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The Next Game Consoles

An inside-the-box look at Xbox 360 and PS3

Reason for Report: Industry analysis

Industry

Highlights:

- As Microsoft (MSFT, B-2-7, \$25.96) and Sony (SNE, B-2-7, \$32.95) square off for the launch of their next-generation game consoles, our analysis indicates that Microsoft has a significant advantage in terms of cost. Taking Sony's weakened financial condition and Microsoft's deep pockets into consideration, we conclude that Microsoft's Xbox 360 should emerge as the early winner in the next round of the game console wars.
- Sony has in PS3 a console with plenty of impressive proprietary technology, but also a high manufacturing cost. The launch is coming just as Sony tries to come to grips with its deteriorating financial situation.
- Our analysis of the bills of material for the Xbox 360 and the PS3 indicates that the PS3 will not only be significantly more costly than Xbox 360 at launch, but will continue to operate at a cost disadvantage for several years. Based on the cost analysis as well as our analysis of the two companies' strategies, we think that Xbox 360 could be selling at half the price of PS3 in the latter half of 2006.
- Microsoft comes to the launch with a nearly unlimited ability to loss-lead with hardware sales if it chooses to. Competitive pricing could hurt margins for the near term, but we think that Microsoft has the potential to exit 2006 with an installed base of 10 million units, with all that implies for more profitable software sales for 2007. Also, as volumes ramp up, Microsoft should see an improved ability to lower hardware costs.
- That would not only be big news for Microsoft and Sony, but also for the many software partners and semiconductor suppliers supporting the PS3 and Xbox 360. Should Xbox 360 manage to open up an early lead, potential beneficiaries include ATI Technologies (ATYT, C-1-9, \$14.42) and of course Microsoft itself. Marvell (MRVL, C-2-9, \$45.62) would benefit from a rapid Xbox 360 ramp although the company also has PS3 exposure, and memory maker Infineon (IFX, C-3-9, \$9.36) is supplying Xbox 360 as well. The biggest perceived losers would be NVIDIA (NVDA, C-2-9, \$33.14), which is the graphics partner for PS3, and Sony.
- On the software side, we highlight Electronic Arts (ERTS, C-2-9, \$55.62) and Activision (ATVI; C-1-9; \$16.12) as early high share holders for the Xbox 360 platform.

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■ **Microsoft has an opening – will the company take it?**

Sony has in PS3 a console with plenty of impressive proprietary technology, but also a high manufacturing cost. The launch is coming just as Sony tries to come to grips with its deteriorating financial situation. Meanwhile, Microsoft is preparing to launch the less expensive Xbox 360, and comes to the launch with a nearly unlimited ability to loss-lead with hardware sales if it chooses to. If Microsoft plays its cards right, we think the company has an opportunity to shift the competitive landscape in the console business. That would not only be big news for Microsoft and Sony, but also for the many software partners and semiconductor suppliers supporting the PS3 and Xbox 360.

■ **Cost analysis reveals a significant differential**

Our analysis of the bills of material for the Xbox 360 and the PS3 indicates that the PS3 will not only be significantly more costly than Xbox 360 at launch, but will continue to operate at a cost disadvantage for several years. Based on the cost analysis as well as our analysis of the two companies’ strategies, we think that Xbox 360 (including the detachable hard drive) could be selling for \$249 by the time PS3 launches for approximately \$500. The factors behind the cost differential are several.

■ **The biggest issue is Sony’s Cell processor**

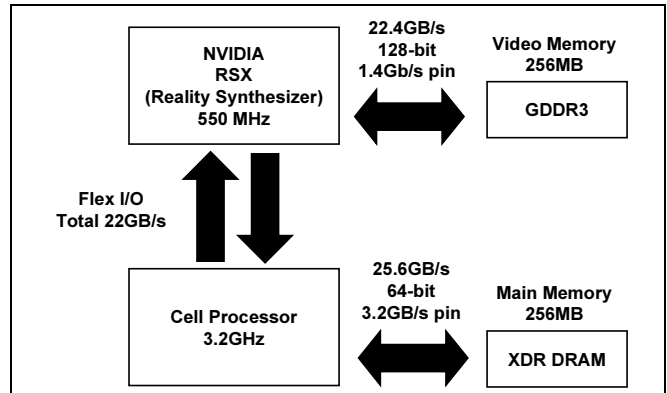
First and foremost, Sony’s decision to develop a completely new architecture – Cell – for the PS3 has been an extremely expensive undertaking. The theory behind Cell has been that the architecture will find markets beyond the Playstation. Processor architectures have been in consolidation mode for the last 5 years, though, and we think it’s going to be difficult for Sony to find takers for Cell outside of the PS3. In particular, the notion that Cell is a viable competitor to mainstream PC processors is not credible. There are reports that Cell is being looked at for imaging-intensive applications that suit its architecture, but we can’t see anything that is likely to provide meaningful volumes. We believe that Sony must be focused on recovering a portion of the development costs for Cell with PS3 sales.

■ **Cell is going to be expensive to manufacture**

Leaving development costs aside, the Cell itself looks like it’s going to be expensive to manufacture. The die, at 235 square millimeters initially, is large, and Sony plans to manufacture it on a leading-edge 90nm process. Add to that the fact that the die is mostly logic, not memory arrays that can easily be repaired, and you’ve got a part that looks like it will be difficult and expensive to manufacture. Per the table on the following page we estimate that the Cell will cost \$160 to make initially. That is significantly more expensive than the \$100 that we estimate for the PowerPC solution that Microsoft is using for XBox360 – the die size

for the processor is \$165 millimeters square according to our estimates. Note that the Cell incorporates a PowerPC core, but various other unique elements as well, and can’t really be thought of as a PowerPC-compatible solution. Sony and Toshiba will be manufacturing Cell, and we have no doubt that the companies can execute. However, we don’t think it’s likely that the two companies manage to out-execute IBM, which will be making the PowerPC-based processor for Xbox 360.

Chart 1: PS3 Processor Block Diagram

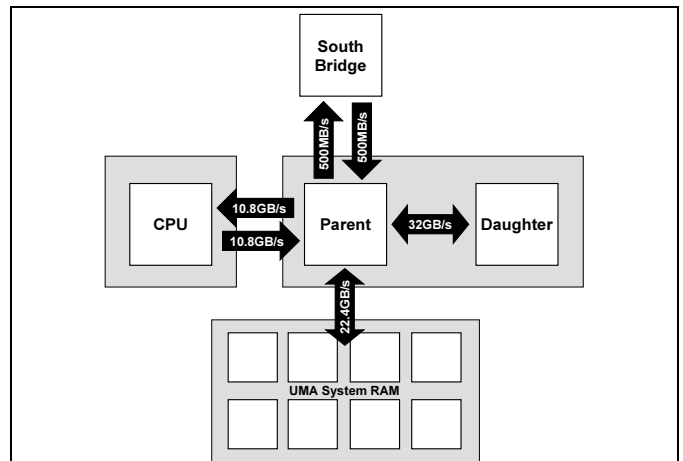


Source: Microprocessor Report

■ **Graphics engines should be comparable from a cost standpoint**

Both Sony and Microsoft have licensed technology from third-party graphics firms for the graphics engines that each console will use. Sony is working with NVIDIA while Microsoft is using ATI Technologies. We don’t see a big difference between the two solutions in terms of cost and manufacturability – per the tables on the following page, we expect both graphics processors to cost \$100 initially, declining to \$30 over the next 3 years. TSMC will be manufacturing the GPU for Microsoft, while Sony and Toshiba will be making the NVIDIA GPU.

Chart 2: Xbox Processor 360 Block Diagram



Source: Microprocessor Report

(Continued)

■ The performance debate

Few industries can compare to computer graphics when it comes to generating arcane performance data, but the reality is that performance by itself has never been a determinant of success or failure in the game console business. The technically impressive Sega Dreamcast and 3DO consoles both failed because of high prices and inadequate software support. What Sony has achieved with Cell is impressive, and the Playstation franchise has so far enjoyed a “must-have” advantage amongst buyers that Xbox has not, but it’s too early to say whether the Cell’s technical specifications will translate into a real-world advantage. What will matter is marketing, software support and pricing.

■ Blu-ray drive also looks expensive

The other major cost disadvantage lies with the Blu-ray drive that Sony plans to include. That’s one of two next-generation optical media standards that will support high-definition images – following the recordable DVD battles the consumer electronics industry has somehow managed to get into another standards battle over high-definition. It’s possible that Blu-ray will emerge triumphant, but we very much doubt that the conflict will have been resolved by the time PS3 launches. The result is a drive that we estimate will be at least \$75 more expensive than the plain-vanilla DVD-ROM drive that Microsoft plans to include in the Xbox 360.

■ Xbox 360 HDD should add \$25

The various add-ons that both consoles will offer should not vary significantly between platforms. The only major element that Xbox 360 includes that PS3 does not is a detachable hard drive. In the 20GB configuration that we believe will be shipped, the price is likely to be \$25. That leaves Microsoft room to lower the price for the HDD-equipped version of Xbox 360, which will initially be offered at \$400.

■ Differing memory architectures give Xbox 360 a slight cost edge

Both consoles utilize specialized high-performance memory, and relative to the cost of other components in the box we don’t expect memory to be a major factor for either player. The only point worth mentioning is that the XDR main memory Sony will be using for PS3 is not a product that’s gained acceptance elsewhere, while GDDR3 should see broader utilization in graphics applications. That leaves Sony and Toshiba in the position of manufacturing the specialized memory themselves, while Microsoft should be able to buy GDDR3 on the open market.

■ Is Sony in a position to loss-lead with PS3?

All of this might not matter were Sony in a position to take large losses on the PS3, but the company’s financial

situation raises questions about just how much money Sony is going to be willing to lose. CEO Howard Stringer has made some public commitments regarding the target level of profitability for the March 2007 fiscal year, and we’re not sure those target are consistent with large losses on PS3 hardware.

■ Microsoft likely to leverage its cost advantage

Meanwhile, Microsoft has a less expensive platform, a 6-month lead on PS3 and the willingness to forgo margins in the near-term in order to pick up market share. Microsoft has more price flexibility with IBM and ATI on the component supply side for Xbox 360 as volumes ramp compared to its older agreements with Intel for the prior Xbox cycle. We expect to see Microsoft take advantage of its position as 2006 progresses, and we wouldn’t be surprised to see pre-emptive price cuts for Xbox360 in front of the European and U.S. PS3 launch. That assumes of course that the PS3 actually launches outside of Japan in 2006 – given the manufacturing challenge that Sony faces with Cell, it’s possible that the PS3 does not make the holiday 2006 selling season outside of Japan.

■ Microsoft will likely break even in Year 1 and generate profits subsequently

Microsoft is in a strong position to assert its claim to #1 market share in the next generation console cycle with a lead in the launch. Microsoft is looking to build a large installed base, possibly around 10 million consoles by the end of 2006. The first year will be very critical, especially the Holiday season of 2005, during which an estimated 65% of console sales are likely to take place.

■ PS3 pricing could be 2x Xbox 360 at yearend 2006

All of this adds up to a situation that we think is much more favorable for Xbox 360, and much less favorable for PS3, than the market currently appreciates. It’s possible that we finish 2006 with the HDD-enabled version of Xbox 360 at \$249 and the PS3 at \$499. If we’re correct, and Xbox 360 comes out of 2006 with a big lead on PS3, there are multiple implications for Microsoft, Sony, their hardware suppliers and their software partners. We examine those implications in the following section.

Table 1: Estimated Bill of Material for PS3

Playstation 3	Components	Est. Cost at launch	Est. Cost after 3 years
CPU	IBM Cell Processor	\$160	\$50
GPU	NVIDIA RSX @550MHz	\$100	\$30
Optical Media	Blu-ray	\$100	\$30
Memory	256MB XDR Main RAM 256MB GDDR3 VRAM	\$60	\$30
HDD	Detachable 2.5" HDD	NA	NA
USB	6 ports (front x4, rear x2)	\$5	\$3
Ethernet	Gigabit Ethernet	\$5	\$4
WiFi	802.11 b/g	\$5	\$3
Bluetooth	Bluetooth 2.0	\$10	\$5
Other components	Analog IC, ASICs, I/O	\$50	\$40
TOTAL		\$495	\$195

Source: Merrill Lynch estimates

Table 2: Estimated Bill of Material for Xbox 360

Xbox 360	Components	Est. Cost at launch	Est. Cost after 3 years
CPU	IBM PPC	\$100	\$35
GPU	ATI GPU	\$100	\$30
Optical Media	DVD-ROM	\$25	\$10
Memory	512MB GDDR3 RAM	\$50	\$25
HDD	Detachable 20GB HDD	\$25	\$15
USB	3 ports	\$5	\$3
Ethernet	Ethernet	\$5	\$4
WiFi	802.11 a/b/g	\$5	\$3
Controllers	Up to 4 wireless controllers	NA	NA
Other components	Analog IC, ASICs, I/O	\$25	\$20
TOTAL		\$340	\$145

Source: Merrill Lynch estimates

Implications for individual companies

■ Expect news flow to favor ATI for the next 12 months

With Xbox360 now set to launch on Nov 22, we think the news flow will favor ATI for the next 12 months. Our model assumes about 2 million units shipped in calendar 2005, followed by 7 million units in calendar 2006. We regard our assumption as reasonable, if not conservative. By comparison, about 3.5 million units of the original Xbox was shipped in the first holiday season, followed up 5.5 million units in the first full calendar year. Assuming a per-box royalty of \$3-4, ATI should make \$21 million to \$28 million of royalty in calendar 2006.

■ NVIDIA's royalty stream at risk

In contrast, our estimates for NVIDIA could be in jeopardy. Currently we estimate NVDA will earn \$60 million in combined software license and royalty from

Sony assuming 12 million units shipped in calendar 2006 (fiscal 2007). If only half the units are shipped, NVDA's royalty revenue could go down by \$30 million, or 8% of operating income. Longer term, it may not be just a revenue push-out. If the delay causes a permanent market share loss as we alluded to earlier, our estimate for NVDA's annual royalty revenue of \$50-100 million for the next few years could also be at risk.

■ Marvell has both boxes, but higher exposure to PS3

Marvell provides the WLAN chipset for the Xbox 360 (WLAN is an optional feature) and we estimate that the ASP is about \$3-\$4. We also believe that the company supplies WLAN, GigE, and SATA ICs into the Sony PS3 and estimate that MRVL's content in this console is about \$8. We are currently modeling MRVL's WLAN business to grow nearly 40% in 2006 as the company benefits from WLAN penetration in gaming consoles, cell phones, printers and other embedded applications. Needless to say, MRVL would benefit more if PS3 wins out against Xbox rather than the other way around, but should see incremental benefits either way.

■ Broadcom may see some Bluetooth opportunity although the impact looks minimal

In April, Broadcom announced a strategic partnership with Nintendo to provide wireless broadband ICs for the company's next generation gaming systems. In particular, we believe the company won the WLAN sockets for Nintendo's "Revolution" game platform. At this point, we are looking for a modest benefit for Broadcom from the win given the projected volume forecasts for the Revolution and the fact that WLAN is already a significant business for the company. Bluetooth is another opportunity for Broadcom in the Sony PS3, but volumes will be minimal relative to the size of the Bluetooth market overall.

■ Infineon set as a memory supplier to Xbox 360

Infineon has gained both memory and logic sockets in the Xbox360. It is supplying 512Mb GDDR3 DRAM memory along with Samsung and Hynix into Xbox360, and all three are no doubt in the running for PS3 too. In August the company announced that it will also supply a removable memory product (Infineon will make the controller, flash memory will be sourced externally): a wireless game-pad controller ASIC; and a security chip. These design-ins are a marginal positive for Infineon but do not materially impact the bottom line.

■ Electronic Arts should have leading share initially

We expect Electronic Arts to have leading initial share on Xbox 360. EA is expected to have five titles at launch and should dominate the sports category. EA's titles for other genres begin to roll out in C1H'06E. We have \$160mn in

Xbox 360 revenues in our Electronic Arts model in FY'06, which could prove to be conservative relative to the \$260mn EA generated on PSX II during the same period after launch. The near-term risk for EA is if sales levels on other platforms can meet expectations, in our view.

■ Activision – four titles at launch

We expect Activision's early Xbox 360 share to be a catalyst. Activision is expected to have four titles at launch, with Call of Duty emerging as one the most anticipated titles on the platform. We expect Activision to have strong, double-digit, share on Xbox 360, which should establish the Company as a leading player on next-generation systems. We have \$63mn of Xbox 360 revenue in our Activision model in FY'06, which could also be low. We continue to believe Activision has revenue upside potential versus consensus revenue expectations in F3Q (Dec. quarter).

Price Objective Basis and Risk

■ ATI Technologies

Our price objective of \$16 is about 10% below the mid-cycle value of \$17.6 suggested by our long term ROOC cycle. We think this is appropriate as ATI continues to move through the bottom of this desktop product cycle over the next 1-2 quarters. The resulting 27x our revised calendar 2006 EPS estimate of \$0.60 looks high, but is reasonable assuming that earnings will recover as the new desktop product cycle kicks in. While the annual growth of the PC graphics market is likely in the single-digit range, we assume ATI will grow the top line at 12% over the next 3 years. We expect operating margin in the range of 10-12% due to the higher-than-average margin that ATI is able to achieve in new markets. The risks to our recommendation are (1) inventory adjustment in the near term, (2) the short product cycles of the PC graphics market, (3) Intel's continued push in the integrated graphics market, and (4) the timing of product ramp in the handset and digital TV markets.

■ Activision

Our 12-month price objective for Activision is \$19 based on our discounted cash flow (DCF) analysis. Our price target represents 29x our FY07 (CY06) EPS estimate of \$0.64. Net of expected cash (\$3/share), and excluding interest income from EPS, our price target represents 28x our FY07 EPS estimate.

Risks to our price objective are industry concerns such as ongoing competitive pressures that could reduce market share, the unpredictability of sales of new titles, including Activision's new FY06 title Gun, sales of next generation consoles that might fall below industry projections, and high costs of technology enhancements that could weigh on margins. Other risks to our price objective include

macroeconomic factors such as a possible slowdown in consumer spending that could restrain overall spending on interactive entertainment and currency fluctuations that could lower international revenue and/or raise costs.

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Neutral	133	58.59%	Neutral	19	14.29%
Sell	11	4.85%	Sell	1	9.09%

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