ACR. You have to put a dollar in the jar. Because if you go to Best Buy or you go to Wal-Mart or Costco and you ask the average TV buyer, do you want the TV with ACR on it, I am pretty sure most people would say, what the heck are you

talking about. Do you want a TV that's more personal, that makes it easier to find content, that's easier to navigate? Absolutely.

And that's what we think is also table stakes you know for anyone in this business is to figure out what does this do for the consumer. What value providing, and how is that making your TV more attractive at Best Buy or Costco or Wal-Mart? And if that's true, then there's other benefits from having a more accurate understanding of the consumer in the audience. But it's predicated on consumer value first and foremost and consumer disclosure.

KEVIN MORIARTY: So Shaq, you mentioned mobile devices. And it seems-- and we already touched on this a little bit-- but it seems like one of the big differences between mobile devices and televisions is that, well at least two differences. One is that with your mobile device, you're used to interacting with it. You're used to, it tells you something. You touch it. You make a choice. There is a very well-developed user interface.

And then the other difference, of course, is that there's essentially two platforms for mobile devices. And everybody's on one platform or the other. So there's an ability for just two companies to essentially control at least the baseline of how information is going to be conveyed to consumers and what it takes to get in their app store.

And I imagine this creates a lot of problems in the TV world of how you're going to address those issues. And I'm wondering if, in the working groups, you've talked about those at all. I know I'm putting you on the spot a little bit here. But if you've talked about those specific problems and how they might be addressed in the TV world.

SHAQ KATIKALA: So the first issue is about not being able to interact directly.

KEVIN MORIARTY: It's the point you were making, which is that it's jarring to see something on your-- it's arguably jarring to see something on your television that expects you to click a box and say OK. You used to just turn on your television. And there's content playing.

SHAQ KATIKALA: That is certainly one of the big challenges and one that we're actively thinking and talking about. In the web and mobile environment, we push to have icons next to the ads, so you can easily access for more information about your privacy options.

But in the TV world, we found that it may be possible that a few companies. For the most part, that's not possible as an overall policy, because not all TV manufacturers have that option yet. We're still doing research to figure out where the TV industry is headed. So maybe in three years, every TV will have some sort of mouse that you can use on your TV and click on things. That still remains to be seen.

And as far as app ecosystems, I mentioned earlier that there's a group of companies that have dealt with app ecosystems in the past. They're trying to translate that to smart TVs. I think they're really thinking about that. And from the TV manufacturers who may not have dealt with app ecosystems as much, one thing to note there is that a lot of times the apps are not talking to each other.

Usually with the mobile environment, you have an advertising ID, which allows cross app information to be conveyed with each other. And all of these TVs, every app is treated in its own ecosystem, in its own publisher. So it's more first party data and third party.

JANE CLARKE: But I would also say to give credit to the TV manufacturers. I think there's some LG folks here. I have an LG smart TV. I've had it for four or five years. You get used to that interface. It's a little weird, trying to use this remote control to type out letters of the movie that you're looking for. But having that app ecosystem on a big screen versus on a small screen is not that difficult to adjust to, I think. They're working on improving the ability. I personally would rather have a keyboard than the thumb.

I think they've been experimenting. You go to CES, and you see lots of different options for how to deal with that app ecosystem on a smart TV. So I think there's innovation coming in that area.

MARK RISIS: So we've been talking about the app ecosystem. But I just want to underscore that there are two very severely different tiers of the app ecosystem. And there are certain apps that are absolutely mandatory for a connected device to sell. And those are Netflix, and Amazon, Hulu, YouTube, and maybe some of the, like HBO GO and things like that.

And having some exposure to the way those negotiations go, there's very little that a manufacturer of a hardware device can do to affect the policy that the app developer and distributor enforces from a data collection standpoint. It's a blind spot. A TiVO device, when it pivots to a Netflix app, it sees nothing. It's completely blank. App launched is literally the last piece of information that is received. And at that point, the hardware manufacturer is blind in many ways.

And then there is everyone else. And they're trying to get onto the connected devices. And I think they will certainly abide by quite a lot to have a presence and the distribution that the hardware manufacturers afford.

And so I think it's important to think of them as two different ones. There is the tier one app developers who dictate what they do with the data completely, pretty much. And then there's everyone else that, I think, are more amenable to how they work with data traction and things like that based on what the carrier of the app dictates. So I think that there is no one that can tell Netflix what to do is the bottom line, with regards to their data. And so that needs to be considered.

KEVIN MORIARTY: How does TiVo approach, if you know, how they approach the consumer interface as the consumer's booting up and--

MARK RISIS: Yes so speaking as a consumer, I have five TiVo's. Been there long enough. So there is a very explicit opt in as you're booting up, saying that your information will be collected. And then there is a secondary opt in that says if you do not wish for this information to be added to our anonymised aggregated panel, here's your option to opt out.

And then subsequent to you setting up your device and playing with it, any privacy policy update is messaged by a fairly intrusive and annoying but nevertheless prominent screen that pops up when you pivot out of live programming and into the guide. Any update is messaged there. It's also messaged via email to your account.

And the opt out from having your data in an anonymous fashion, an aggregate fashion, sent to an entity like TiVo research, you're able to opt out from the Settings menu right on the box. And you're also able to opt out on the web account portal. And that's front and center and right next to where you would go as a consumer to, essentially, manage your recordings and things like that. So I'd say there is at least three prominent points and an ongoing mechanism to message any changes in the privacy policy.

KEVIN MORIARTY: So this question relates a little bit to an audience question, which is asking about would it makes sense to have an external device with some option to control ACR make sense. And I'm just wondering-- maybe this is just terribly old fashioned to suggest that consumers are still using remote controls-- but why couldn't you just put a button on a remote control that instead of just the Settings button, but a privacy button that would give people a menu of the kind of tracking that a television or a set up box is doing?

And maybe even, having additional information about what tracking is going on for that particular program? Is that something that you talk about?

JANE CLARKE: You know how many remote controls most people have in front of their television set? Which one would you use? And which one would override the other one? It's an interesting concept. And I don't know if any of MVPDs or OENs have tried to work together on something like that. But they all do different things. I've got four of them sitting there. They all do different things.

KEVIN MORIARTY: I know people tend to want fewer buttons on the remote control rather than more buttons. But they don't tend to be shy about adding single use case buttons to remotes. So it seems like this is something, if it were sufficiently important, that a manufacturer or a set-top box maker could choose to put on that remote.

ASHWIN NAVIN: I think it just comes down to, like I said earlier, disclosure, choice, and control. And I don't know if we need to be specific in saying, hey, it has to be a button. Or it could be part of an app. Or it could be part of the UI of the television. But the core principals need to be clear. And I think we could do a better job as an industry putting those together.

JANE CLARKE: And benefit, too, because I have a pet peeve that allowing your data to be collected, opting in, is like voting. That if you want to get good content in this country, you've got to let people know what's being watched. So if you're just going to hide, then your content will not be counted. Your content viewing will not be counted. And we can't help it if nobody makes any more content that you're going to like. it's just a pet peeve that I have about that.

I don't really think people understand. They think when they are opting that it's something having to do with the government or Jason Bourne or whoever it is. But they really don't understand that there are benefits to having your voice counted.

MARK RISIS: I think it comes down to, going back to the example that Jessica gave about the senator and their rental history, it wasn't their rental history itself that was the issue. It was that the senator's identity was revealed. To Jane's point, viewing information in itself, if it's completely depersonalized and anonymized, is a consumer benefit. It informs.

And to a lot of the points Ashwin and others made on the panel, it helps the consumer experience in a tremendous way. I think it's the re-personalization and letting the consumer identity be exposed that really is much more of the issue at hand. I don't think the two should be lumped together. It's not the data. It's the person that really should be protected in the most strenuous way possible.

SHAQ KATIKALA: So to address what the suggestion was from a self-regulatory standpoint, we're technology neutral. And I think the end result is our rules will generally tell you, you need to provide this kind of notice. You need to provide this kind of choice. It needs to meet a certain level of prominence.

But at the same time the Apple TV remote doesn't have any buttons on it at all. And it's not in our place to tell them your design is wrong. Because it doesn't have a button like this other manufacturer does. So we don't like to pick winners and losers in terms of design and technology and that sort of thing. But we have flexibility for companies to innovate.

KEVIN MORIARTY: So to again put you on the spot about what the working group is up to-- and wasn't my intent-- but this was another audience question. And it relates to what Mark was mentioning about we're not touching the PII.

And I guess the question is have you considered whether the option of not requiring any transparency and choice, if a company can somehow certify that the data that they're collecting does not include any PII from consumers? If it's just a pure-- I don't know how you make it de-identified at that point that it comes from someone's box. But you could imagine it being de-identified shortly. Is that a situation where a manufacturer, some ACR provider wouldn't have to tell consumers what they're up to?

SHAQ KATIKALA: Well, we don't have the code yet for smart TVs. But what we have for Web and mobile is a three tiered system. One, we require a certain consent a higher level of consent for what we call PII distinguish from device identifiable information like cookies or mobile advertising identifiers, those types of things. So to the extent you don't know the person's name or e-mail address, we think there's good reason to provide incentive for companies to avoid using those types information where possible.

And if you're de-identifying them all the way, then in that case, if you don't have user level data, then it doesn't really pose much for a privacy threat. It's more aggregate and statistical

information. But for the other two categories, we do require notice and choice. And it differs based off of the sensitivity of the information.

JANE CLARKE: There's a lot of complexity here in terms of which data you're getting at a household level, which is smart TV data, which data you're getting at an individual level, which is device level data. Set-top box data is at a household level. The different identifiers, if you have PII if you have a subscription relationship that you can get IP address. You can get device ID. You can get location ID. I think there's been some concern raised that as you put together all these things that are non-PII, they can all of a sudden start to become PII.

And so I think industry is really being very cautious about that, about putting together too many pieces, because that's been raised as an issue, as a concern. But it's a complex environment, where some people are covering it by only having household data. They don't have individual data. It really depends on which combinations of data people are putting together.

KEVIN MORIARTY: So we're getting right to the end here. So I thought I'd give everybody a minute or so to have any concluding thoughts. If you have any, we can start, I guess, the opposite way than how we started the panel. Start with Josh, if you have anything to share.

JOSH CHASIN: Yeah, I don't know that I have anything new to share. I think that all of us, of all of the companies involved in this particular ecosystem, we all have chief privacy officers. We all understand the laws about consumer privacy. We're all diligent about that.

Information-- and I said this, I think, twice already-- information facilitates commerce. And commerce is good. Information makes marketplaces more efficient. Efficient marketplaces are good for producers and consumers. So I think that as I said, one of the fundamental natures of the environment we live in today is the fact that there are so many digital environments. And by the way, smart TV and MVPDs, set-top boxes, those are digital technologies. That's why the data is created in the first place.

By nature, it creates data. We need to govern the data. But the data is, I think, helpful for producers and consumers.

JANE CLARKE: That's a good one. The data is helpful for both producers and consumers. I do think that, as an industry, we could do a better job explaining the benefits of how data can help consumers and that it's not just to send them a re-targeted ad that will follow them everywhere they go across screens, which is probably what people fear.

So I think there's a lot of opportunity for education. There's opportunity for better standardization. But it's such early days that I do think we have to allow for some innovation to keep happening here and how to make this work better for consumers, how to get the consumer experience out there that's optimal.

SHAQ KATIKALA: I'd echo that as well. So the industry is really new, especially the TV manufacturers side. And I think every player is new to one aspect of the space. So either a new manufacturer dealing with, or a new privacy law they're working with. But the thing is, I haven't

met a company yet that's not thinking seriously about notice and choice. They are putting a lot of effort into it. So we'll keep working with them and trying to build something standardized for the industry.

ASHWIN NAVIN: I'm actually really glad this is happening, this workshop. And I appreciate the effort that went into it. We're really excited about television, about media about what the power of data has for the experience for media and television. I use my app every day. I love what it does for me to help find something to watch. And I think that we not only need to do a better job as an industry to clarify what are some guiding principles. But as an industry, we need to develop a better sense of what this data does for the consumer and actually realize that.

So part of the educational gap happens when we've provided sufficient value to the consumer that they don't feel like there's this unknown thing that could happen in the future or that they're surprised when they find out that their TV is doing something. If it's something that they're immersed in and they actually get the benefit of it, then there's no surprise at all. And so we need to be more innovative. We can do more as an industry.

I think it's helpful to have guidance, leadership. There is a regulatory gap or a vacuum that has, I think, in recent years or maybe in recent months caused flare ups in the press. And certainly in the legal environment, there's been some class action lawsuits that aren't helpful. That in fact, we as startups, as software companies, as innovators, hardware companies in this space actually benefit from clarity. Innovation sometimes requires rules of the game. Actually it definitely requires rules of the game. And we need to quickly put those in place. So it's helpful to have the leadership of the FTC. And we appreciate that

MARK RISIS: It's hard for me to add to what my esteemed panelists have summarized quite so well. But I guess just a parting thought, the television market-- and this is what Josh started with-- so take it full circle. Television market is essential for the health of commerce of the country. And it supports so much from everyone engaged, the advertisers, everyone who works for those companies, the networks, the consumers. And consumer behavior, consumer purchase drives so much of our economy.

But the stark reality is that market is driven by data that was created in the 1950s. And the consumers live in 2016. And there is simply no way to get from 1950s to 2016 without a rich amount of data available for experimentation and innovation. And deprived of that, I think the market will fragment and-- God forbid-- collapse. And that would be systemically damaging to quite a bit.

KEVIN MORIARTY: Well thank you all again so much for your participation today. We really appreciate the opportunity to have heard from all of you. So we're now taking a short break. We'll be back at 3:15 for the second panel of the day.

[APPLAUSE]