The Business Case for Digital 3D Cinema Exhibition
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Main digital 3D technology providers

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<th>Technology</th>
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<td>RealD</td>
<td>passive circular polarisation</td>
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<tr>
<td>Dolby/Infitec</td>
<td>spectral filter system.</td>
</tr>
<tr>
<td>Macnaughton</td>
<td>active shutter glasses</td>
</tr>
<tr>
<td>Vrex</td>
<td>active shutter glasses</td>
</tr>
</tbody>
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Comparison of digital 3D equipment by technology provider

<table>
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<tr>
<th>System provider</th>
<th>Technology</th>
<th>Single/Dual Projector*</th>
<th>Hardware</th>
<th>Eyewear</th>
<th>Screen</th>
</tr>
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<td>RealD</td>
<td>Circular polarisation</td>
<td>Single</td>
<td>External active polarising filter</td>
<td>passive</td>
<td>Silver screen</td>
</tr>
<tr>
<td>Dolby</td>
<td>Wavelength triplets</td>
<td>Single</td>
<td>Integral filter in projector, Dolby server unit</td>
<td>passive</td>
<td>Matt white screen</td>
</tr>
<tr>
<td>MacNaughton, Vrex</td>
<td>Active polarisation</td>
<td>Single</td>
<td>Infrared system, glasses tester</td>
<td>active</td>
<td>Matt white screen</td>
</tr>
</tbody>
</table>

Note*: based on DLP Cinema projector models only
Source: Screen Digest

Digital 3D

There are various methods for displaying digital 3D content, but once a movie has been converted into digital 3D, it is important to note that it can then be shown in any of the competing formats.

Digital 3D is more technically advanced than earlier renditions of 3D cinema. It has no reported side effects such as eyestrain or headaches, while adverse effects on colour have also not been reported. The equipment can be installed at any cinema screen with only a few minor theatre alternations to be made on top of the basic d-cinema equipment. Digital 3D technology utilizes DLP cinema projectors and manufacturers Barco, Christie, NEC, Cinemeccanica and Kinoton, are all capable of projecting 3D content with either one or two projector models. Normally, the projector will have a separate 3D mode, which can be switched on/off in between 2D screenings.

The only exception is Sony’s 4K resolution projector, which does not currently have a fast enough switching speed between right and left eye images, because it uses (LCoS) technology based on liquid crystal on silicon rather than a digital light processor (DLP), to enable 3D projection from one projector. However, Sony’s 4K projector can be adapted to a two projector model, for very large screens or special venues where brightness is a special factor, although this could significantly add to the costs overall.

Imax is also introducing a digital system that will use two Sony 4K projectors.

In terms of cinema servers Doremi, Kodak, QuVis, GDC and Dolby are all 3D compatible and have been used to screen digital 3D movies. XD C’s server solution is expected to be upgraded to 3D compatibility by Q3 2007. However, Dolby will be introducing its own proprietary 3D system, based on technology from German firm Infitec.

The various types of digital 3D formats can be divided between active or passive formats, and one or two projector models. The main differences are between active eyewear and disposable glasses, plus some slight theatre modifications. However, once a film has been converted into stereoscopic format the movie can be shown on any theatre with 3D equipment, regardless of the format.

Technical attributes of digital 3D

Image alignment

Digital 3D is far superior in terms of image alignment, which means that the jitter effect apparent in all film based systems is avoided. The digital projectors will need to be reset in 3D mode, and a brighter lamp is also required for 3D screenings. Cross talk/ghosting is when you see something in the left eye that you are also supposed to be seeing in the right eye, which minimises the overall effect of quality of 3D. One aspect of good 3D is to obtain a high extinction ratio, whereby the
Higher attendance ratios

Screen Digest has analysed the potential higher incremental attendance of 3D screenings against their respective 2D versions, once any premium charging had been removed and the results show that 3D screens attracted between 2.0 and 2.8 times more customers than the 2D screens in the all important opening weekend period, where the option of a flat screen version was also available.

For 3D only releases, of which Nightmare before Christmas 3D is the first and only example at the time of writing, the title generated impressive average screen revenues $19,506 compared to the leading title that week The Prestige, which grossed an average $6,489 per screen in its first weekend. In total, Nightmare grossed over $8.0m from just 168 screens in eight weeks of release.

Market Competition

The burgeoning competition between various 3D cinema formats is testament to the potential of the marketplace, and resulting take-up will add to a necessary critical mass of 3D screens. It is likely that the introduction of competitors, particularly with Dolby investing in its own proprietary 3D system in late 2007, will only serve to drive the market harder. Even though RealD, at first half 2007, has an almost monopoly control of the market (accounting for over 95 per cent of installations), in the longer term competition will help improve the cost and technical offerings of the various formats on the market.

Leading exhibitors will also be keen to maintain competitive ground against rival circuits at certain venues in particular locations, or even regionally or nationally. 3D screen provision is likely to be included by most major exhibitors.

Seeing as 3D screens attract more customers where a 2D version is also available, cinemas who do not invest may be losing out to rival circuits in the locality. The differential will of course become far more obvious once 3D-only releases are involved, where a 2D version is not available. As at first half 2007, a total of 34 cinema chains in the US market had installed 3D equipment in order to meet their customer demands and keep a competitive edge.

Threats

There are a number of issues that might negatively affect the continued development of digital 3D cinema. Broadly speaking they can be divided into three categories: potential or longevity of the 3D genre; business model issues and lack of content or screen base. However, the potential loss of revenues in subsequent release windows ie DVD and VoD (video on demand), particularly for 3D only releases, also needs to be justified on a longer term basis.

3D quality

Longevity

It remains to be seen whether the success of early digital 3D releases can be harnessed as a long term and stable revenue generator. The longer term survival of the format will be dependent on both the quality of content available as well as sufficient access to a wide enough screen base to make developing the content worthwhile. It also remains a business issue whether it is cost effective to continue to equip screens with hardware for 3D presentation, on top of the basic d-cinema system.

The audience lies at the centre of this dilemma, where positive feedback is essential.

### Total 3D box office as % of total revenues in US market

<table>
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<tr>
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<th>3D total box office</th>
<th>total box office (2D+3D)</th>
<th>3D of total</th>
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<tr>
<td>Chicken Little</td>
<td>7.5</td>
<td>135.4</td>
<td>5.5</td>
</tr>
<tr>
<td>Monster House</td>
<td>10.3</td>
<td>73.6</td>
<td>13.9</td>
</tr>
<tr>
<td>Nightmare Before Christmas 3D</td>
<td>8.7</td>
<td>8.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Meet the Robinsons*</td>
<td>29.7</td>
<td>95.6</td>
<td>31.1</td>
</tr>
<tr>
<td>Total</td>
<td>56.2</td>
<td>313.3</td>
<td>17.9</td>
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Note: First nine weeks of release only
Source: Screen Digest from industry data
The Business Case for Digital 3D Cinema Exhibition

Regional

North America had equipped 646 digital 3D screens or 86.1 per cent of total 3D screens in H1 2007. Europe's share increased from just 4.7 per cent in 2006 to 7.2 per cent in first half 2007 and overtook Asia-Pacific to become the second largest region for 3D screens. Asia-Pacific is now the third largest region with 42 screens, equating to 5.6 per cent of the total, a reduction from its 13.6 per cent global share at end 2006.

Western Europe was actually the fastest growing market in the first six months of 2007, as 3D screens increased there from 10 to 50, a product of both new RealD installations (using passive circular polarisation) particularly in Greece and Portugal, but also several deployments using active glasses, particularly in the German market. In comparison, the number of 3D screens in Asia-Pacific increased by just 20 per cent or seven new screens in the first six months of 2007. There were an additional 440 new 3D screens in first half 2007, against end 2006 in North America, a growth rate of 214 per cent in that timeframe alone.

Driver territories

1. USA

The USA is the primary driver territory for the roll-out of digital 3D cinema screens.

The leading exhibitors in the US have driven the adoption of digital 3D and widened the screen base for the release of major 3D feature content. According to Screen Digest, there were 639 digital 3D screens in USA at first half 2007, of which 99 per cent used the passive circular polarisation technique advocated by RealD. There was also a test site for Dolby’s 3D digital cinema system at an unknown location.

Exhibitors in the US leading the deployments are Carmike Theatres, which will convert 500 screens to RealD’s format, in Australia at end 2006, the highest of any territory in Asia Pacific. However, in both Mexico and Slovenia, 3D configured screens were in fact the only high-end systems which had been deployed at all in those two territories. In Mexico, the deployments are using the RealD systems, while in Slovenia the market was based on dual projectors (Slovenia is home to Xpand, a company which previously offers a two projector model for displaying 3D features). In South Korea, 13 per cent of the territory’s 130 d-screens had installed an additional 3D interface system at end 2006.

The UK was fourth ranked overall with five digital 3D screens configured at end 2006, three of which are located in Odeon Cinemas and the remaining two at Vue Entertainment. However, looking at results from the first six months of 2007, the UK had dropped to seventh in the territory rankings. The leading territory in Europe was in fact Germany with 22 3D screens and indeed ranked second overall. In total, there were two European territories in the top five (Germany and Portugal) and five in the top ten.

In Spain, 3D screens accounted for 5.3 per cent of its digital screen base at end 2006. Generally, 3D has yet to take off in Europe on a large scale, although rate of take up will be strongly influenced by existing digital cinema deployments, of which Europe is generally stalling behind the USA. Leading territories in Asia were Korea and Australia as the only regional representatives in the top ranked territories. In total, there were just five Asian territories with digital 3D equipment as at the first half 2007, including Singapore, Japan and New Zealand.

Territories

Two of the top five digital 3D territories were in Asia-Pacific, led by South Korea and Australia with 21 and 16 3D screens respectively at end first half 2007. Australia was perhaps a surprise entry in the top five 3D territories, because its screen base for d-cinema is still relatively low and in fact 3D has been the primary driver for digital cinema deployments there. 3D screens accounted for over 60 per cent of total digital deployments in Australia at end 2006, the highest of any territory in Asia Pacific. However, in both Mexico and Slovenia, 3D configured screens were in fact the only high-end systems which had been deployed at all in those two territories. In Mexico, the deployments are using the RealD systems, while in Slovenia the market was based on dual projectors (Slovenia is home to Xpand, a company which previously offers a two projector model for displaying 3D features). In South Korea, 13 per cent of the territory’s 130 d-screens had installed an additional 3D interface system at end 2006.

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Exhibitors in the US leading the deployments are Carmike Theatres, which will convert 500 screens to RealD’s format,
This chapter outlines any investments necessary at the exhibition level to acquire or lease digital 3D equipment on top of the basic d-cinema system.

In the second section of this chapter, we will also explore the potential revenues that can be made from applying a surcharge model for each cinema ticket for 3D screenings.

Part one: Investments

This section highlights the various investments that are required for each stereoscopic presentation system. The investments can be divided at the following levels:

- eyewear
- equipment (hardware)
- screen requirements

The related costs for each digital 3D system will be just one element that could impact on the choice for exhibitors. Other significant attributes include durability, reliability, in-theatre handling as well as affordable business models in order to finance the equipment. The summary data presented in a table for each of the four digital 3D cinema formats outlined records initial costs against ongoing contributions.

Part two

Revenue/Profit

This section analyses the potential revenues from screening digital 3D movies based on analysis of the four titles released to date. The data summarises potential average revenues per screen when applying an average surcharge of $2 per admittance, based on weekly analysis of box office returns.

The model also provides allowances for the costs of providing disposable eyewear, which are incorporated into revenue share of the surcharge with the studio/distributor, who typically provides the glasses in the US market. Screen Digest understands that the split of surcharge revenue is based on existing film rental agreements, and has used an average marker of 50% in its analysis.

Screen Digest has also adapted data from the four previous digital 3D movies to show the potential revenue and profit (after studio share of revenues). The data is presented on a sliding scale, and is dependent on the overall performance of the movie, ie box office revenue per screen. The data provides indication of the potential revenues and profit from applying a higher surcharge revenue. Although it is not known to what extent the exhibitor must always share with the studio on a very high price premium eg if an average of $5 was applied per ticket.

Investments for the digital 3D stereoscopic format

RealD

Eyewear

The RealD system requires the use of inexpensive disposable glasses. The cost of the circular polarized glasses are typically provided by the distributor/studio in the US, although in some international territories,