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Business Analysis for Video Entertainment Participants

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In this report:

3D Entertainment: Dimensions of an Emerging Market

The billion-dollar success of "Avatar," the second highest-grossing movie in history, coupled with headlines emanating from the Jan. 7–10 Consumer Electronics Show in Las Vegas, have thrust 3D video technology firmly into the public spotlight.

Today's 3D viewing experience, which has moved far beyond earlier failures, already has changed the movie business, and now is poised to change the video gaming, sports programming and perhaps even the general TV entertainment businesses in the next few years.

Like the early days of high definition television, a wide swath of industry players — movie studios, cable and broadcast networks, TV set manufacturers and platform providers — now shares a common 3D vision. The result is a determination to move in concert to bring 3D to consumers. Many executives at the center of this galvanization believe the technology can reach mass adoption faster than HDTV, because today's 3D enjoys more favorable production and TV set economics than HDTV of a decade ago.

3D's chief drawback, compared to HDTV, is the requirement that viewers wear special glasses to enjoy the full 3D effect. But many companies believe the astounding success of "Avatar" in the theaters will translate to the living room. There's also hope that technological advancements will obviate the need for 3D viewing glasses within three years.

All that adds up to a 3D juggernaut, propelled by studios, TV set manufacturers, video programmers and platform providers, which is rolling towards America's living rooms. In this report, we examine the challenges and opportunities critical 3D constituent groups face in making 3D a reality.

Understanding 3D technology

3D technology, in various forms, has been around since before 1900 (stereoscope viewers), and reached new heights during the 3D movie craze of the 1950s.

Since then, technologists have endeavoured to create more lifelike 3D images, but the core remains the same: creating two slightly different versions of the same image.

Creating 3D content is accomplished by placing two cameras side by side to shoot the same scene, so that each records the scene from a slightly different vantage point. This technique mimics the stereo vision produced by the right and left eye.

The 3D system then delivers these two images to the viewer — one version to the left eye, and one to the right. Just as it does for normal vision, the human brain then interprets both images and combines them, resulting in the perception of image depth.

There are several techniques for encoding video to produce this effect. In the 1950s, cameras outfitted with blue and red filters recorded images that were layered together. At the movie theater, moviegoers donned the iconic blue-red glasses that symbolize the early 3D era. The blue lens filtered out the blue image and rendered only the red, and the red lens performed the opposite function — creating an off-color 3D experience.

In the modern digital age, two more sophisticated, color-correct methods have emerged.

The first, a version of which was used in "Avatar," uses a trick of light. The dual video footage is encoded at two different polarized light angles (polarizing filters light, blocking all rays except those that enter at a specific angle). The footage is then spliced so that the frames alternate between the left and right eye view, at a frame rate of 120 frames per second.

To get the 3D effect, viewers wear special polarized glasses — the right lens is oriented to see one view, and the left is aligned to see the other. At 60 frames per second per eye, the viewer does not notice the change in frames but does see the image in 3D.

A second method that has been incorporated into the new Blu-ray 3D standard ratified in December 2009 also involves alternating image frames. It uses the Multiview Video Coding (MVC) codec, an offshoot of the MPEG-4 H.264 Advanced Video Codec now in wide use today and supported by Blu-ray players. MVC also produces a video stream with alternating frames — one for the left eye, one for the right — at a rate of 60 frames per second apiece.

In this scheme, the viewer wears a pair of electric-powered shutter glasses that rapidly black out the left and right lenses alternately. An infrared emitter mounted on the 3D HD box synchronizes the timing of the lens movements with the alternating views for the right and left eye.

"In the short term, we're in a glasses universe. To go to a truly glasses-less world we need much better TV glass technology. You will see more of these experiences in shopping malls, but as far as in-home viewing, it's going to take a little while before we see the glasses-less vision experience."

Joshua Greer, president RealD, from the *New York Times*

Longer term, developers are working on a system that doesn't require glasses to view 3D content. Called autostereoscopy, it uses a strategy akin to 3D postcards in creating two image layers and then assigning the two video perspectives to each layer. This can be done with a physical screen called a parallex barrier or by shooting the video using a lenticular lens able vary magnification of parts of the image to create depth. But early results have produced video that is difficult to watch for long stretches of time, with viewers complaining of eye strain and headaches. For that reason, most experts believe 3D video without glasses is several years away.

While all of the 3D TV schemes are based on the same principals, a major issue facing the industry is a lack of standards. At present there are more than 10 3D encoding formats in use. Various manufacturers and standards bodies including the IEEE, cable's SCTE and television's Society of Motion Picture and Television Engineers (SMPTE) are working on standards of their own, but it will take time for these versions to be finalized.

In the meantime, not all 3D TVs will support all 3D formats. Will a 3D TV set based on the Blu-ray 3D standard render a 3D image for content formatted for the polarized 3D system? It is not entirely clear.

That means consumers could encounter device and content incompatibility issues, similar to the format problems present in the early DVD player market. Also, there is the risk that more than one standard format will arise, leading to market fragmentation as seen with the recent DVD-HD and Blu-ray HD disc war.

But in the early stages, there does appear to be one emerging format in the Blu-ray 3D standard, which will be used to deliver movies on disc. Indications are that TV manufacturers are following this path, making it a strong early contender for the home 3D TV standard of the future.

As in any standards battle, the common good of earning money can trump hardened business positions. It wouldn't be surprising, given the potential money to be made, if manufacturers and studios came together to insure a quick agreement on standards.

3D Blu-ray players

Four CE manufacturers introduced these 3D Blu-ray players at the January 2010 Consumer Electronics Show. Pricing details are available only for the Toshiba models.

Panasonic DMP-DBT350
Features dual HDMI outputs (HDMI 1.3 and the newer 1.4) making it easier to connect to existing AV systems.

Samsung BD-C3900
Built-in Wi-Fi, access to Netflix, Blockbuster and other online video sources.

Sony BDP S770
Netflix, Amazon Video on Demand and other applications, plus Wi-Fi built in.

Toshiba BDX2500, 2700 and 3000
Spring 2010 release. Lower-end model lists at $200, mid-model (with built-in Wi-Fi) at $250.

3D: KEY IMPACTS BY PARTICIPANT GROUP

Movie studios

No event has done more to fuel interest in 3D than 20th Century Fox Film Corp.'s release of director James Cameron's "Avatar." After five weeks, the film grossed $436 million in the U.S. and nearly $1.4 billion worldwide (with 75% of sales coming from 3D), making it the second-highest grossing film ever. The IMAX screens (3D on steroids) showcasing "Avatar" accounted for 25% of the movie's box office revenue on only 2% of the available screens.

"Avatar" is the hit, or justification, Hollywood needed to accelerate 3D efforts across the board. Some 30 films currently in production this year will be shot in 3D, according to IMAX CEO Richard Gelfond, and the success of "Avatar" will accelerate that trend. Dreamworks Animation, maker of "Monster vs. Aliens" (where 60% of first week revenue came from 3D screenings), has committed to 3D production for all future films.

Studios are also poring through their library titles, including "Titanic" and "Star Wars," to determine the suitability to add and market 3D features.

Among forthcoming 3D titles from major studios in 2010:

- Disney/Tim Burton's "Alice in Wonderland" in March
- Dreamworks' "Shrek Goes Fourth" in May
- Dreamworks' "Cowboys and Aliens"
- Dimension Films' "Piranha"
- Walt Disney Pictures' "Tron Legacy"
- 20th Century Fox's "Garfield Pet Force"
- Universal's "Despicable Me"

On the home video front, Sony will release "Cloudy with a Chance of Meatballs" in 3D when it comes to home video (DVD and Blu-ray) this summer. The studio also promises other 3D home video announcements late this spring. Disney has announced "A Christmas Carol," "Alice in Wonderland" and "Toy Story 3" will be in 3D when they make their home video debuts this year.

All told, four of the top 10 films in 2009 were 3D: "Avatar," "Ice Age: Dawn of the Dinosaurs," "Up" and "Monsters vs. Aliens," making them likely candidates for home video, and thus VOD 3D availability in 2010. It's obvious that animation, followed by action and horror movies, are 3D's top genre draws.

The cost to shoot and produced a film in 3D, or to up-convert already produced movies into 3D, while substantial, isn't as large as the conversion from standard-definition video to HD. "Avatar" cost more than $230 million to make, although the animation portions of the movie also drove up those production costs. Consumers, at least in AMC theaters, paid $3 for the 3D and $4 for the IMAX experience for "Avatar," above and beyond the main ticket price.

> "We had no choice but to drive into 3D because, for one thing, piracy is such an enemy. It's the villain of content, and 3D is harder to pirate. And it's a bet we had to make because if you stand still with technology, you're crushed."
>
> Sony chairman Howard Stringer, from the *Wall Street Journal*

Most of today's up-conversion methods center on duplicating the video frames, then skewing the perspective of the duplicate frames to mimic the stereo image captured by a twin-lens 3D camera.

That idea is incorporated into a Toshiba Corp.'s new Cell TV, which is designed to convert 2D images to 3D on the fly. Employing a cluster of rapid-fire 3.2 GHz processors, the TV set can automatically render the stereo frames and deliver them to a viewer wearing shutter viewing glasses.

Some critics, however, have branded this form of 3D up-conversion as being substandard to true 3D, particularly with fast-moving scenes, noting that up-converted 2D video tends to make objects appear as if they are always moving away from the viewer. Other observers believe up-conversion may be an adequate short-term fix that's needed to get a base of 3D content in the market before original production can help fill up libraries.

"2010 will be the year in which 3D is brought to the home…The incremental cost which is much less than we've seen in other platforms as they rolled out is going to make this very, very appealing."

DreamWorks Animation
CEO Jeffrey Katzenberg,
from *USA Today*

Cable networks

In a near mirror image of early HDTV programming development, Discovery Communications Inc. and ESPN Inc. are leading the cable network charge into 3D.

Discovery's new 3D channel joint venture with Sony and IMAX is scheduled to launch in 2011. It will feature movies contributed by Sony alongside nature, science, adventure, engineering, children's and history documentaries and programming from Discovery and IMAX.

ESPN announced it will produce 85 live events in 3D, starting with the opening match of the 2010 World Cup soccer tournament (South Africa vs. Mexico on June 11), over the next year. The list includes 25 World Cup matches, Summer "X Games" events and college basketball and football games, including next year's NCAA Bowl Championship Series game.

Spurred by DirecTV's early embrace of 3D, a number of content providers are jumping into the category. AEG Digital Media, CBS, Fox Sports/FSN (MLB's All Star Game), Golden Boy Promotions, HDNet, MTV, NBC Universal and Turner Broadcasting System Inc. are among those developing additional 3D programming that will debut in 2010–2011.

Internationally, both BSkyB and Canal Plus plan to launch 3D channels later this year.

The evolution of 3D thinking among cable networks (ESPN has had a 3D task force for more than a year) mirrors the same pattern seen with HDTV, when HDNet, Discovery and ESPN led the charge, while other networks followed a few years later when a critical mass in HDTV set penetration was reached.

FX will likely be early in the ad-supported cable network fray, having bought the rights to "Avatar" for basic cable viewing.

"We think our audience is perfectly lined up for 3D."

Sean Bratches, EVP, sales and marketing, ESPN,
from *Advertising Age*

The economic motivations for cable networks generally fit into existing revenue and profit models. We see three primary models emerging:

- 3D exhibition of programming may provide early-arriving networks with a ratings boost that elevates the value of commercial time.
- 3D programming, particularly new channels, may endow networks with arguments for new, incremental or higher affiliate license fees from distributors, although there is an early proving ground that must first be established.
- For premium and on demand content, 3D may serve as a subscription or purchase inducement, with on demand content (as it has in some instances with HD) driving higher per-view prices.

Additionally, 3D offers some intangible economic value in the form of consumer awareness and marketplace buzz that may bring attention and favorable brand value to some networks. ESPN, for example, maintains an almost religious devotion to embracing promising consumer video technology as it seeks both to extend its presence across new media channels and to defend itself from competitors that might use technology to gain advantage.

"In five to 10 years, I'm convinced we'll see mass rollout of this."

Discovery Communications Inc. founder John Hendricks, from *Light Reading*

Broadcast TV networks

Broadcast networks are united in pronouncing support for 3D. CBS and NBC Universal were included in DirecTV's announcement of 3D programming plans at CES, Fox plans to produce this summer's Major League Baseball All Star Game in 3D, and Disney chairman Robert Iger has talked glowingly about 3D from a movie perspective. Still, it's unclear just how soon or how deeply the broadcast networks will move into 3D.

The broadcast networks are joined at the hip with their affiliated TV stations, and that creates two separate issues for both groups: business strategy and technology conversion.

From a competitive business standpoint, the broadcast networks can't afford to allow other programmers to get too far ahead in 3D if, in fact, 3D becomes a game changer like HDTV. In reality, HD was not a big moneymaker for broadcasters, and was, in fact, a cash drain in the early years, especially for local stations. Even today, broadcasters aren't among the chief economic beneficiaries of HDTV, compared to TV set manufacturers and, secondarily, multichannel video service providers.

The primary content consumers will see in 3D early on will be sports and movies, again mirroring the historical evolution of HD programming. Broadcasters carry some new movies through syndication deals and some sports programming. It's the latter area where broadcast networks are likely in negotiations with the major professional sports leagues about adding 3D production and transmission to current and future rights contracts.

A second and more vexing issue involves the technical costs needed by local stations to transmit 3D signals. The costs to convert to HDTV and/or

digital were problematic for many broadcasters, especially those in smaller markets, largely because there was no direct revenue realized from the conversion. The theories that advertisers would pay more for an HD spot, or that broadcasters would get more money in retransmission consent discussions, never truly came to fruition. For TV stations, the cost to convert to HDTV became just a new cost of doing business, even a cost just to stay in business, as the rest of the world converted to HD around them.

3D, at the moment, is shaping up to look a lot like HDTV for the average TV station owner, and that's not an appetizing prospect, given an economy that has seen local ad revenue fall by 30% or more in some markets. While a tepid recovery is under way, local broadcasters face plenty of challenges. The broadcast networks want a part, in some cases a substantial part, of any retransmission consent fees. Even if local broadcasters could keep all the retransmission revenue they negotiated, it wouldn't cover the shortfall in ad sales.

It's possible that because of technology advances and cost declines, the final cost to add 3D technology to today's existing digital signals won't be onerous, or at least not on the order of HD conversion costs. But given the local broadcasters' emphasis on local news and syndicated/broadcast entertainment programming (talk shows, dramas, sitcoms), it's doubtful local TV will lead the 3D charge. TV stations likely will gradually move in 3D, perhaps taking the plunge when 3D TV set penetration in a given market is substantial, perhaps 25%, and when their own program schedules are heavily weighted with broadcast network movies and live sporting events.

Madison Ave.

When observers examine the forces that slowed early adoption of HD, Madison Ave. emerges as a frequent target. Once the HDTV revolution got going in the middle part of the last decade, HDTV set sales were growing more than 30% a year and dozens of programmers started launching HD feeds, the assumption/hope was that advertisers would soon follow with HD spots in HD programming.

While HDTV set manufacturers were only too happy to buy advertising in HDTV networks and film ad spots in HD, the rank and file on Madison Ave., ranging from clients to ad agencies to media buyers, were slower converts to HD. The first HD network, HDNet, launched in 2001, yet it wasn't until 2007 that Discovery and the media agency Starcom held the first HD upfront presentation.

Even today, consumers can still see a fair amount of SD commercials on HD networks, notable for their less impressive picture quality and jarring black bars on each side of the screen.

The hopeful observer might think that Madison Ave., having had the HD experience fresh in mind, might move more quickly this time.

But economic impediments remain. As with HD, advertising agencies must bear the cost (10% to 20% higher) of shooting a commercial in 3D. Last year,

Dreamworks distributed 125 million pairs of 3D glasses as part of a promotion in the Super Bowl for its upcoming film "Monsters vs. Aliens," a costly stunt the studio doesn't plan to repeat.

To date, only snack maker Mars has dipped its toe into the 3D advertising waters, with a Skittles campaign that is running in theaters. The cost of converting a 3D ad for the cinema can be $70,000 or more.

That said, look for TV manufacturers with 3D sets to sell to step up to the plate. Sony has signed on as a sponsor with ESPN for 3D programming, and will receive exclusive rights for ESPN's carriage of the BCS national championship game a year from now, 13 college football games and the Summer "X Games" events. At those events, ESPN will use Sony 3D cameras.

Separately, Panasonic will be sponsoring DirecTV's new three 3D channels that will debut this summer.

Platform providers

DirecTV is the first platform provider to announce the launch of dedicated 3D channels, timed for this summer when many TV manufacturers promise dozens of 3D HDTV models will be on store shelves.

The satellite TV company said it will provide a software upgrade for "millions" of current subscribers that will allow them to view 3D. It's unclear, however, exactly how many of DirecTV's set-tops, including legacy models, will be able to render 3D, but the thought is that most of DirecTV's newer STBs will pass the test. Panasonic Corp., which plans to target DirecTV's 18 million subscribers as it markets new 3D TV sets, believes about 10 million DirecTV homes can receive 3D signals, according to an Associated Press interview with Yoshi Yamada, Panasonic North American chairman and chief executive officer.

DirecTVs three 24/7 new channels are:

- A 3D pay-per-view channel focused on movies, documentaries and other programming
- A 3D DirecTV on Demand channel
- A free 3D sampler channel featuring event programming such as sports (including the MLB All Star game), music and other content

DirecTV also announced that AEG/AEG Digital Media, CBS, Fox Sports/FSN, Golden Boy Promotions, HDNet, MTV, NBC Universal and Turner Broadcasting System Inc. will develop 3D programming that will debut in 2010–2011 on DirecTV's service.

Although DirecTV wasn't saying, the periodic ESPN 3D broadcasts that begin this summer could fit into the sampler channel.

The Discovery-Sony-IMAX channel isn't slated to launch until 2011, so the only real content available this summer will largely be studio movie content. The on demand channel would allow DirecTV to offer recent hit movies, including

"Avatar," on a per-transaction basis. It could also offer any Hollywood library titles that are converted to 3D as part of the on demand channel.

In cable, both Time Warner Cable and Comcast are in talks with ESPN and Discovery about 3D carriage deals. Comcast chairman and CEO Brian Roberts expressed enthusiasm about 3D, particularly on VOD.

"It's particularly nice for VOD," he told investors in early January. "We have done some 3D movies on VOD."

"There are a lot of good things [about it]," Roberts added, including "the higher price point, the opportunity to revalue a movie show or sporting event." Roberts, whose company is seeking approval to acquire film studio operator NBC Universal, said that "The best 3D will be movies for a long time."

From a cable distributor perspective, Roberts said, "Everyone will claim to be able to do it, and we want to prove we can do it as well." But adoption won't happen overnight, he said. "It's a long road, but it's great, just like HD has been great. 3D is part of enriched experience."

Verizon and AT&T also will be looking at adding 3D to their subscription video lineups, especially if DirecTV, Comcast and other cable operators make 3D splashes. Verizon's FiOS plant has large amounts of bandwidth, which will make it easier to offer 3D. AT&T's FTTN IPTV system, on the other hand, has some bandwidth limitations, and a current cap of two (soon to be three) live HD streams to the home. Depending on the final bandwidth requirements for 3D, AT&T may be slower to add 3D to its U-verse arsenal.

Some research suggests a meaningful share of multichannel video customers could be swayed by the availability of 3D video. A Quixel Research online survey of 1,000 U.S. adults found 32% said they'd be willing to switch video providers to attain access to 3D video content. The December 2009 survey also found more consumers would prefer to get 3D content from cable or satellite providers than from Blu-ray players.

The technical challenge of 3D TV, for cable operators, lies in the subscriber hardware and their own video transmission systems.

On the set-top side, technology consortium CableLabs Inc. has moved in to help cable operators develop and implement 3D TV, opening a 3D test facility in March 2009. Based on that work, it appears that many of the digital set-top boxes now deployed in cable systems are capable of passing through the 3D TV signals to a 3D-capable TV set.

The one caveat is that with the higher-resolution Blu-ray MVC scheme, it will require a new HDMI 1.4 interface between the set-top and the 3D TV.

"We've found today's cable system is a flexible system that enables delivery of 3D TV signals with little to no change in cable's existing video on demand and switched digital video infrastructure to existing set-top boxes," said CableLabs President and CEO Dr. Paul Liao, in a Jan. 5 press release. "This system will deliver a high-definition 3D image to today's new generation of 3D TVs regardless of their native display technology."

Decisions needed

On the transport side, cable operators will have to make some decisions regarding how to encode and distribute 3D video.

Initially, operators may start with a polarized 3D system — the same system 3D technology provider RealD is providing to DirecTV to support 3D channels and VOD content for the satellite provider's service. The advantage is that the polarized format (sometimes also referred to as paneling) will deliver 3D video at roughly the same payload as a standard HD stream, albeit at a slightly lower picture quality compared to the Blu-ray 3D standard. The glasses needed to view the video also are relatively inexpensive, averaging about $20.

Eventually, cable-delivered 3D may transition to the new Blu-ray 3D standard, particularly given the direction of TV and DVD manufacturers. But that will require the cable customer to buy the more expensive electric shutter glasses, which range from $100 to $200.

But the Blu-ray 3D MVC codec is problematic for cable operators because it requires 50% more bandwidth compared to a standard HD stream. There is a potential variation to MVC that would cut the frame rate in half, but it tends to produce a jerking motion in fast-action sequences. So there is some question whether viewers will find it onerous.

Another bandwidth-saving possibility is to deliver 3D HD signals using IP MPEG-4, rather than the standard MPEG-2 cable channel. That also could cut the bandwidth load in half. Cable operators may also opt to place 3D content on VOD or switched digital video systems, where the higher bandwidth could be more easily managed. Since much of the early 3D content will be Hollywood movies, the VOD/switched digital options could gain traction among MSOs.

The likelihood that the polarized and Blu-ray 3D systems will coexist in the market also presents challenges. If the Blu-ray 3D method is adopted by consumers for DVDs and cable operators and programmers rely on the polarized format, consumers may complain that they are forced to keep both sets of glasses on hand, and may be confused about which set to use with what content.

In either case, cable operators will have to invest in encoders and ingest receivers that support 3D formats, and that will be an additional expense. Encoders able to support 3D are coming onto the market from gear makers including Motorola, Harmonic and Conexant.

Bandwidth also will become an issue for cable operators in supporting programmers' 3D channels plans. Discovery President David Zaslav indicated the new Discovery/Sony/IMAX 3D channel would need a full 6 MHz of bandwidth at 38.8 Mbps. That would eliminate the possibility of multiplexing channels on a single 6 MHz carrier, as is standard practice now.

"We led the way with HD and we are excited to do the same with 3D."

DirecTV Entertainment EVP Eric Shanks, from DirecTV press release

Also, cable operators will have to deal with legacy incompatibility issues when it comes to customers' older HDTV sets. There have been some scattered discussions regarding ways to upgrade existing HDTV sets using adaptor units, but even if that is possible these older sets must be able to support a 120 Hertz refresh rate, which corresponds with the minimum 120 frames per second speed for 3D rendering.

Many HDTV sets purchased before 2009 do not support that frame rate, potentially leaving a large group of subscribers out of the 3D loop.

Main street

The segment that has the ultimate power to decide whether 3D is a success, a failure, or takes a place in the no man's land between those extremes is the consumer.

Will consumers keep going to 3D movies?

Will sports viewers view 3D as a must have for sporting events?

Will consumers readily part with $1,000 or more for 3D sets, even if they've made a recent HDTV set purchase?

In the case of HD, the answer to similar questions was, eventually, yes.

The one question HD didn't have is the toughest of them all: Will consumers, en masse, habitually put on 3D glasses to watch 3D content?

The research is mixed, notwithstanding the huge success of "Avatar."

Researcher InStat found that 25% of consumers said they wouldn't pay any extra fees to receive 3D. Some 43% wanted to spend less than $200 for it. A total of 11% would spend $400 to $999, and only 3% said they would spend more than $1,000. But 67% of consumers said they would be willing to pay more for a 3D Blu-ray than a 2D Blu-ray.

CEA found that 25% of consumers in an online survey planned to buy a 3D TV set in the next three years. Some 53% of respondents said they want to watch 3D at home.

Like HD, demonstrations may be the key to 3D growth. In the CEA survey, 16% of U.S. Internet users surveyed had the impression 3D was "gimmicky," but after viewing 3D content, the figure dropped to 8%.

Other CEA data points:

- 43% of those who have seen a 3D movie or event in the last year say they would prefer to watch movies and television shows in 3D instead of 2D.
- 33% of those who have seen a 3D movie or event in the last 12 months report they would like to watch all television programs in 3D, while 36% say the primary reason to buy a 3D TV is to play 3D video games in their home and 65% say the primary reason to buy a 3D TV is to watch 3D movies in their home.

"If it took 10 years for HD to go from one home to reach more than half the U.S. population, it will take 3D just as long."

James McQuivey, Forrester

- 69% of those who have seen 3D movies or events in the last year believe a 3D TV should have a screen of more than 40 inches (compared with 49% for those that haven't seen a 3D show/event in the last year).
- 57% of those planning to buy a 3D TV within the next 3 years consider themselves an early adopter of technology.

TV set manufacturers

Consumer electronics manufacturers thrive on the next big idea to sell to consumers. It's a cutthroat business with razor-thin margins. Striking gold, while euphoric, doesn't happen every day, or even every year, for that matter.

So it's no surprise that TV set manufacturers, perhaps more than any other constituency, are leading the charge into 3D. For those companies that were hard hit by the 2009 recession 3D is the new HD.

Sony's bet is all in, as it will have nine TV set models capable of 3D display by this summer, or about 25% of its base.

Panasonic, LG, Samsung and Toshiba also displayed 3D HDTV sets at CES. While only a handful of 3D sets are on the market today, these companies promised by this summer — the launch date for DirecTV's 3D channels — dozens of 3D models available for purchase.

And if the hype is to be believed, it won't be just 5% to 10% of their product lines. 3D sets ranging in size from 46 to 65 inches will be available for purchase this summer.

But what's the premium for a 3D HD set, compared to today's prices? LG Electronics' Tim Alessi said 3D sets would sell for $200 to $300 more than today's comparable 2D HD sets. That's not too stiff of a markup, considering how much more expensive the first HDTV sets were compared to SD, in some cases 100% or more. Reuters said a current 42-inch 3D HDTV sells for $1,000, compared to $600 to $700 for its 2D HD counterpart.

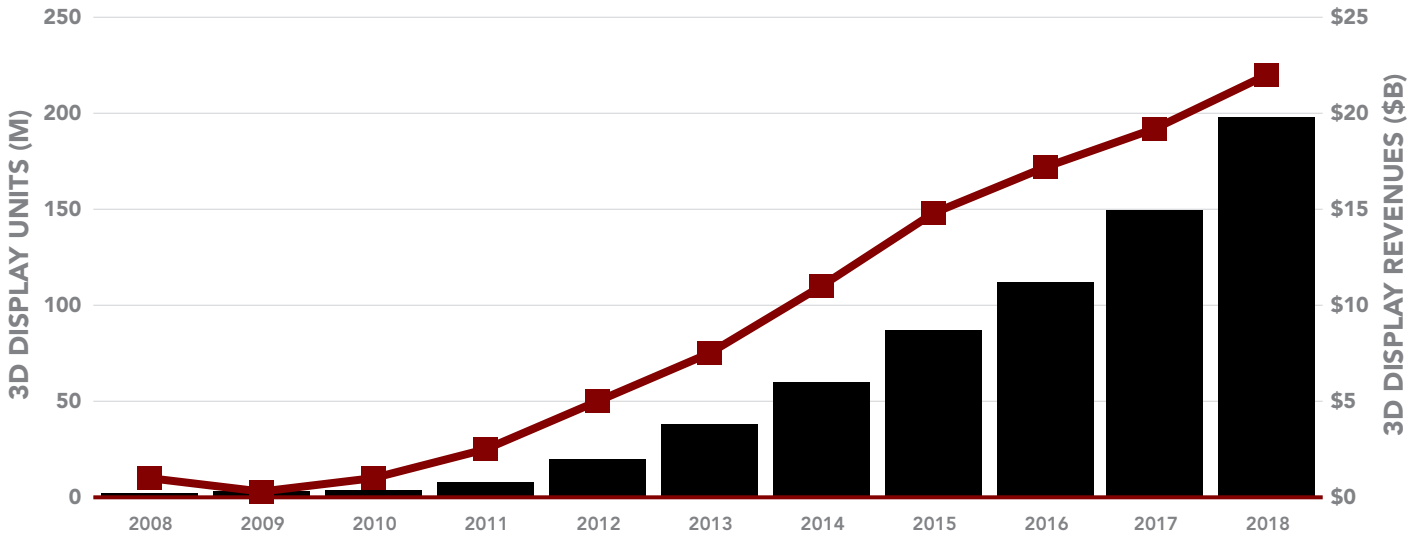
Before Phillips shut down its 3D manufacturing plant last March, it was selling 3D sets for between $3,000 and $12,000. Toshiba has a CellTV 3D set on sale for $10,000 in Japan.

No wonder many manufacturers, who are keen to reignite the CE industry after a tough 2009, are saying 3D sets have to be priced within a few hundred dollars of current HD models.

The always-optimistic CEA says there about 1 million 3D sets in the U.S. today. At the beginning of CES conference, CEA was estimating 2.2 million would be sold in 2010 and 4.3 million in 2011. By the end of the show, CEA had 3D fever, moving up its 4.3 million 2011 sales estimate to yearend 2010. By 2013, 25% of all TV sets sold will be 3D, CEA estimates. For its part, LG hopes to sell 400,000 3D sets in 2010 and 3.4 million in 2011. Panasonic has said publicly it aims to sell 1 million 3D sets this year worldwide.

Others have published equally optimistic projections. Futuresource Consulting estimates 45% of U.S. homes will have a 3D set in 2014, up from 3% in 2010. Industry research firm DisplaySearch estimates there were 200,000 3D sets sold in 2009. Its projections show 9 million 3D sets sold in 2012, rising to 64 million in 2018.

3D Display Forecast



Source: DisplaySearch *3D Display Technology and Market Forecast Report*

DisplaySearch also sees a rapidly expanding market for other 3D devices, including:

- 3D-ready monitors will grow from 40K units (0.02% penetration) in 2009 to 10 million (3.6% penetration) in 2018.
- 3D notebook PCs are forecast to grow from 66K units (0.04% penetration) in 2009 to 17.7 million (3.2% penetration) in 2018.
- Mobile phones will be the largest 3D display application on a unit shipment basis in 2018, with 71 million units with 3D capability.
- The largest screen size category for 3D display shipments will be 1–4.x inches, due to demand from mobile phone and digital camera/camcorder applications. The second largest size range will be 40-49 inches, due to TV, public display and 40-plus monitor applications.
- LCD will be the primary display technology used for 3D displays, as a result of its wide range of display applications ranging from small mobile phones to large public displays and TVs.
- Eyewear will be necessary for most 3D applications for many years to come, due to the limitations of autostereoscopic (no glasses) technologies.
- DisplaySearch forecasts there will be more than 7,000 new 3D cinema screens installed in 2010 and an additional 9,000 in 2011.

"It's a challenging market. We need something to kick us out of this. To me the thing that's going to get us there is 3D."

Panasonic CTO Eisuke Tsuyuzaki, from *Multichannel News*

But the hopes of TV set manufacturers have to be tempered by the current economic climate and consumer buying cycles. Consumers who have been hit hard by the recession, through a housing foreclosure or a job loss, aren't likely adopters.

Even more problematic are consumers who have some disposable income, but who have just recently (say the last three years) bought their first or second HD sets. That's a sizable chunk of the population.

If the programming quality is strong, early adopters will buy 3D TV sets, just as they did when HD rolled out. But consumers who recently bought a $1,000-plus HD set may need a few years before they are ready to buy/replace HDTV sets.

U.S. HD adoption history (homes in mil.)

YEAR	HOMES WITH HD SET(S)	TOTAL TV HOMES	HD % OF HOMES
2000	1.0	100.8	1.0%
2001	2.04	102.2	2.0%
2002	3.7	105.5	3.5%
2003	5.3	106.7	5.0%
2004	7.6	108.4	7.0%
2005	13.2	109.6	12.0%
2006	18.7	110.2	17.0%
2007	27.9	111.4	25.0%
2008	38.3	112.8	34.0%
2009	52.7	114.5	46.0%

Source: Nielsen, Leichtman Research Group, One Touch Intelligence

Even so, TV set manufacturers may only need the momentum of the early adopters in 2010, 2011 and 2012, perhaps 3 to 5 million sets a year, to establish 3D as a viable, and legitimate mainstream product. Discovery founder John Hendricks believes there are 5 million "early adopter" homes in the U.S. that would buy 3D sets in the next 24 to 36 months, and 20 million affluent "fast followers," who will adopt 3D next.

By 2012, there may be enough 3D networks (20–30), and positive consumer feedback (the 3D glasses aren't all that bad), to push 3D into the next phase growth, similar to HD's go-go years in the middle to latter part of the last decade. And by that time, consumers may not even need 3D glasses to view 3D content, removing a final impediment to adoption.

3D TV set survey

3D excitement at CES centered on the television sector, where five major electronics manufacturers unveiled new 3D TV sets, most of which will be ready for distribution later in the year. Here is a look at some of the featured products from Sony, Samsung, Panasonic, LG and Toshiba.

Sony

Sony came out with three new lines of 3D-capable LCD TVs: the XBR-LX900 series, the XBR-HX900 series and the KDL-HX800 series. All sets feature 1080p and 240Hz output.

Of these new products, only the XBR-LX900 series includes everything in the bundle needed for immediate 3D viewing, including the RealD active shutter glasses, valued between $100-$200. The XBR-LX900 series comes in 60-, 52-, 46- and 40-inch models.

The XBR-HX900 and KDL-HX800 series are 3D ready, but do not include 3D glasses or emitters in the package, only as an add-on feature. The HX900 series comes in 46- and 52-inch screen sizes while the HX800 comes in 40-, 46- and 55-inch screen sizes.

All three series of TVs are scheduled to be on the market this summer.

Samsung

Samsung also has three LCD enabled TVs, which can connect to Samsung 3D enabled Blu-ray players. All models include 1080p as well as 240Hz output. Those models also come with an auto-conversion system, which converts 2D images into 3D in real-time.

The UNXXC9000 TV is the thinnest of the 3D-enabled models and comes in 46- and 55-inch sets.

The UNXXC8000 and UNXXC7000 series come in 46-, 55-, 60-, and 65-inch models with the 7000 series including a 40-inch model as well.

Samsung also has a 3D-enabled plasma model, the PNXXC7000 series, which comes in 50-, 58- and 63-inch models.

The release date for these devices is unknown, but they can be expected to be available sometime in the second half of 2010.

Panasonic

Panasonic introduced its Plasma V-Series 1080p TVs at CES. The sets are scheduled to be available in the spring of 2010. The VT25-series will include glasses and be available in 50-, 54-, 58- and 65-inch sets.

Panasonic also introduced the PP-BDT350 3D Blu-ray Player.

LG

LG focused more on upgrades to the LED and LCD sets at CES rather than on 3D models. LG did, however, unveil the world's first single-lens full 3D HD projector, the CF3D. The CF3D has an LED projection, with 120Hz output.

There was no available release date for the CF3D.

Toshiba

Toshiba's ZX900 CELL series TVs converts 2D images into 3D in real-time. The televisions currently retail for around $10,000 in Japan and require 3D glasses. The ZX900 is expected to be released in the U.S. in the fall of 2010.

CONCLUSION

A few months ago, the development of 3D, on a scale of 1–10, hadn't moved much past 1.0. The attendant amount of hope, and hype, even after the release of the 3D film "Monsters vs. Aliens," hadn't reached developmental critical mass.

But as with most new technology movements, a series of events created a 3D confluence that now puts 3D at the 3.0 stage on that same 1–10 scale. The near-term evolution 3D is looking a lot like the early days of HDTV, with the potential that adoption could happen even faster than it did with HDTV.

To start, there is the hit movie "Avatar," which serves as a content foundation point. As "Avatar" works its way through the window cycle (DVD, pay TV, network TV), it will serve to reinforce the 3D message throughout 2010 and into 2011.

DirecTV's launch of 3D channels this summer, and the high profile content coming from ESPN, Discovery and others, will serve to keep the 3D message in front of consumers. The initiatives by those companies will move their affiliates — cable MSOs, DBS and telcos — and other programmers to stay competitive by adopting their own 3D strategies.

TV set manufacturers, having laid down the gauntlet in Las Vegas, will take 3D from drawing boards at CES to the showrooms of Best Buy, Ultimate Electronics and the myriad advertising outlets to pound home the message of 3D starting this summer and heading into the 2010 holiday buying season.

The industry players are lining up, some faster than others, behind the 3D juggernaut. The issue isn't so much the question of whether 3D gets "built," but rather how quickly the constellation of stars — programming that's good enough, delivery platforms that are easy to navigate, TV set pricing that's not onerous and viewing glasses that aren't an impediment — align for consumers.

APPENDIX: OBSERVATIONS AND PERSPECTIVES

"I think 90% of the males in the country would be dying to watch the Super Bowl and be immersed in it. You don't necessarily want the ladies of 'The View' sitting around you when you watch them."

Riddhi Patel, iSuppli

3D "will fall short of the hype" because of high TV set prices and the lack of standards. Large adoption "is at least a few years away."

Ingrid Chung, Goldman Sachs Group

"TV makers want more for 3D than they can get. Plus, neither Samsung, Sony, Panasonic or LG has gained the technological advantage. Until that outcome becomes clear, I'm not investing."

Mitsushige Akino, Ichiyoshi Investment Management

"3D is obviously the next viewing upgrade and DirecTV has two distinct advantages over cable operators in offering the service. The first is DirecTV has a relatively affluent customer base of early adopters, and second, their audience is national, so they can go out and find everybody who has upgraded to a 3D TV. It's a very smart move."

Todd Mitchell, Kaufman Bros. LP

"A lot of stars are going to have to align over time before 3D in the home can start breaking forth in any significant fashion."

Ben Bajarin, Creative Strategies

"With every demo we become more convinced that 3D is actually going to take off."

Engadget

"Until broadcasters and sports leagues start investing in producing 3D TV shows and covering major games in 3D, expect these channels to be looping 'Avatar,' 'Up,' and the opening ceremonies of the Beijing Olympics all day. "

John Falcone, CNET

"I really can't imagine inviting a group of friends over for hamburgers and beers to watch a Yankees game, then handing them a pair of 3D glasses as I greet them at the door."

Nick Bilton, New York Times

"Total hours a week you might want to watch in 3D? From two to five hours for most, up to 10 for a real serious gamer. That's between 10% and 20% of viewing time, and that assumes that content is available, which it's not. Would you be willing to spend the extra thousands in order to enhance 10% of your viewing time? Probably not."

James McQuivey, Forrester

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Matt Stump has been analyzing the media and entertainment industries for 29 years. He served as a reporter and editor for *Broadcasting*, *Cable World*, *On Demand* and *Multichannel News* magazines from 1980–2006. He joined One Touch Intelligence as VP, Communications Industry Intelligence in May 2006, and developed the ONETRAK® service that launched in October 2006. He monitors the competitive media and entertainment landscape on a daily basis for OTI and serves as primary writer for the company's TELCOTRAK service. Stump is a frequent moderator at industry events and has been quoted in major national newspaper and broadcast outlets.

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ABOUT ONE TOUCH INTELLIGENCE

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