3D Here and Now…
a goose that lays a golden egg?

As we continue to analyze the 3D Entertainment markets, we interview players around the world in the different industries, including film studios, video game companies, broadcasters, pay-TV operators, network operators, theater exhibitors, technical equipment providers, start-ups and consumer equipment manufacturers, in the main video entertainment formats (films, live TV, home entertainment, games, user generated content) and main entertainment screens (movie theaters, TV, PC, mobile phones).

Summary

A Year of Progress

A year ago we reported on the uncertainties about the future of the 3D entertainment market.

Two tipping points for 3D that we identified then have since been resolved: standardization and the commercial success of high-profile projects, specifically Avatar. Standardization has made significant step forward with the definition of a 3D Bluray standard and the progress on HDMI1.4a specification. At the box office, Avatar 's record-breaking success created a mass awareness of 3D movies and had a broad halo effect on 3D.

So we can say unequivocally that substantial progress has been made. Many people were skeptical about 3D.

Now, many people are over-excited by it. The danger is that industry players risk killing a golden goose by overselling and, in some cases, overpricing the 3D experience – and by providing too much mediocre content that doesn't do justice to the technology.

3D Movies

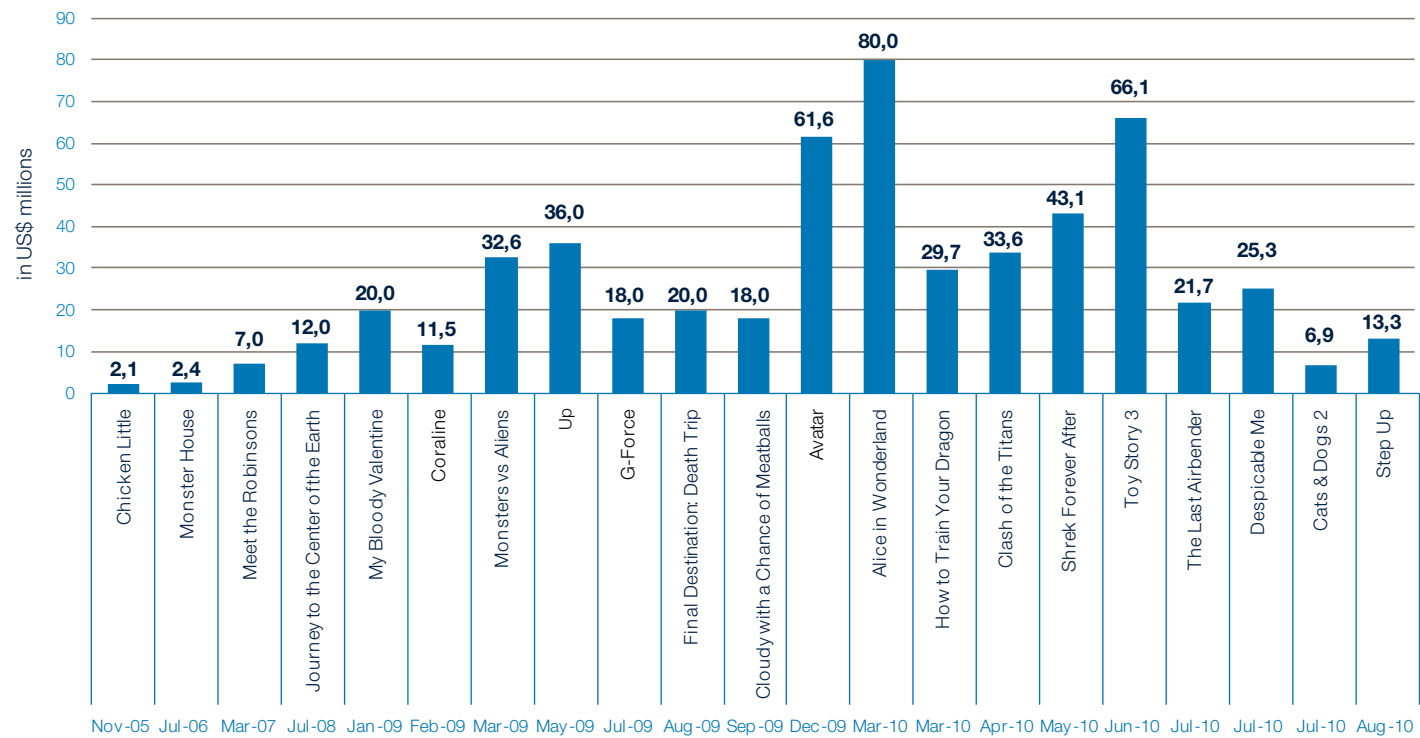On the positive side, eight of the top 20 grossing films in the first eight months of 2010 were 3D, compared with three in 2009 and one in 2008. Yet it is clear that weaker films are diluting and will continue to dilute the audience's excitement about 3D.

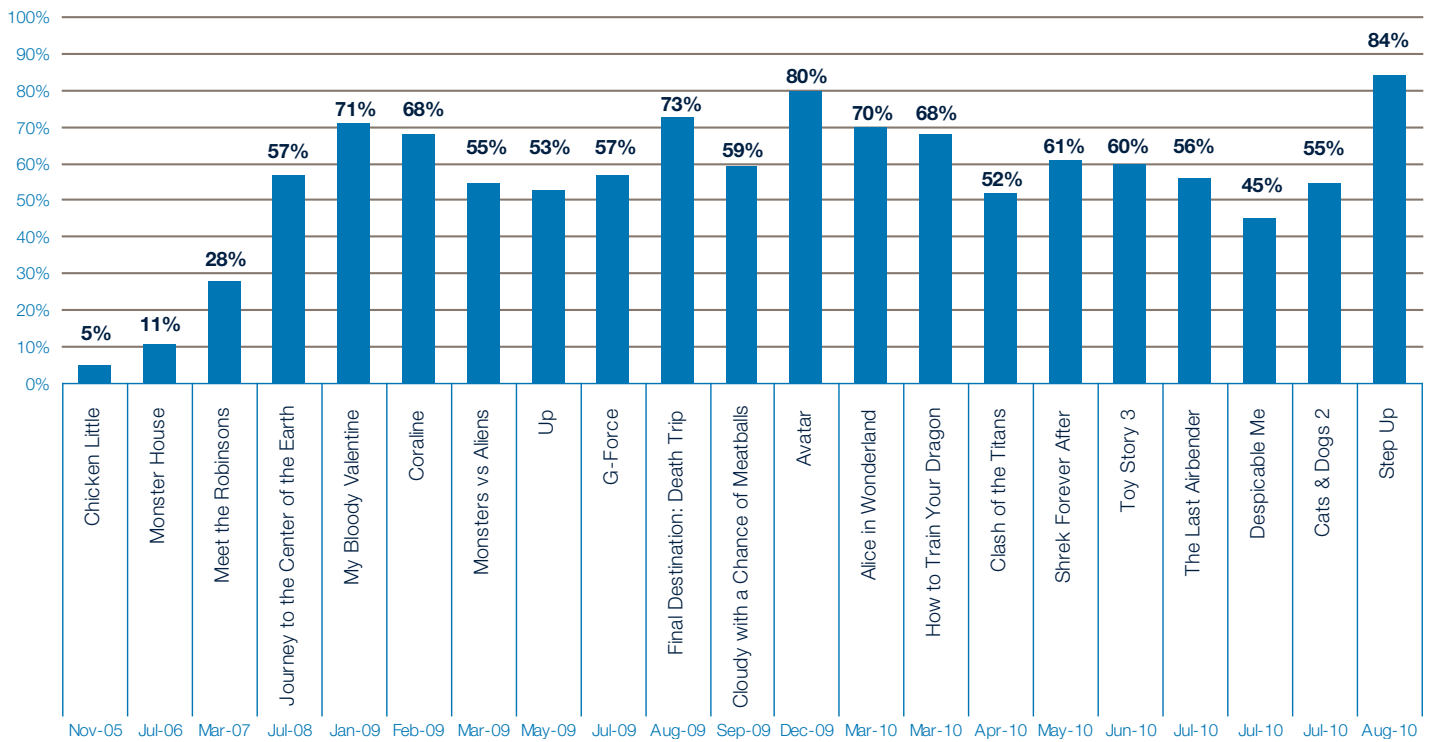|	2007	2008	2009	Sept 2010
1	Spiderman 3	Dark Knight	Transformers 2	ToyStory 3
2	Shrek the Third	Iron Man	Avatar	Avatar
3	Transformers	Indiana Jones	Harry Potter	Alice in Wonderland
4	Pirates of the Caribbeans	Hancock	Up	Iron Man 2
5	Harry Potter	Wall-E	Twilight- New Moon	Twilight Saga: Eclipse
6	Bourne Ultimatum	Kung-fu Panda	Hangover	Inception
7	300	Madagascar	Star Trek	Despicable me
8	Ratatouille	Twilight	Blind side	Shrek forever after
9	I am Legend	Quantum of solace	Monster vs. Aliens	How to train your dragon
10	The Simpsons	Horton Hears a who	Ice Age- Dawn of Dinosaurs	Karate Kid
11	Wild Hogs	Sex & the City	X-Men Origins	Clash of Titans
12	Alvin & the Chipmunks	Mamma Mia!	Night at the Museum	Grown ups
13	Knocked up	Juno	Proposal	Last Airbender
14	The book of secrets	Chronicles of Narnia	2012	ShutterIsland
15	Rush hours 3	Incredible Hulk	Alvin & the chipmunks	Salt
16	Live free or die hard	Wanted	Fast & furious	Valentine's Day
17	Fantastic four	Get smart	GI Joe	The Other guys
18	American gangster	Four christmases	Mall Cop	Robin Hood
19	Bee movie	Tropic thunder	Taken	Date Night
20	Night at the museum	Bolt	Sherlock Holmes	Sex and the City 2

A Year of Progress

Despite the traditional rhythms of successes and failures that characterize the movie industry, it remains that 50 to 70% of box office revenues are generated by 3D and that 3D has helped the entire industry to increase its revenues despite a declining number of tickets sold.

Opening week end - 3D Box Office revenues

Movie	Date	Revenue (US$ millions)
Chicken Little	Nov-05	2,1
Monster House	Jul-06	2,4
Meet the Robinsons	Mar-07	7,0
Journey to the Center of the Earth	Jul-08	12,0
My Bloody Valentine	Jan-09	20,0
Coraline	Feb-09	11,5
Monsters vs Aliens	Mar-09	32,6
Up	May-09	36,0
G-Force	Jul-09	18,0
Final Destination: Death Trip	Aug-09	20,0
Cloudy with a Chance of Meatballs	Sep-09	18,0
Avatar	Dec-09	61,6
Alice in Wonderland	Mar-10	80,0
How to Train Your Dragon	Mar-10	29,7
Clash of the Titans	Apr-10	33,6
Shrek Forever After	May-10	43,1
Toy Story 3	Jun-10	66,1
The Last Airbender	Jul-10	21,7
Despicable Me	Jul-10	25,3
Cats & Dogs 2	Jul-10	6,9
Step Up	Aug-10	13,3

in US$ millions

Opening week end - 3D share of Box Office revenues

Film	Date	3D Share
Chicken Little	Nov-05	5%
Monster House	Jul-06	11%
Meet the Robinsons	Mar-07	28%
Journey to the Center of the Earth	Jul-08	57%
My Bloody Valentine	Jan-09	71%
Coraline	Feb-09	68%
Monsters vs Aliens	Mar-09	55%
Up	May-09	53%
G-Force	Jul-09	57%
Final Destination: Death Trip	Aug-09	73%
Cloudy with a Chance of Meatballs	Sep-09	59%
Avatar	Dec-09	80%
Alice in Wonderland	Mar-10	70%
How to Train Your Dragon	Mar-10	68%
Clash of the Titans	Apr-10	52%
Shrek Forever After	May-10	61%
Toy Story 3	Jun-10	60%
The Last Airbender	Jul-10	56%
Despicable Me	Jul-10	45%
Cats & Dogs 2	Jul-10	55%
Step Up	Aug-10	84%

A Year of Progress

We also note that 3D has established a global popularity and is not just a US/Western Europe phenomenon.

Consider, for example, the popularity of *Avatar* in various nations.

Share of Avatar 3D Box Office revenues as January 17th, 2010

Country	Share
UK	85%
Australia	82%
USA	79%
Japan	79%
France	75%
Germany	73%
Russia	70%
China	65%
Spain	61%
South Korea	44%
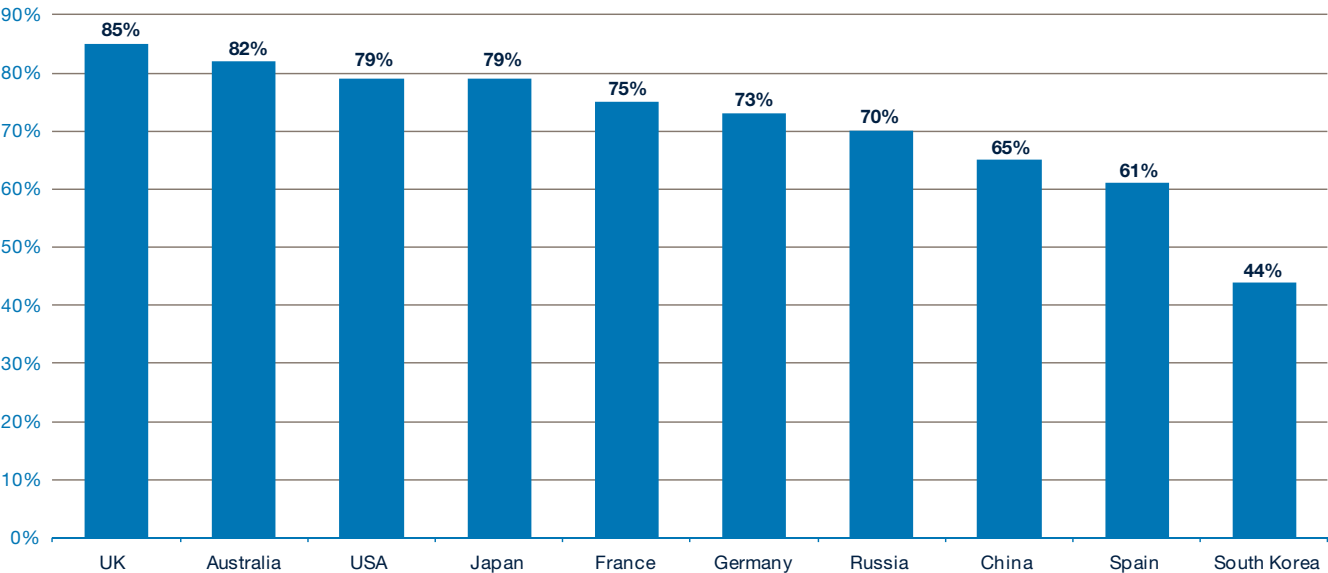
Source: Screen Daily (Jan 2010)

3D films generate two to three times the revenue per theater of 2D, giving theater operators a powerful incentive to convert to the new technology.

A big expense for theatres is in converting from traditional prints to digital – a transition the film industry regards as essential, as it can then shed the cost of copying and distribution.

Once a theater employs digital technology, the transition to 3D is relatively easily and inexpensively done. Studios have therefore a strong incentive to make 3D movie a success in order to facilitate a particularly interesting and profitable change in movie distribution. The success of 3D has proved critical in the rapid digital roll-out which has been observed this year in the US and throughout the world. As an example, we project to have over 3,300 screens in the US alone by end of this year.

From the studio and, perhaps, the audience perspective, more 3D theaters are needed, because a bottleneck occurs when too many 3D films are released in a short time period. Industry experts say a typical multiplex needs a minimum of three screens devoted to 3D; some theater owners are converting the entire multiplex at once. The owners have found that if they don't have enough 3D screens, their share of box-office revenue decreases.

Share of "Monsters vs. Aliens" 3D screens and revenues

Legend:
- % of 3D screens
- % of 3D BO revenues
- 3D multiplying ratio (right scale)
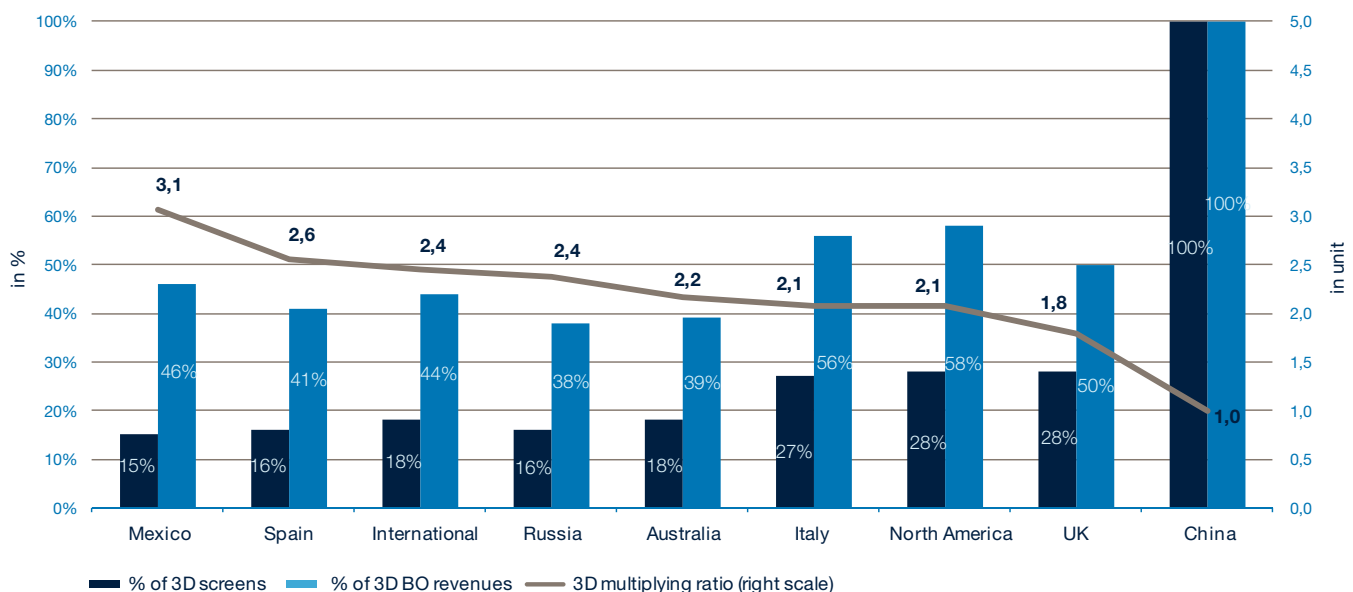
Source: Screen Daily (Jan 2010)

A Viable Ecosystem has Emerged

Another very positive finding is that when a 3D film is good, there is no negative impact on the film's DVD sales (*Avatar,* no surprise, is also top-selling DVD of the year). High DVD sales are critical to the economics of film production, because they have historically had the ability to generate approximately more than half of the revenues of a film.

|	Top grossing films (2009)	Top selling DVD titles (2009)		Top grossing films (2010)	Top selling DVD titles (2010)
1	Transformers 2	Twilight	1	Toy Story 3	Avatar
2	Avatar	Transformers 2	2	Avatar	Twilight – New moon
3	Harry Potter – Half-Blood Prince	Up	3	Alice in Wonderland	Blind side
4	Up	Madagascar 2	4	Iron Man 2	The princess & the frog
5	Twilight – New moon	Harry Potter – Half-Blood Prince	5	Twilight – Eclose	Alvin & the chipmunks
6	Hangover	Star Trek	6	Inception	Alice in Wonderland
7	Star Trek	Hangover	7	Shrek foreever	Hangover
8	Blind side	Monsters vs. Aliens	8	Despicable me	2012
9	Monster vs. Aliens	Ice Age 3	9	How to train your dragon	Mickael Jackson
10	Ice Age 3	Proposal	10	Karate Kid	Sherlock Holmes
11	X-Men origin	Bolt	11	Clash of titans	Cloudy with chances of meatballs
12	Night at the museum 2	X-men origin	12	Grown uos	Couples retreat
13	Proposal	GI Joe	13	The last airbender	Up
14	2012	Taken	14	Shutter island	The book of Eli
15	Alvin & the chipmunks	Gran Torino	15	Salt	The Hurt locker
16	Fast & furious	Marley & me	16	Valentine's Day	Law abiding citizen
17	GI Joe	Beverly Hills chihuahua	17	Robin Hood	Zombieland
18	Mall cop	The Dark knight	18	The other guys	It's complicated
19	Taken	Mall cops	19	Date night	Percy Jackson
20	Sherlock holmes	Hannah montana	20	Sex & the City 2	Clash of titans

Source: Boxofficemojo, PricewaterhouseCoopers analysis

But it cannot be emphasized enough that a 3D film must be *good* to generate strong DVD sales. In both theaters and the DVD market, you can charge a premium for a superior product. But consumers will not pay a premium for a grade B film, or the not anticipated conversion of a 2D film to 3D. And, as noted previously, an abundance of less-than-thrilling products can dilute the overall excitement about 3D.

Financing in Abundance

With all the excitement about 3D, financing has proven little problem for filmmakers. More than 40 3D movies are already scheduled for 2011.

3D movie analysis

Native 3D ■ CGI ■ 2D 3D conversion ■ Unknown
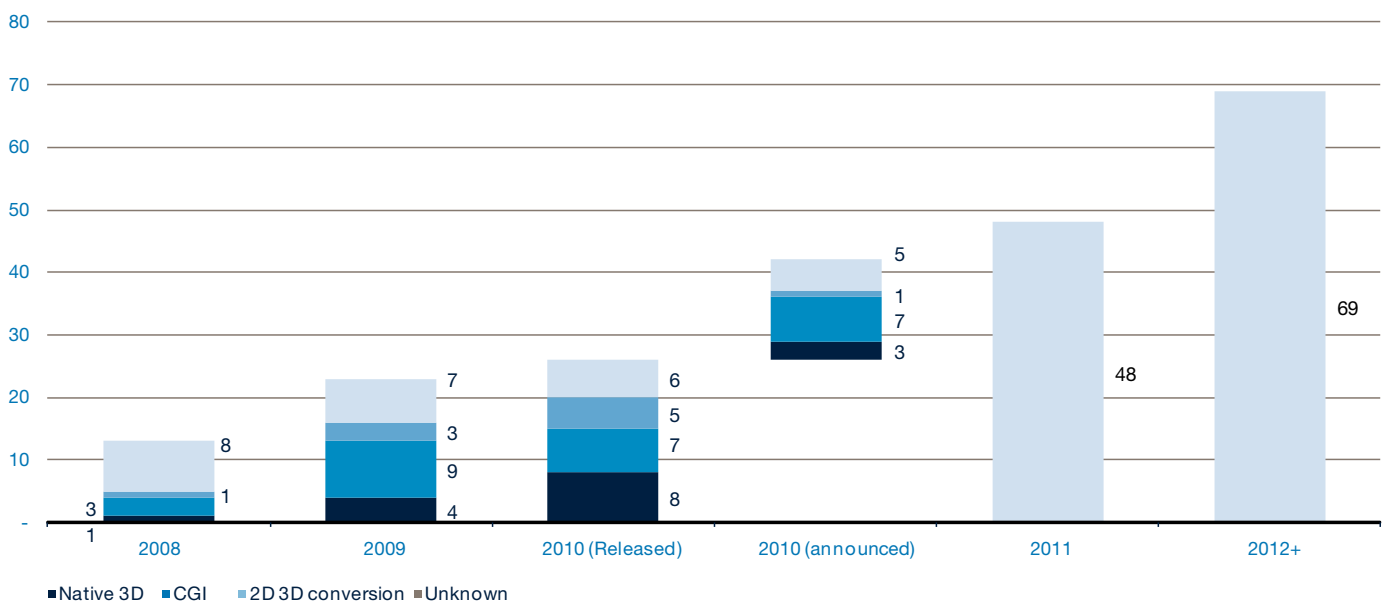
Source: www.3dmovielist.com, PwC analysis. Note: the list include short movies

So many people are keen – sometimes too eager – to finance 3D films. This supply of funds in a globally difficult film financing environment has led to a push for the conversion of some films originally envisioned as 2D into the 3D format. This often proves ill-advised.

Conversion can produce a satisfying, successful product if conversion is anticipated from the beginning and throughout the production and post-production (from the script to the editing). To take a film designed and shot in 2D and "translate" it into 3D can lead to catastrophic results, both in cinematic values and at the box office.

So in the world of 3D, an adjustment phase is needed: people thought they could use 3D to make money easily, but it won't be as simple as that – they need quality content to justify a premium. Quality 3D films are therefore critical to protect the ticket premium. Otherwise 3D will be limited to animation and horror movies and will remain a niche market. One should however bear in mind that certain genres could be more translatable to 3D than others.

The Artistic Debate

The business and economic issues aside, within the world of cinema a debate rages on the artistic issues of 3D. The director Christopher Nolan, whose *The Dark Knight* and *Inception* featured stunning visual effects and were blockbuster hits, has spoken out about his uneasiness with 3D.

At the Hero Complex Film Festival in Hollywood in June, Nolan told the audience during a Q&A session: "Let me put it this way. There is no question if audiences want to watch films in stereoscopic imaging, that's what the studios will be doing, and that's what I'll be doing." Still, he said, he had qualms. When he tested *Inception* in 3D with different conversion processes, he found that "on a technical level, it's fascinating, but on an experiential level, I find the dimness of the image extremely alienating." Of shooting in 3D rather than converting, he said, "There are a lot of problems with it… enormous compromises."

One issue is that current 3D technology projects film at 24 frames per second – which is insufficient for fast-action scenes. Better projection systems are also needed because 3D movies are unanimously considered to be too dark (well below the threshold level of 10 lamberts, a lambert being a measure of brightness). This barrier is critical to resolve if audiences are pressed to pay a premium for 3D.

How Large a Premium

Such influential views as Nolan's notwithstanding, 3D seems certain to move ahead, and so another hotly debated issue awaits resolution: what is the appropriate premium to charge for 3D? Globally, audiences seem willing to pay an additional 2 or 3 dollars or euros for a *quality 3D movie.* The premium in the US has sometimes been higher, often in the area of $5. If film quality slips, that cannot be sustained. Generally speaking, the sustainability of the 3D ticket premium is questioned by some players whom we interviewed.

Opinion about the price premium to view a movie in 3D

I don't want to pay a premium for a 3D movie — 37%

I don't want to pay a premium of US$ 4 for a 3D movie — 77%
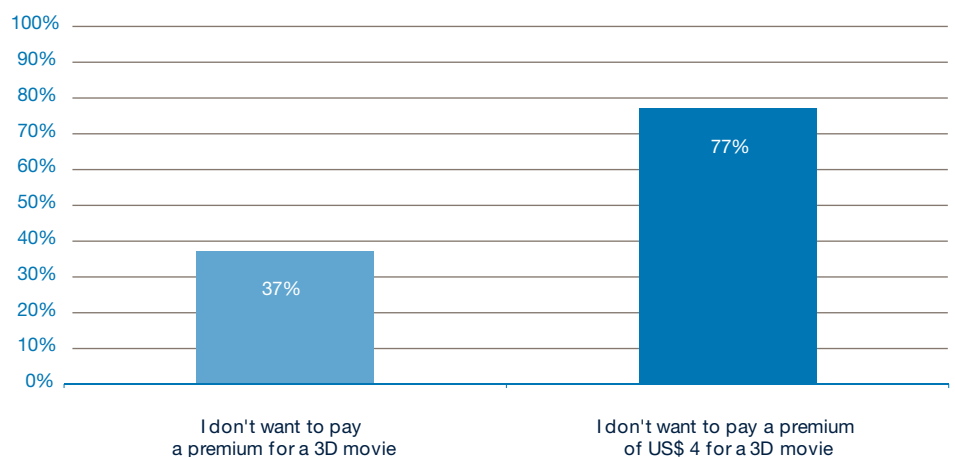
Source: BTIG

3D Television

If theaters and DVD markets seem pointed in the right direction, the market for 3D television is less mature. The success of the 3D television market revolves around four factors: the affordable availability of 3D TV sets, the availability of attractive 3D content, a sound business model for TV channels, and the viability of end-to-end 3D broadcasting.

The Sets

The growing awareness that 3D television is or soon will be available has not translated into consumer eagerness to buy a new set. What is holding people back? Economic conditions and the relatively recent acquisition of flat screens may definitively be an explanation. The premium for a 3D set is not very large but may be a factor.

More powerful may be the high level of discomfort with 3D glasses and a broad awareness of the limited 3D programming. Let's consider each of these.

The premium that consumers must pay for a 3D set is noticeable but not extreme – far less than the premium charged for HDTV at its launch. The typical premium now is about 30 percent, several hundred dollars on a midsized unit, and sets are already available for under $1,000 and, in Europe, below €1,000. Fierce competition among manufacturers is driving down the price – Samsung, for example, cut prices in early 2010 and captured an 88% market share in the US between March and July.

So it is possible for 3D TV sales and home penetration to pick up, and more quickly if manufacturers and retailers are savvy enough to offer these models as "future-proof" TVs – that is, with all the necessary technologies including Internet connectivity, which might be a better selling proposition right now than 3D, given how little 3D content is available.

The active 3D glasses are considered as heavy and too expensive and are not interoperable between competing technologies and brands. New television technologies are being developed for more affordable, interoperable and easier-to-wear "passive glasses." Passive 3D TV sets are progressively being introduced in the market, though their price point now is yet still too expensive, because of the efforts needed to position the polarization filter on the TV. More distant technologies will eventually enable 3D viewing without glasses.
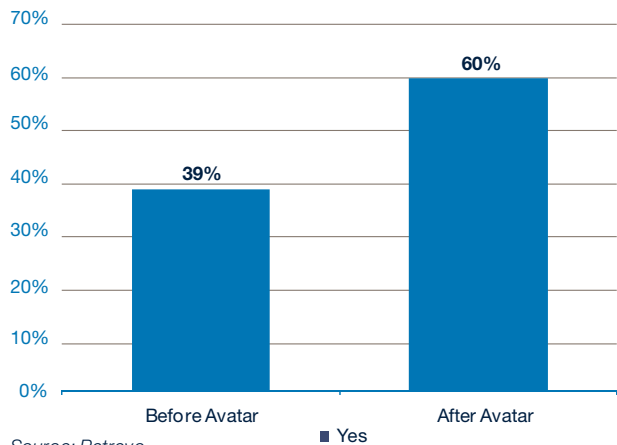
Research on the health effects of 3D TV is inconclusive to date but the concerns remain, and receive frequent press coverage.

Would you buy a new TV set to enjoy the 3D experience on TV?
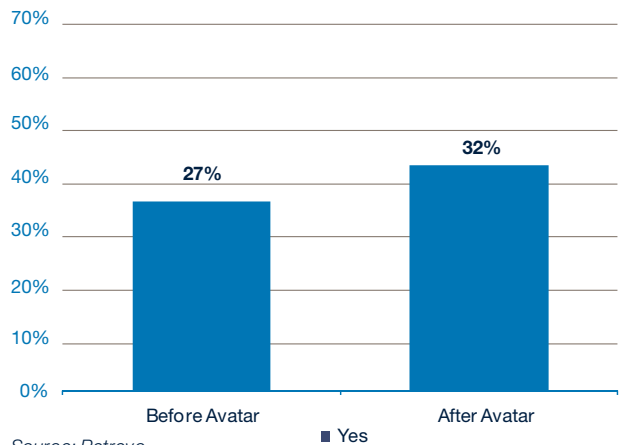
Source: Retrevo

**Are you aware that you may soon be able to watch 3D Television at home?**

Source: Retrevo

Is Enough 3D Content Available?

No doubt the biggest challenge for 3D TV is the lack of content, and this is likely to persist for a number of years.

Whether television will opt for event-driven 3D-on-demand, or when sufficient 3D inventory will become available to sustain a channel (as in traditional linear programming) remains unresolved. Certainly, now and in the immediate future, the availability of 3D content is not sufficient to support 24/7 programming, About 3,000 hours of programming or 500 films are needed to support a dedicated channel, and currently only about 200 hours and 30 films are available.

Would you buy a new TV set to enjoy the 3D experience on TV?

- 3D content needed
- 3D content available
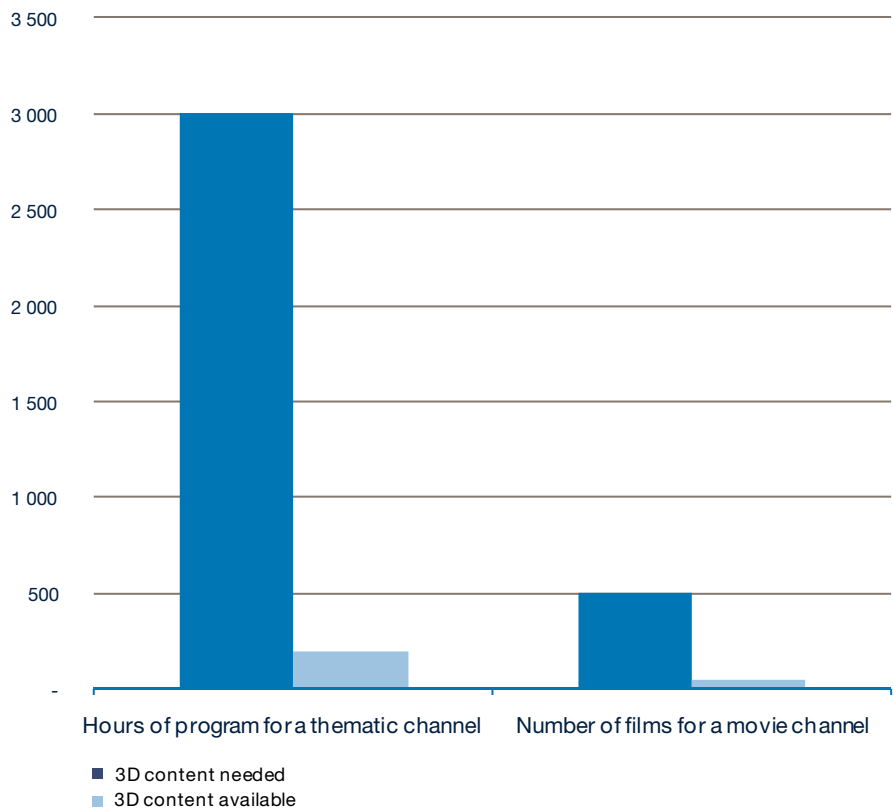
Source: PricewaterhouseCoopers analysis

A Year of Progress

Trials of 3D television are under way around the world, as broadcasters try to experiment, as well as protect their image as innovators. But from these countless trials, few projects of quality have emerged. Much was made of sport's potential to provide a breakthrough in 3D content, with ambitious plans made to broadcast the 2010 World Cup from South Africa in 3D. But 3DTV penetration was far too low to generate a significant awareness. Other event specials such as concerts and other live events may also generate awareness.

But these live event programs alone will never provide for all programming needs. Thus, in search of total penetration of the home market, programming must be found in other genres that address the needs of all audiences. The Discovery Network is among those experimenting with 3D for all types of programming with the declared ambition of being the future leader of 3D TV production.


Existing 3D TV channels

Main announced 3D TV projects

# Is There a Business Model for 3D TV Channels?

Experimentation and research and development are one thing, sound business models another, and given the limited content, the case for 3D TV channels is not yet sound. The most positive finding to date about public appetite for 3D TV found that 32% of recipients declare that they would change their service provider to gain access to a 3D channels. So far the executives at television channels whom we interviewed are skeptical about the sustainable profitability of a 3D TV channel. Higher image capture and transmission costs – and a limited ability to amortize these costs over the existing subscriber base – create an equation that could work only with a long-term perspective.

Would you be interested in receiving 3D content for the home via your pay-TV operator?

Would not want
23%

High preference
46%

Some preference
31%
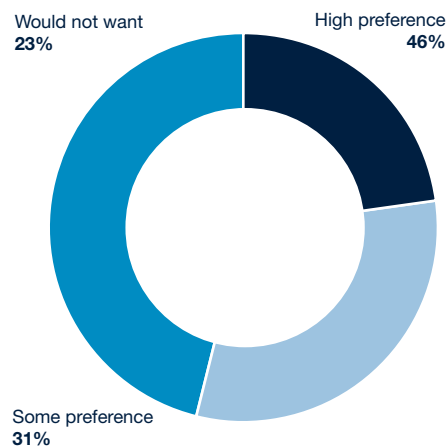
Source: Quixel 3D Survey (Dec 2009), PricewaterhouseCoopers analysis

Would you be ready to change video provider (cable or satellite) in order to have access to 3D content?

Yes
32%

No
68%
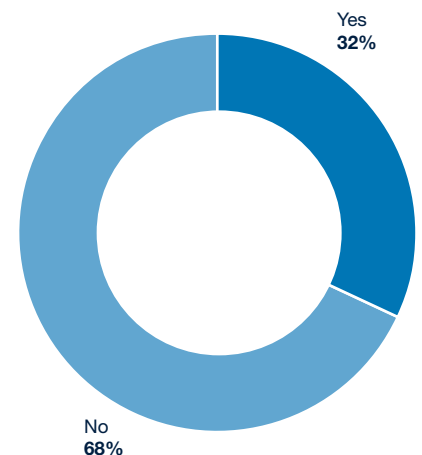
Source: Quixel 3D Survey (Dec 2009), PricewaterhouseCoopers analysis

Viability of 3D Broadcasting

TV channels across the globe have successfully put in place an end-to-end broadcasting solution for 3D content during 2010, while few of them would have bet a penny on 3D just a year and a half ago. 3D broadcasting works, but the solution implemented by TV channels does not offer a true HD 3D experience. Considering the low commercial potential (at least in the short term), using new compression technologies remains critical for resolving both economical and capacity constraint problems.
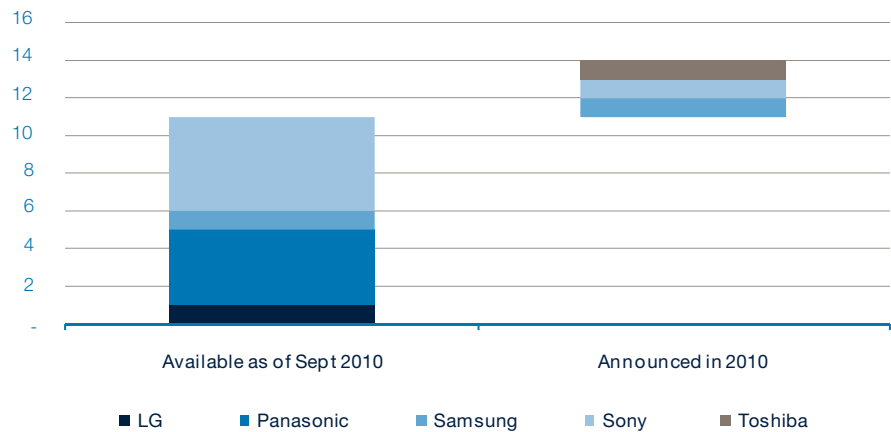
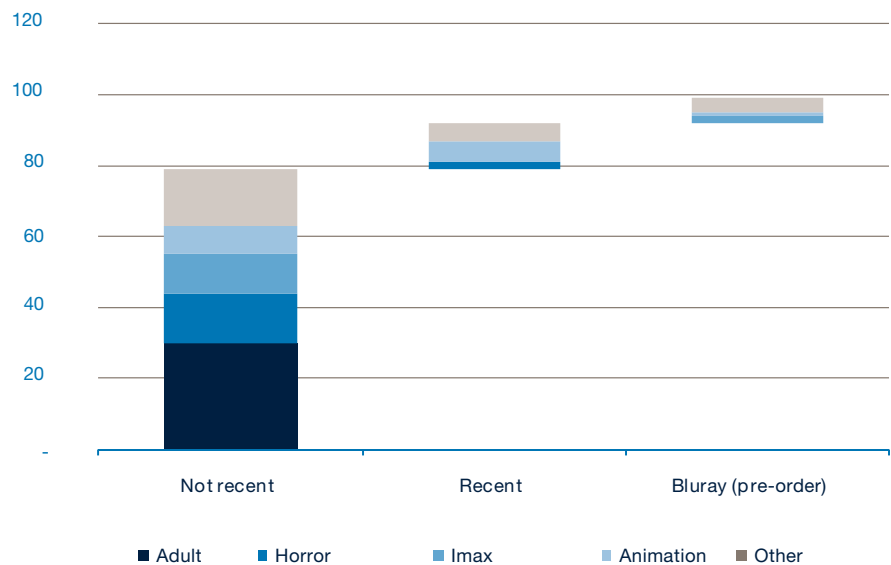|	Compression standard	Bandwidth required	
		Contribution	Distribution
Reference (1080i @50/60 Hz)	2D MPEG-2	50 Mbps	15 Mbps
Frame compatible	MPEG-2 MPGHL	65 Mbps	20 Mbps
	MPEG-4 AVC High Profile	35 Mbps	10 Mbps
	MPEG-4 SVC	-	-
	Dolby-compatible Base Layer	-	10 Mbps
	JPEG2000	120 Mbps	-
	Uncompressed	1240 Mbps	
2D + Something	MPEG-4 Multiple Auxilary Component	Unknown	Unknown
	MPEG-C Part3 Auxilary Video Streams	Unknown	Unknown
	MPEG-4 Part 2 Object shape & Disparity Coding	Unknown	Unknown
Stream / Service compatible	MPEG-4 AVC Simulcast	50 Mbps	15 Mbps
	JPEG2000 Simulcast	240 Mbps	-
	Uncompressed Simulcast	2 480 Mbps	-
	Dolby 3D incl. Enhancement layer	40 Mbps	12 Mbps
	MPEG4-4 MVC Multiview High Profile	45 Mbps	13 Mbps
	MPEG-4 MVC Stereo High Profile	45 Mbps	13 Mbps
	MPEG-2 Multiview Profile	95 Mbps	26 Mbps

Source: ATEME

How Will The TV Market Develop?

So where will progress in the 3D TV market come from? Some industry participants hope the answer is the introduction of the 3D home entertainment system, comprising a 3D TV set, a 3D Blu-ray player, a digital sound system and a growing inventory of 3D films and television content in Blu-ray format.

3D DVD player panorama

Legend: LG, Panasonic, Samsung, Sony, Toshiba (categories: Available as of Sept 2010, Announced in 2010)

3D DVD title Overview

Legend: Adult, Horror, Imax, Animation, Other (categories: Not recent, Recent, Bluray (pre-order))

Source: PwC analysis

We believe that people will either use their PS3 as a 3D Bluray player or begin to buy a 3D player as the price premium for 3D DVD players will not be dissuasive but they cannot be relied upon to watch 3D until more programming is available.

The 2010 World Cup came too early in the emergence of 3D; many industry players now look to the 2012 Olympics Game in London and to the FIFA 2014 World Cup in Brazil. One optimistic view is that the Olympics will do for 3D television what *Avatar* did for 3D cinema.

3D Video Games

Within the universe of video games is an interesting dichotomy: External experts on gaming believe there is this strong fit between video games and 3D. But at the games studios, executives seem to be more skeptical. The positive view notes the strong fit between 3D immersion capability and the demand for immersive gameplay, that many game-players are early adopters of new technology, that there are no, or very limited, incremental production costs, and that 3D-capable game consoles already exist. The more cautious view emphasizes that most hardcore gamers seem more interested in the story and the gameplay than in the technology that accompanies it – and in the best-selling "flagship games" that dominate the market, which are not yet available in 3D.

Many hardcore gamers are obsessed with performance, and 3D reduces both the resolution and the frame rate and can generate nausea in fast-motion games (like first-person-shooter games).

Sony's PlayStation 3 has been upgraded to accommodate 3D, making it the first 3D Blu-ray player. Microsoft's Xbox 360 is 3D-capable, but this feature has not been marketed yet by Microsoft. And some of the most popular games, such as *Gran Turismo 5, Motor Storm Pacific Rift, Wip3out, Pain, Mortal Kombat, NBA 2K11 or Crysis, will be available in 3D.*

Announced PS3 3D games

- Gran Turismo 5
- Motor Storm Pacific Rift
- Pain
- Super Stardust HD
- Wip3out

PS3 3D games announced at E3

- Crysis 2
- Ghost Recon
- Motor Storm Apocalypse
- Mortal Kombat
- NBA 2K11
- Shaun White Snowboarding

In some game categories, 3D adoption probably awaits its adoption by other entertainment formats. In action, adventure and heroic fantasy games, for example, gamers want to replicate their cinema experience – and 3D is not yet the standard for these categories of movies. In sports games, the gamers want also to replicate their experience watching games on television, and the development of 3D sports broadcasting is probably needed to generate a market for 3D sport games.

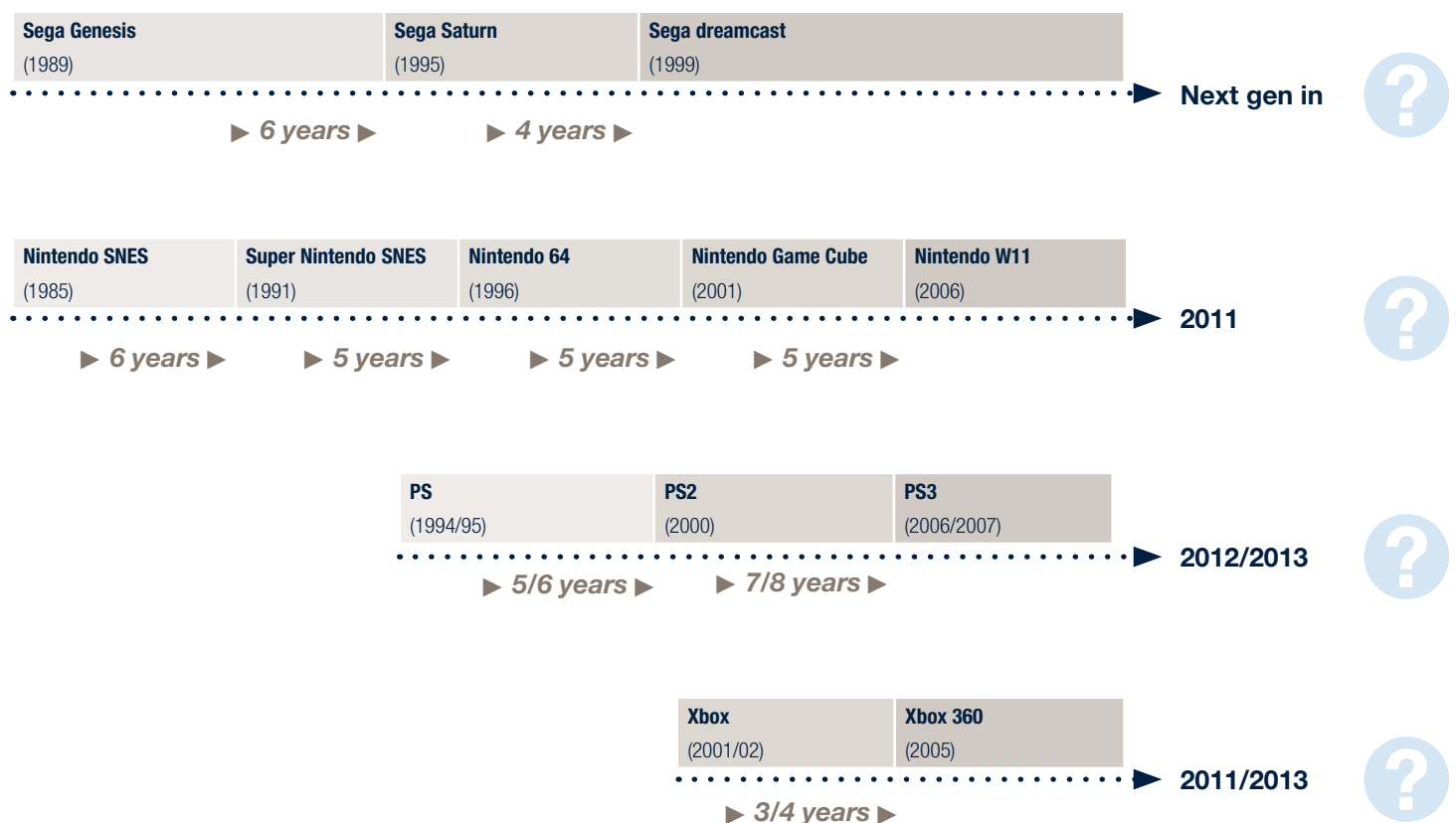| Game category	Immersion as KPI	3D comfort	Mirror of other formats	Potential 3D adoption
Action	+	- (long game time)	- - (action movies)	- -
Adventure	+	- (long game time)	- - (adventure movies)	- -
Arcade	+			+
Educational	+			+
Fighting	+	- (speed)	- (Fight TV programs)	-
FPS	+ +	- - - (speed + glass discomfort)	- (action movies)	- -
Movement tracking	+ +			+ +
Music	+ +			+ +
Racing	+ + +	- (speed)		+ +
RPG	+ +	- - (speed + long game time)	- - (Sci-Fi movies)	- -
Simulation	+			+
Sports	+ + +	- - (speed + game time)	- - (Sport TV programs)	-
Strategy	+ +			+ +

A Year of Progress

Perhaps that will change as Nintendo's 3DS comes to market – a portable 3D game player that requires no glasses.

More impetus may come from the introduction of movement detection technology – a 3D camera built into the game player that includes the player in the game. Movement detection systems, such as PS3's Move and Xbox 360's Kinect, could boost 3D game adoption as they improve the gaming experience while addressing the casual gamer population. So this is a sector to keep an eye on.
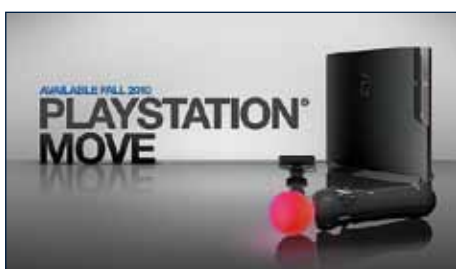
Still, many experts look to the launch of next-generation 3D-ready consoles, probably in 2012 or 2013, which they think will include a commitment by manufacturers to develop flagship made-for-3D games. If these next-generation consoles are successful, they should certainly build the audience for 3D TV.

Sega Genesis	Sega Saturn	Sega dreamcast
(1989)	(1995)	(1999)

Next gen in

▶ *6 years* ▶   ▶ *4 years* ▶

Nintendo SNES	Super Nintendo SNES	Nintendo 64	Nintendo Game Cube	Nintendo W11
(1985)	(1991)	(1996)	(2001)	(2006)

2011

▶ *6 years* ▶   ▶ *5 years* ▶   ▶ *5 years* ▶   ▶ *5 years* ▶

PS	PS2	PS3
(1994/95)	(2000)	(2006/2007)

2012/2013

▶ *5/6 years* ▶   ▶ *7/8 years* ▶

Xbox	Xbox 360
(2001/02)	(2005)

2011/2013

▶ *3/4 years* ▶

A Year of Progress

Also adding to a growing public awareness of 3D are 3D cameras (indeed, Fuji recently introduced its second-generation 3D camera). This development could lead to the creation of 3D User Generated Content and to the generalization of 3D Entertainment.

We anticipate that a market will grow – and products and services will sprout to meet it – for the conversion of 2D photos and videos into 3D. And 3D YouTube is already available to provide a virtual gallery and sharing mechanism for all 3D enthusiasts.
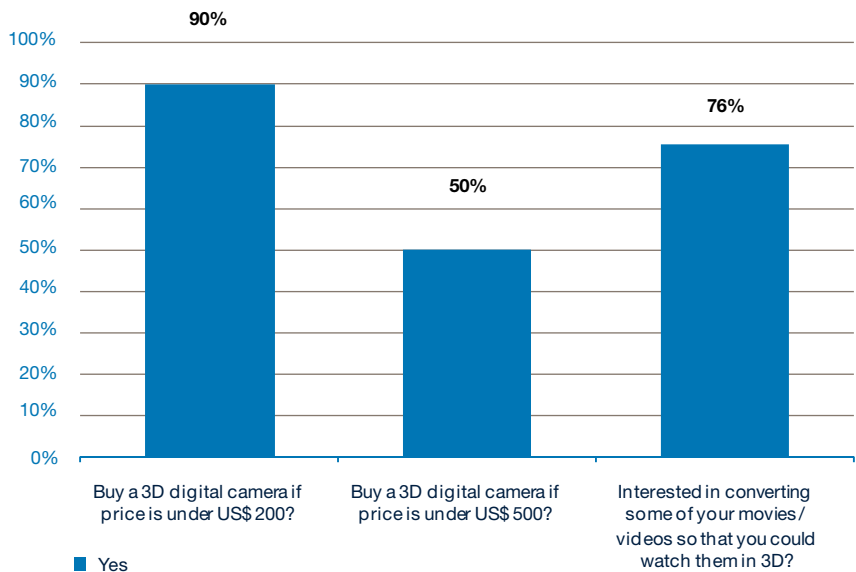
Roxio survey illustrates the potential of 3D User Generated Content

Which of the following activities would you be most interested in capturing in 3D?
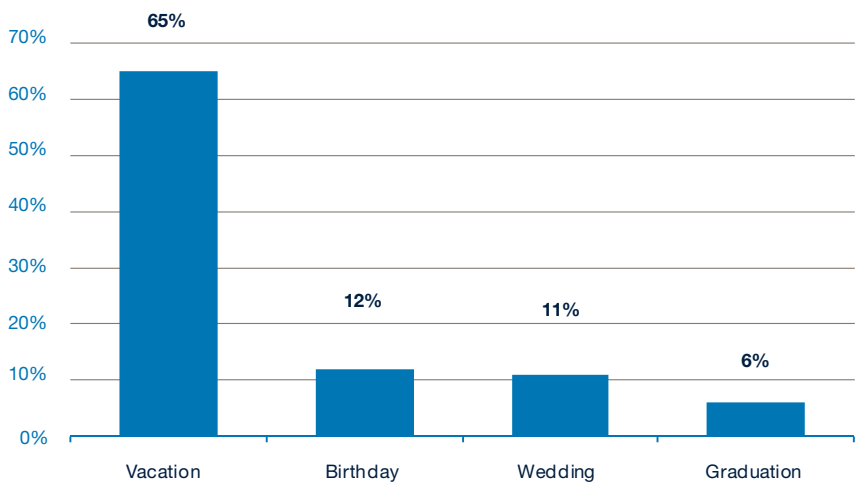
Source: Roxio

Would you

Source: Roxio

Overview of 3D R&D Programs

While our focus is 3D entertainment, we want to acknowledge other work on the 3D front.

In Japan, the National Institute of Advanced Industrial Science and Technology has developed technology based on a series of fingertip modules for the hands that offer an illusionary tactile-and-kinesthetic-sense interface that allows people to manipulate 3D imagery.

Still in an early phase, this technology is unlikely to have major impact on the mass market in the medium term. Rather, the 3D touchscreen seems to hold promise for the vision impaired, for medical procedures, and in museums and the world of the arts. In time, this technology might be re-used by game developers.
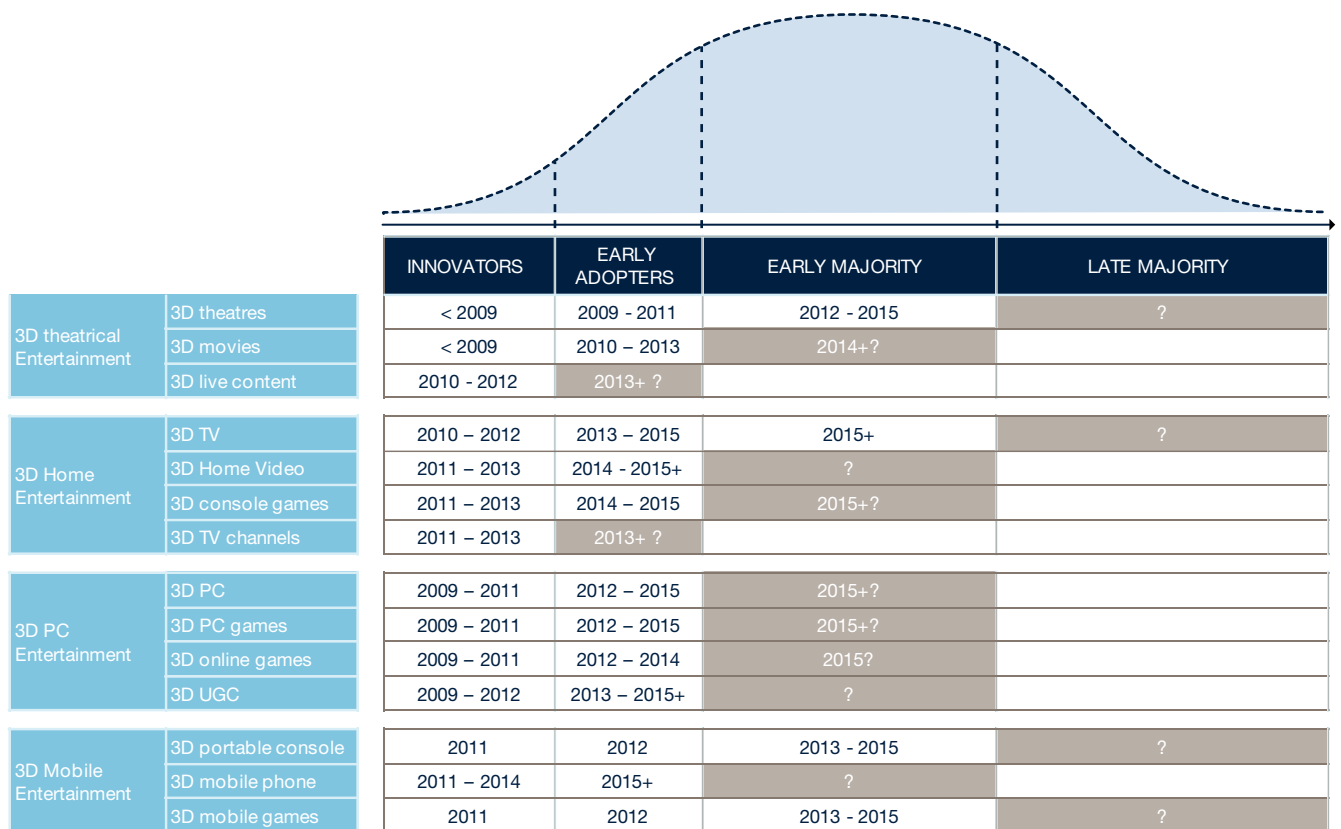
NHK, the Japanese broadcast giant and TV pioneer, has made a massive investment of $4.2 billion in holographic 3D TV. Its stated goal is to have the new technology in wide use by the FIFA 2022 World Cup.

In South Korea, the government is investing heavily in 3D, with a five-year plan backed by a $700 million investment. Its goals are to:

- Finance R&D projects, especially in glass-free technologies.
- Produce 20% of movies, television shows and video games in 3D by 2015 (the government covers up to 50% of the costs of 3D content development).
- Create 40,000 jobs into this market.
- Train up to 6,000 workers a year in 3D-related areas.
- Develop new 3D equipment, such as depth cameras and 4k video processing equipment.
- Develop 3D-related products and technologies in shipbuilding, air transport, advertisement, medical services and education
- Provide larger export-payment insurance for 3D-related content.

So What Lies Ahead?

The mass-market potential of 3D entertainment remains uncertain, as is dramatized by the clear gap between the availability of 3D-ready equipment and quality 3D entertainment content.

		INNOVATORS	EARLY ADOPTERS	EARLY MAJORITY	LATE MAJORITY
3D theatrical Entertainment	3D theatres	< 2009	2009 - 2011	2012 - 2015	?
	3D movies	< 2009	2010 – 2013	2014+?	
	3D live content	2010 - 2012	2013+ ?		
3D Home Entertainment	3D TV	2010 – 2012	2013 – 2015	2015+	?
	3D Home Video	2011 – 2013	2014 - 2015+	?	
	3D console games	2011 – 2013	2014 – 2015	2015+?	
	3D TV channels	2011 – 2013	2013+ ?		
3D PC Entertainment	3D PC	2009 – 2011	2012 – 2015	2015+?	
	3D PC games	2009 – 2011	2012 – 2015	2015+?	
	3D online games	2009 – 2011	2012 – 2014	2015?	
	3D UGC	2009 – 2012	2013 – 2015+	?	
3D Mobile Entertainment	3D portable console	2011	2012	2013 - 2015	?
	3D mobile phone	2011 – 2014	2015+	?	
	3D mobile games	2011	2012	2013 - 2015	?

PwC analysis

3D Movies

The development of 3D movies is conditional on the production of quality 3D movies, by the penetration of digital cinema and by the share of 3D screens among all screens.

Our scenario for the production of 3D movies anticipates the following:

- Most animation and horror movies will be released in 2D and 3D.

- A growing share of the other film categories – blockbuster, sci-fi, concert and family – will have a 3D version.

- Overall we anticipate that over the next five years an average of 15% of released movies will have a 3D version. The Hollywood film studios anticipate that 25% of the film slate will have a 3D version, but smaller studios are expected to have a more limited involvement in the production of 3D movies.

- We anticipate that the conversion of historical blockbusters will have a limited impact on theater equipment and film financing and that 2D to 3D conversion will have improving results but will still have relatively limited commercial success.

- We anticipate that the premium for 3D movie will be more variable in the future depending on the film potential and will average US$2-3 per ticket.

- The production of 3D movies in Europe, China, India and Japan will increase through remaining relatively limited.

- By 2015, the incremental production costs of 3D will continue to deter some film-makers, but the main barrier to 3D will continue to be its adoption by directors.

Our scenario for the penetration of 3D screens anticipates the following:

- The adoption of digital distribution is expected to reach 100% among the multiplex and large urban theaters in the medium term, with slower adoption among small theaters.

- The upgrade of digital screens to 3D is expected to be strong for large theater groups, as investment needs are relatively limited and as the proportion of 3D blockbusters is expected to be strong.

- A flexible 2D/3D solution could be adopted by some theaters.

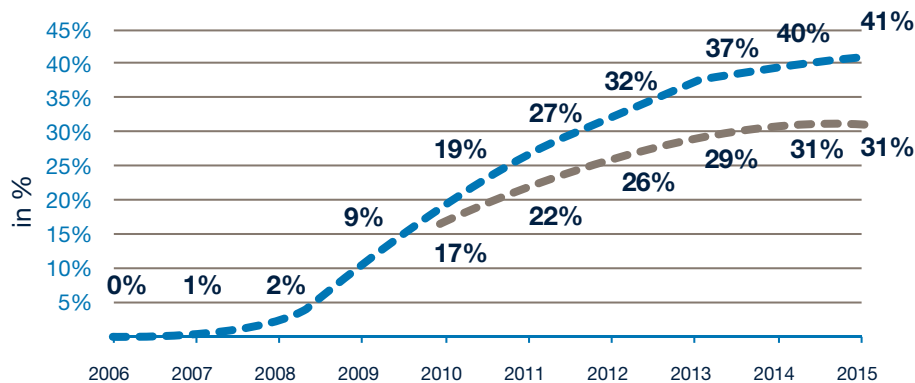- Physical 3D screens penetration is expected to remain marginal.

USA – 3D screen penetration forecasts
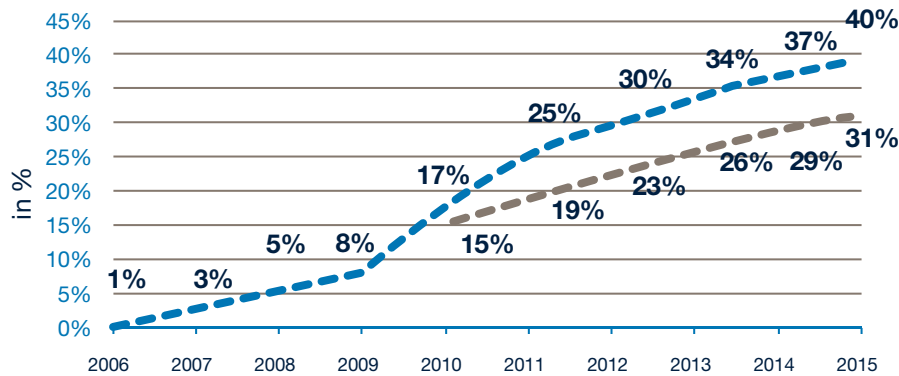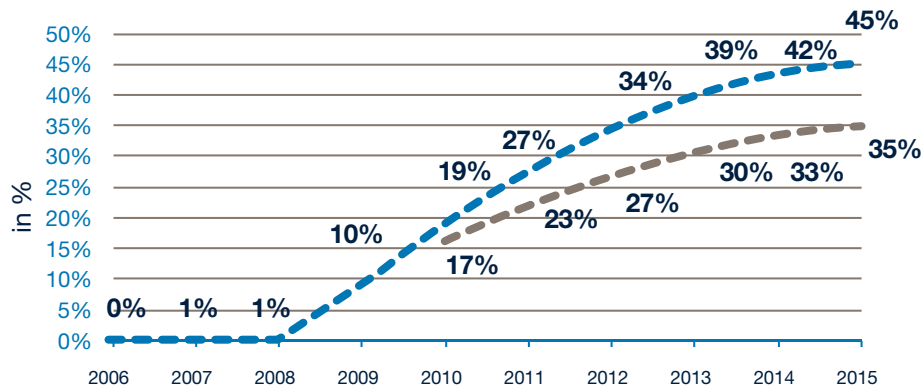
Europe 5* – 3D screen penetration forecasts

Japan – 3D screen penetration forecasts

PwC analysis
* UK, France, Germany, Spain and Italy

So What Lies Ahead?

3D Television

The development of 3D TV depends mainly on the availability of quality 3D content and the adoption of 3D TV sets by consumers.

Our scenario for the availability of 3D TV content anticipates the following:

Video games
- PlayStation3 can already be upgraded and Xbox 360 can be used to play 3D games.
- The availability of 3D games is expected to increase, but the main titles are likely to await next-generation consoles before moving to 3D.
- The growing increasing availability of portable 3D consoles will increasingly familiarize gamers with 3D games.

Home video
- More 3D DVD will be available, reflecting the release of new films and Imax movies in 3D Blu-ray and the release of 3D versions of blockbusters such as the *Star Wars* series, the *Lord of the Ring* trilogy and *Titanic.*
- 3D video will be available in both Blu-ray and digital video-on-demand.

TV
- We anticipate that one or two 3D TV channels and one video-on-demand platform will be available on the main pay-TV platforms in most countries.
- The main 3D programs that will be broadcast will be limited to live-performance events, such as premium sporting contests and concerts.
- The adoption of 3D by other categories of TV content is likely to remain limited.

Our scenario for the adoption of 3D TV anticipates the following:

- The current offerings of 3D TV will continue to increase, and prices will continue to fall (the 3D chipset price remains about US$20).
- Most high-end and connected TV models will become 3D-ready in the medium term, even though this functionality will not always be engaged by end users.
- The proportion of households with one hardcore gamer is around 10-15% in each country.
- There is a similar percentage of home-theater fans.
- We anticipate a worldwide 3D TV promotional campaign in 2012 for the Olympics in London and in 2014 for the FIFA World Cup in Brazil.
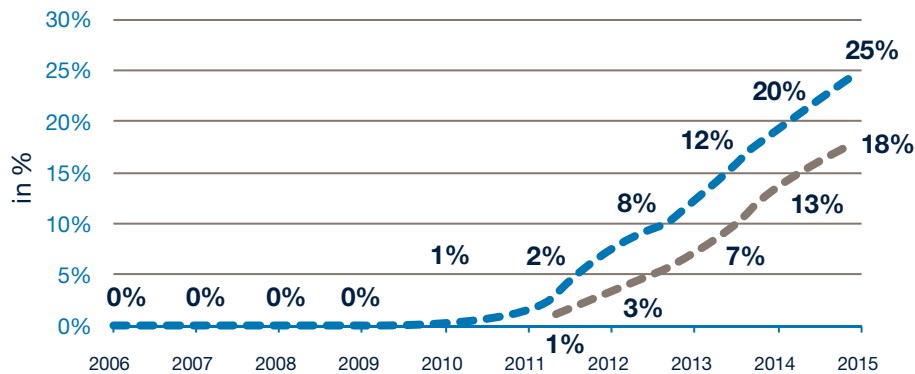
USA – 3D screen penetration forecasts
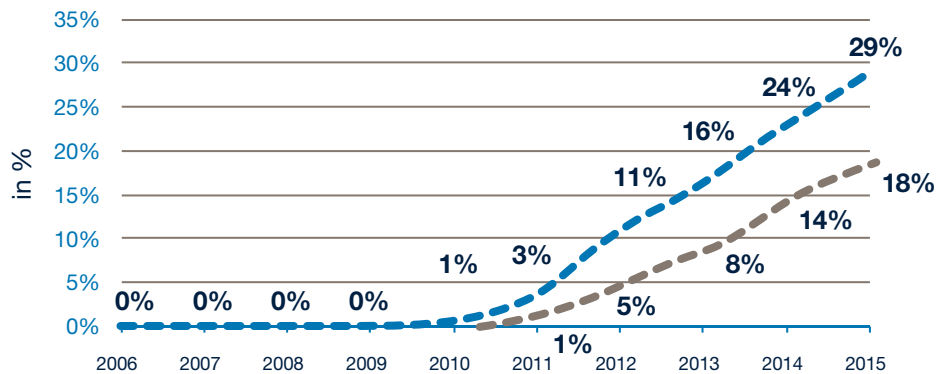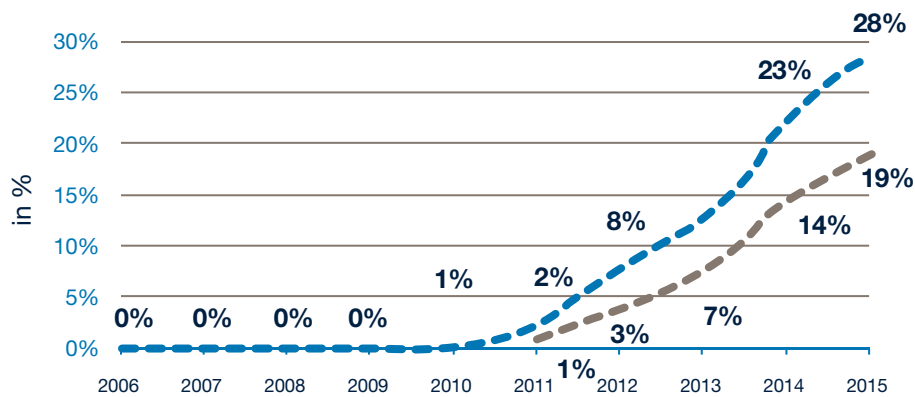
Europe 5* – 3D screen penetration forecasts

Japan – 3D screen penetration forecasts

PwC analysis
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So What Lies Ahead?

3D PC

The development of 3D PC is mainly conditional on the availability of quality 3D Internet content and PC games and on the adoption of 3D-ready PC monitors.

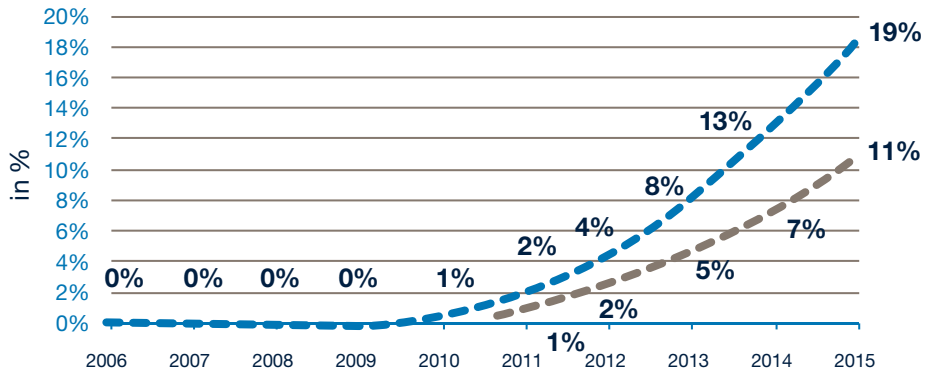**Our scenario for the availability of 3D Internet content and PC games anticipates the following:**

- The offerings of quality 3D PC games are expected to increase, but their impact on the sales of 3D-ready monitors is likely to remain limited, because of the historical decline of PC games.
- 3D Internet content will be progressively developed, but its adoption is expected to remain limited to the early-adopter segment.
- The availability of 3D cameras will allow the development of 3D photos and videos.
- The development of semi-professional user-generated video content will also develop marginally and drive some usage.

Our scenario for the adoption of 3D PC anticipates the following:
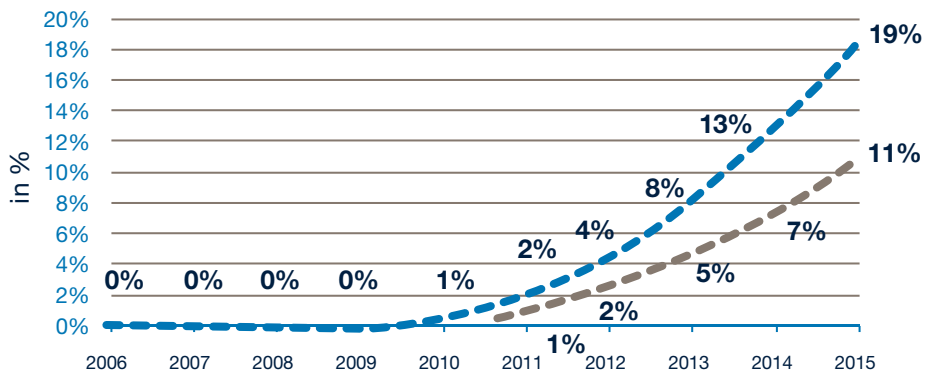
- Offerings of 3D-ready monitors are expected to increase.
- Most 3D-ready PC monitors that are sold are not likely be activated for 3D.
- 3D-ready laptops are available, and more are expected, but are not expected to be a major factor because of the price premium they command and the need for better-performing batteries.
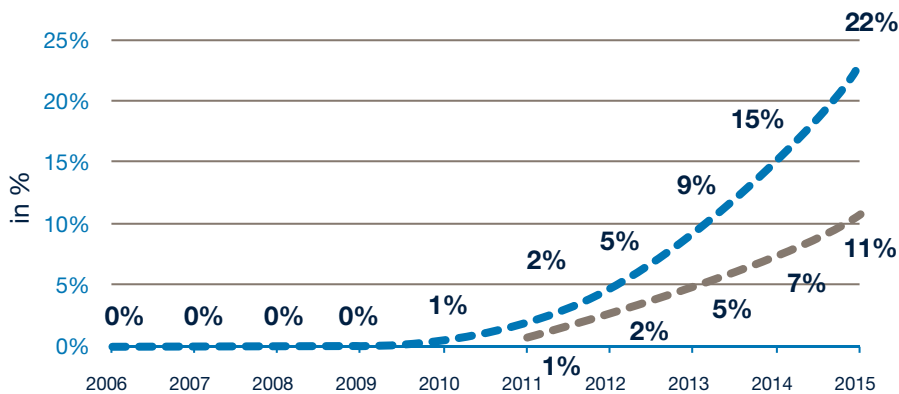
USA – 3D screen penetration forecasts

in %

20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%

2006   2007   2008   2009   2010   2011   2012   2013   2014   2015

0%   0%   0%   0%   1%   2%   4%   8%   13%   19%
                                                        5%   7%   11%
                                                1%   2%

Europe 5* – 3D screen penetration forecasts

in %

20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%

2006   2007   2008   2009   2010   2011   2012   2013   2014   2015

0%   0%   0%   0%   1%   2%   4%   8%   13%   19%
                                                        5%   7%   11%
                                                1%   2%

Japan – 3D screen penetration forecasts

in %

25%

20%

15%

10%

5%

0%

2006   2007   2008   2009   2010   2011   2012   2013   2014   2015

0%   0%   0%   0%   1%   2%   5%   9%   15%   22%
                                                        5%   7%   11%
                                                1%   2%

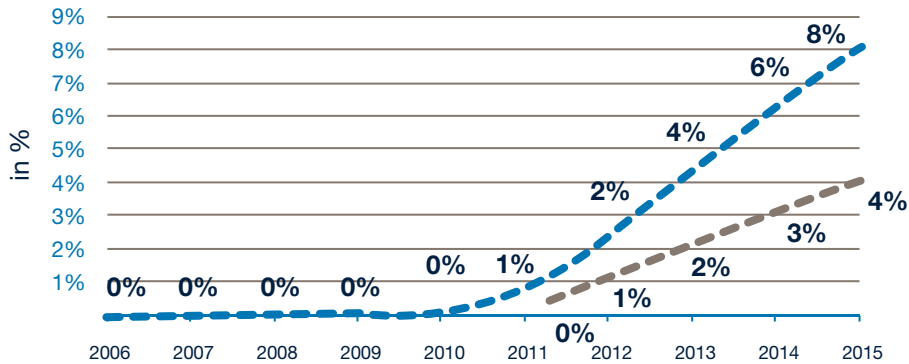*PwC analysis*
* UK, France, Germany, Spain and Italy

3D Mobile Phones

*The development of 3D mobile phones is linked to developments in 3D photos and 3D games.*

The development of 3D mobile phones is expected to be driven by:

- The limited incremental benefits provided by 3D, such as 3D photos and 3D games.
- The lack of interoperability among the different standards – a 3D picture captured by one model cannot be displayed on a 3D model from a different manufacturer.
- The first 3D auto-stereoscopic mobile phones are already available in Japan and will be introduced in Europe and in the US.
- We anticipate that 3D mobile penetration will be boosted by the introduction of 3D portable phones game consoles such as the Nintendo 3DS, scheduled for release in February 2011.
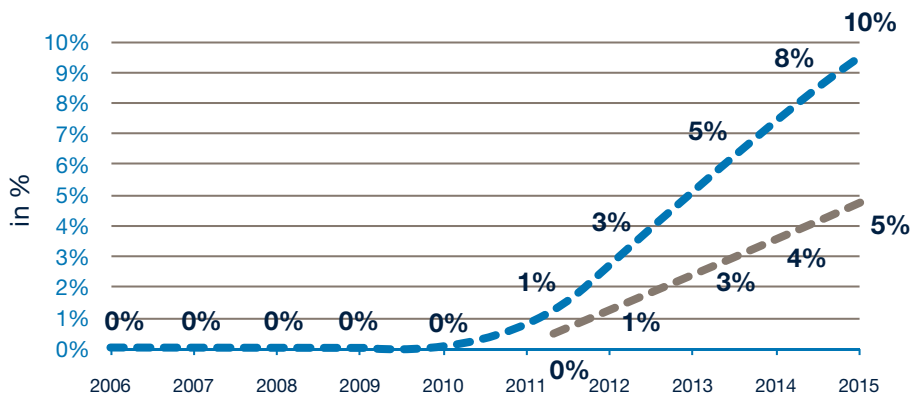
USA – 3D screen penetration forecasts

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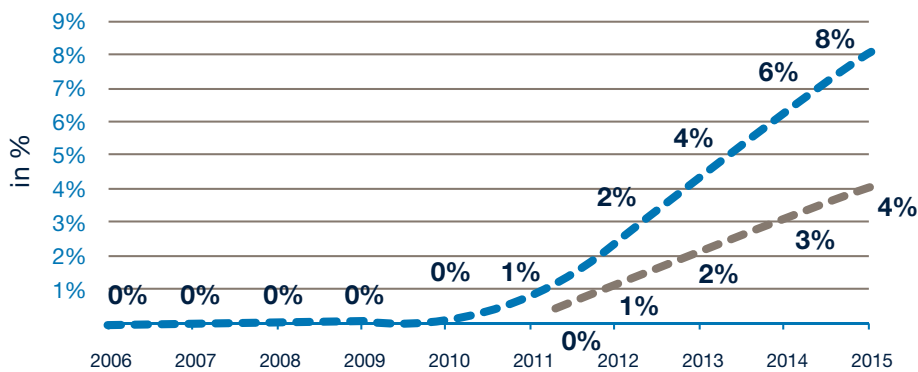
Japan – 3D screen penetration forecasts

PwC analysis
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Key Questions

There is no shortage of uncertainty

Movie Producers

– Rhythm of 3D adoption by film directors?
– Magnitude of the 3D opportunity/ Sustainability of 3D ticket premium?
– Extension of 3D to new movie genres (comedy, drama, adventure, thriller)?
– Potential of 2D/3D conversion?

Games Studios

– 3D adoption by flagship game titles?
– 3D adoption by hardcore gamers?
– Learning from 3DS experience?
– Will 3D games require higher frames per second?
– Extension of 3D to new game genres?
– Potential of 3D streaming games?

Movie Theaters

– Sustainability of the 3D ticket premium?
– Potential of variable premiums?
– Potential of non-film theatrical exhibition?

TV Network

– Formats of 3D TV Channels (appointment-to-view, 24/7 linear channels, on demand)?
– Type of content?
– 3D learning curve?
– Access to 3D stocked content?
– Potential of 2D/3D conversion?

Pay-TV Distributors

– 3D TV potential and platform competition?
– Marketing strategy?
– Business model?
– Broadcasting technology?
– 3D activation strategy?

Consumer Electronics Manufacturers

– Potential of passive glasses?
– Product strategy?
– Pricing strategy?
– Potential of auto-stereoscopic TV?
– Studio partnership strategy?
– Communication strategy?
– Competitive strategy?

Game Console Manufacturers

– Next-generation console features?
– Timing for next-generation consoles introduction?
– Investment in 3D games?

Equipment Manufacturers

– Migration from frame compatible to service compatible standards?
– Need for new equipment (STB, encoders)?
– Potential for professional 3D equipment?

Internet Companies

– Potential of 3D user-generated content?
– Potential of 3D online content (mass market and professional)?

Contacts

About PricewaterhouseCoopers

PricewaterhouseCoopers is a leading professional services organization for the Communications, Entertainment & Media and Technology industries, providing industry-specific advisory, assurance and tax services to help clients manage risk, maximize shareholder value and support M&A activities. Our practice offers a diverse industry-dedicated team of professionals that provide solutions to critical issues facing companies across these convergent industries.

PricewaterhouseCoopers can help you prepare and navigate the changes by providing advice and assistance based on our strategic, economic, financial, analytical and business process skills in the development and implementation of your strategy.

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